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Research Article

HRCT Evaluation in Symptomatic HIV Seropositive Individuals with Apparently Normal Chest X-Ray

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Abstract: HIV is one of the most important infections that causes significant detriment in the human immunity causing many opportunistic infections. Fifty six patients HIV seropositive individuals out of 482 were selected who come to Outpatient in department of pulmonary medicine who had pulmonary complaints with normal chest radiograph were selected. Out of the 56 patients who were investigated, 4 patients did not turn up for follow up with the investigation report. Only 52 are included in the present study. Out of these 52 patients with normal chest radiographs, 19 patients had abnormal HRCT findings. In conclusion, HRCT of chest is a useful cost-effective investigation, and is superior in demonstrating the distribution and extent of parenchymal abnormalities and can localize the lesions in the lungs and helps further diagnostic accuracy in invasive investigations.
Keywords: HIV, Normal Chest X-ray, HRCT abnormal, Opportunistic Infections, Early Diagnosis.

INTRODUCTION

HIV is one of the most important infections that cause significant detriment in the human immunity causing many opportunistic infections. The purpose of this study is emphasized mainly, to identify the pulmonary manifestations of opportunistic infections, causing the disease in HIV seropositive symptomatic individuals as early as possible using HRCT even if their Chest X-Ray appears to be normal. Due to the atypical radiological presentation and under diagnosis of opportunistic co-infections like Tuberculosis, PCP pneumonia, fungal and other bacterial infections in HIV seropositive patients, it is very important to identify the disease as early as possible. Computerized Tomography scanning plays an important role as one of the useful diagnostic investigations of choice in detecting the early abnormal radiological patterns of lung parenchyma in HIV seropositive individuals.

MATERIAL AND METHODS

A Hospital based observational study was conducted over 2 years (November 2011 to October 2013), in Outpatient Block in Department of pulmonary Medicine, Government General Hospital, Vijayawada.

Study Group

The study group included patients presented to the outpatient block at Department of Pulmonary Medicine, SMC, GGH, Vijayawada with respiratory complaints who were diagnosed and registered as HIV seropositive at any Integrated Counselling and Testing Centers (ICTC) for HIV, organized by A.P. State Aids Control Society, Hyderabad.

Consent

Patients were subjected for CT scan evaluation of chest only after taking proper consent. Patients were explained properly and informed prior about the merits and demerits of CT scan imaging. Permission and clearance was given by the thesis ethics committee.

Inclusion criteria

HIV seropositive patients diagnosed at ICTC centres where 3 different types of rapid tests (Bioline method, Triline method, Trispot method) were performed to detect antibodies against HIV.

HIV seropositive patients with symptoms suggestive of lung disease – fever, cough, breathlessness, chest pain , night sweats, generalized weakness, loss of appetite and weight etc.,

Symptomatic HIV seropositive patients with Normal chest radiograph as confirmed by the thesis guide and radiologist.

Exclusion criteria

- HIV seronegative patients
- Asymptomatic HIV seropositive patients
- Patient with abnormal chest radiographs
- Patients less than 12 years of age
- Patients with other systemic diseases like heart disease, CNS problems, diabetes mellitus etc,
- Pregnant woman
- Patients who are not co-operative

All cases were examined in detail as per proforma with special reference to respiratory system. Other systems were also examined in detail whenever it was found necessary. In each case, history of present and past illness was carefully enquired into so as to obtain a complete historical background of case. None of the patients were on antiretroviral therapy.

After clinical examination all the patients were subjected to the following investigations:

- Chest X-Ray PA View
- Complete blood picture
- urine – Albumin, Sugar and deposits
- Blood sugar
- Blood urea
- Serum creatinine
- Serum bilirubin
- SGPT
- Serum electrolytes
- Absolute lymphocyte count
- CD4+ count
- SPO2 (oxygen saturation)measurement
- Mantoux skin test
- Sputum examination-Gram stain, culture,
- AFB smear examination (2 Sputum samples)
- oxygen saturation measurement
- HRCT

A HRCT scan of the chest was performed consisting of 1.5mm collimation section at `10mm intervals reconstructed with a high spatial frequency algorithm. All scans were performed without intravenous contrast media at suspended end inspiration with the patient in a supine position. Scans were reviewed at a setting appropriate for both lung parenchyma and mediastinum. The chest radiograph and HRCT scans were evaluated by a radiologist who had no prior knowledge of the etiology and clinical features. The HRCT scans were reported without the concurrent availability of the chest radiograph.

HRCT findings were correlated with clinical features and other investigations.

RESULTS

Out of 482 HIV positive cases treated and investigated at outpatient department, 56 (11.08%) patients had normal chest radiograph with pulmonary symptoms. But 4 patients were lost for follow up. So results were tabulated for 52 patients. This accounts for 10.78% of the total number of the cases. Out of the total 52 cases studied, most of the cases (48.07%) belong to the age group between 31-40 years; 36.53% of patients were in the age group of 21-30 years; 11.53% patients were in the 41-50 years age group and only 2(3.88%) patients had age less than 20 years. In the present study the patient's age ranged from 12 years to 50 years. Mean age of the group is 32.3 years. The maximum numbers of cases were between 31-40 years.

Of the total number of 52 cases studied, 30(57.69%) were males and 22 (42.31%) were females. The male: Female ratio is 1.3:1.

In this study, 50 patients presented with cough (96.15%) as the main symptom. Fever was the main presenting symptom in 38 (73.07%) patients. Dyspnoea was seen in 19 (36.5%) of cases while chest pain was seen in only 7 (13.40%) of cases. Haemoptysis was seen in 6 patients (11.52%). Other symptoms like night sweats, loss of appetite, loss of weight, wheeze, diarrhea, vomiting were seen in 10 (19.2%) of the cases. The most common symptoms observed in the present study were cough (96.15%) and fever (73.07%).

Table 1: No. of cases with normal and abnormal HRCT findings

HRCT finding	No. of cases	Percentage (n=52)
Abnormal CT	19	36.53%
Normal CT	33	63.47%

The present study shows that about 36.53% of the patients with normal chest radiograph and pulmonary symptoms had abnormal HRCT findings, while, 63.47% of the patients had normal HRCT findings.

Mantoux skin test was positive in 16 patients (30.76%) out of the 52 cases studied. Of these, 9 patients were males and 7 patients were females.

The Mantoux skin test was negative in 36(69.24%) of the cases studied.

Table 2: HRCT findings gender wise

HRCT findings	No. of patients	Percentage (n=52)	Male%	Female%
Blebs	1	1.92%	1(1.92%)	0(0%)
Areas of pneumonitis	3	5.76%	2(3.84%)	1(1.92%)
Consolidation	3	5.768%	1(1.92%)	2(3.84%)
Infiltrations	12	23.04%	4(7.68%)	5(9.61%)
Ground glass opacity	5	9.61%	4(7.68%)	1(1.92%)
Broncho pneumonia	1	1.92%	0(0%)	1(1.92%)
Pleural effusion	1	1.92%	1(1.92%)	0(0%)
Hilar adenopathy	3	5.76%	1(1.92%)	2(3.84%)
Cavities	3	5.76%	1(1.92%)	2(3.84%)

*multiple findings

Of all the CT findings observed, Infiltrations were seen in 12 cases (23.04%), ground glass opacities in 5 cases (9.60%) ,areas of consolidation seen in 3 cases (5.76%), hilar adenopathy, areas of consolidation ,areas of pneumonitis and cavities in 3 cases (5.76%) each, blebs, pleural effusion and bronchopneumonia in 1 case(1.92%) each with 4 male (7.68%) and 5 female (9.61%).

Hilar lymphadenopathy, areas of consolidation and Cavities were seen in 3 cases each (5.76%), 1 male (1.92%) and 2 females (3.84%) in both CT findings.

Pleural effusion, Blebs and Bronchopneumonic pattern were seen in 1patient each (1.92%). Pleural Effusion and Blebs were seen in 1 male each and Bronchopneumonia pattern seen in 1 female.

Table 3: CT findings according to the areas involved in the lungs

Various CT findings of lung	No. of cases with positive findings	Percentage of total (n=52)
Total CT findings in Right Lung	13	24.96%
Upper Lobe	5	9.61%
Middle Lobe	3	5.76%
Lower Lobe	5	9.61%
Total CT findings in Left Lung	4	7.68%
Upper Lobe	2	3.84%
Lingula	0	0%
Lower Lobe	2	3.84%
Bilateral CT findings	11	21.12%

*multiple findings

Various positive CT findings such as infiltrations, cavities, ground glass opacities, blebs, areas of consolidation, pleural effusion etc., were observed as overlapping findings in one lobe or two or all the three lobes. 13 cases (24.96%) show the various CT findings involving the right lung. 4 cases (7.68%) show the various CT findings involving the left lung and 11 cases (13.46%) showed the various CT findings involving both the lungs.

In the right lung, CT findings in upper lobe were noted in 5cases (11.53%), the middle lobe in 3 cases (5.76%) & lower lobes were involved in 5 cases (9.61%).

In the left lung, the upper lobe was involved in 2 cases (3.84%), and lower lobe in 2 cases (3.84%).

In the present study, it was observed that the right lung was involved mostly with predominant involvement of the upper lobe and lower lobe.

Table 4: Comparison of Mantoux skin test positivity in males and females with CT findings

CT Findings	Males with Mantoux positive	Females with Mantoux positive	Total Mantoux positive (n= 16/52)
Abnormal CT	5 (9.61%)	4 (7.68%)	9(17 .3%)
Normal CT	4 (7.68%)	3(5.76%)	7(13.4%)

Out of 19 cases presenting with abnormal HRCT findings, 9 cases (17.3%) were Mantoux positive, of which 5 cases (9.61%) were males and 4 cases (7.68%) were females.

7 patients (13.4%) with positive Mantoux skin test were found to be having normal study on HRCT.

In the present study, Mantoux positive was seen more often in patients with abnormal HRCT when compared to patients with normal HRCT. 17.3% of patients with abnormal HRCT were Mantoux positive where as only 13.4%pateints with normal HRCT were Mantoux positive.

Table 5: Comparison of Mantoux skin test result with HRCT findings

Mantoux test	Abnormal CT	Normal CT	Total
Positive	9(17.3%)	7(13.4%)	16(30.76%)
Negative	10(19.2%)	26(50%)	36(69.24%)
Total	19(36.53%)	33(63.46%)	52(100%)

This table compares the number of abnormal and normal HRCT findings in Mantoux positive and negative individuals.

9 (17.3%) out of 16 patients with Mantoux positivity showed abnormal HRCT. While 10(19.2%) out of 36 patients with Mantoux negativity showed abnormal HRCT findings.

In this table, odds ratio is 3.34, chi square is 3.87, for degree of freedom 1, the 'p' value is < 0.05, and hence the odds ratio is significant.

This table interprets the importance of Mantoux skin testing in symptomatic HIV seropositive individuals presented with normal Chest X-ray, and was investigated further with HRCT.

Fig. 1: Mantoux and HRCT relation

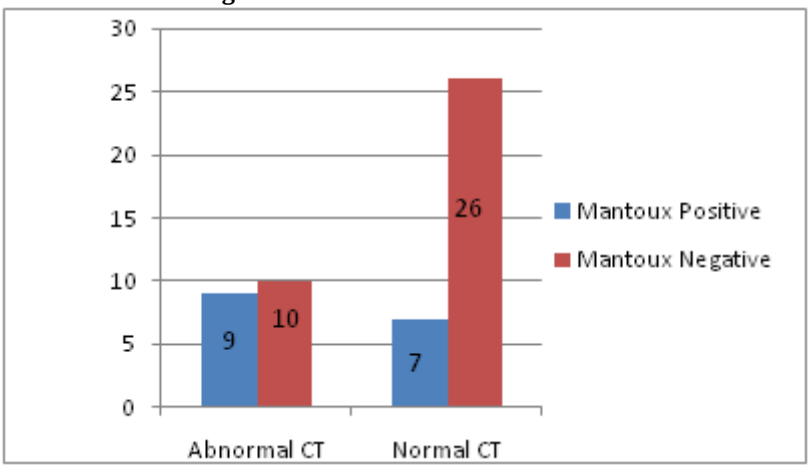

Table 6: HRCT findings– age & sex wise distribution

Age (yrs)	Normal HRCT			Abnormal HRCT		
	Male	Female	Total	Male	Female	Total
<20	-	1(1.92%)	1(1.92%)	1(1.92%)	-	1(1.92%)
21-25	3(5.76%)	4(7.69%)	7(13.46%)	1(1.92%)	3(5.76%)	4(7.69%)
26-30	5(9.61%)	1(1.92%)	6(11.53%)	2(3.84%)	-	2(3.84%)
31-35	4(7.69%)	3(5.76%)	7(13.46%)	2(3.84%)	3(5.76%)	5(9.61%)
36-40	6(11.53%)	2(3.84%)	8(15.38%)	4(7.69%)	1(1.92%)	5(9.61%)
>40	2(3.84%)	2(3.84%)	4(7.69%)	-	2(3.84%)	2(3.84%)

In the present study, the maximum number of patients with abnormal HRCT findings were seen in the age range of 31-40years i.e.,10 cases (19.22%), out of which 6(11.53%) were males and 4(7.69%) were females. 6 patients (11.53%) were in the age of 21-30 years, of which 3 patients (5.76%) were males and 3(5.76%) patients were female. 2(3.84%) female patients were in the age group of more than 40 years. Only 1(1.92%) male in the present study was in the age range of less than 20 years.

Table 7: Comparison of HRCT findings in smokers & non –smokers

Smokers	10(19.23%) (a)	12(23.07%) (b)	22(42.30%)
Non-smokers	9(17.30%) (c)	21(40.38%) (d)	30(57.69%)
Total	19(36.53%)	33(63.46%)	52(100%)

Among the patients studied with positive HRCT findings 10(19.23%) were smokers and 9(17.30%) were non-smokers.

To measure the strength of association between risk factor and outcome, Odds Ratio can be calculated.

Odds ratio = ad / bc

= 10 x 21 / 12 x 9

=1.94 (Odds Ratio > 1 → Positive association)

That means, smokers show a risk of having abnormal CT findings 1.94 times that of non-smokers. But, chi square is 1.31, which for degree of freedom of 1, corresponds to 'p' value > 0.05.

Though the odds ratio shows positive association, the 'p' value is > 0.05 hence is not significant.

Table 8: Diagnosis made in this study

Diagnosis	No. of cases	Percentage of total (%)(n=52)
Pulmonary Tuberculosis	10	19.2%
Extrapulmonary tuberculosis	1	1.92%
Bacterial Pneumonia	2	3.84%
Pneumocystis carinii pneumonia	3	5.76%
Others(pneumonitis,OAD)	3	5.76%

In our study the most common diagnosis was tuberculosis with 11 cases (21.15%) of total. Bacterial pneumonia accounted for 2 cases (3.84%). PCP was seen in 3 cases (5.76%). Others included Blebs OAD (Obstructive Airway Disease) seen in 1 case (1.92%) and nonspecific Lower Respiratory Tract infection in 3 cases (5.76%). So in the present study most common diagnosis with normal chest X-ray was Tuberculosis.

DISCUSSION

In our study of 482 HIV seropositive patients with pulmonary symptoms, 56 patients were selected for study that had normal chest radiograph which is equivalent to 11.08%. This value correlates with the studies conducted by John Segreti *et al*., who demonstrated that the chest radiographs were normal in 10% of his HIV positive patients with pulmonary symptoms [1].

Among these 56 patients, 4 patients did not turn up for further investigations. Hence only 52 patients were included in the study.

The most common presenting symptoms in our study were cough (96.15%), fever (73.07%) and dyspnoea (36.5%). In 1 patient dyspnoea was the major complaint.

All the 52 patients were examined clinically, followed by laboratory examinations and high resolution- CT of the chest was done within a week. Out of these 52 patients with normal chest radiographs, 19 patients had abnormal HRCT findings, which is equivalent to 36.53%. In a study conducted by Kauczor HU *et al*. in 1995, HRCT was done on 30 HIV seropositive patients with respiratory complaints and normal chest radiographs, of which 30.77% had abnormal findings [2].

In another study conducted by Diehl SJ *et al*. in 1997, 31 HIV seropositive cases with acute pulmonary symptoms and normal or non specific chest radiographs, HRCT was done. Nineteen of these patients (61.3%) showed abnormal HRCT findings. This high value could be due to the inclusion of cases with non-specific chest radiographs [3].

These two studies concluded that in the presence of pulmonary symptoms in HIV seropositive patients, HRCT should be performed whether the chest radiograph is normal or abnormal since it may reveal additional information. Compared to Broncho Alveolar Lavage (BAL) and induced sputum, HRCT can provide conclusive results within a short time. This conclusion holds good even in the present study.

In the present study, 84.61% of patients belonged to the age group ranging from 20to 40 years with a mean age of 30.3 years. As this is economically the most productive age group, early diagnosis and treatment of pulmonary disease decreased the morbidity, mortality and economic burden on the society. Palmieri F *et al*., in their retrospective study on 146 HIV seropositive patients observed a decrease in survival among patients with pulmonary TB with negative sputum smear and normal chest X-ray at presentation. This was primarily attributed to the delay in the diagnosis of tuberculosis

and initiation of anti-tuberculous treatment which resulted in rapid progression of HIV infection [4].

This highlights the importance of early diagnosis and treatment in symptomatic HIV seropositive patients with normal chest x-ray findings in India, where tuberculosis contributes the major share for the morbidity and mortality of HIV infection.

In the present study, lesions in the right lung were seen in 13cases (24.96 %) and in left lung 4 cases (7.68 %) and in both the lungs in 11ases (21.12 %). In the right lung, lesions were seen in 9.61 % cases in the upper lobe and lower lobe each, 5.76% cases in the middle lobe. In the left lung lesions were seen in 3.84% cases in the upper lobe, in 3.84% cases in the lower lobe. High resolution CT helps in localizing the lesions in the lung, where further diagnostic investigations like bronchoscope, bronchoalveolar lavage (BAL) and fine needle aspiration cytology (FNAC) can be done where ever necessary. This observation was supported by Kirshenbaum KJ *et al*. in their study conducted in January 1998 [5].

In the present study, the following were the CT findings – Infiltrations in 12 cases (23.04%), ground glass opacities in 5 cases(9.60%) ,areas of consolidation seen in 4 cases (7.68%), hilar lymphadenopathy and cavities in 3 cases (5.76%) each, blebs, pleural effusion and bronchopneumonia in 1 case(1.92%) each. These findings can help us to suspect a diagnosis and guide us in selecting necessary, specific, invasive and laborious investigations like bronchoscopy, BAL, FNAC, sputum culture for TB bacilli, staining for Pneumocystis carinii etc., to come to a specific diagnosis.

Gruden JF *et al*. in their study concluded that empirical therapy or immediate bronchoscopy can be avoided in many patients of PCP on the basis of the HRCT findings [6].

In the present study, 11(21.15%) patients were diagnosed tuberculosis based on HRCT findings and other investigations like sputum examination for AFB, Mantoux test along with their clinical features. Patients were started on antituberculous treatment. Symptoms subsided in all cases within two to three weeks.

Raninga S *et al*. [7] recommended HRCT where X-ray findings are normal or inconclusive of tuberculosis in clinically suspected patients for confirmation and determination of activity. In the present study tuberculosis could be diagnosed based on HRCT findings, clinical features and other relevant investigations. Ahidjo A *et al*. [8] in their study conducted in 2005 observed that majority of symptomatic patients with HIV infection had normal chest radiograph (25%). In the present study 21.15% of patients (11 cases) with normal chest radiograph were diagnosed tuberculosis. The conclusion of their study that absence of changes in chest radiograph should not exclude the diagnosis of pulmonary tuberculosis holds well in our present study also.

In the present study 5cases showed ground glass appearance in HRCT, dyspnoea being the main complaint in these patients. They were tachypnoeic with low oxygen saturation (low SpO_2). These patients were started on cotrimoxazole based on HRCT findings. They responded to treatment within 1 week.

Gruden JF *et al*. confirmed that HRCT was 100% sensitive and 89% specific with 90%accuracy in diagnosing PCP [6].

Udwadia ZF *et al*. [9] concluded that PCP is not uncommon infection in Indians with advanced HIV. Lack of recognition has been responsible for the under-diagnosis of this disease.

Kirshenbaum KJ *et al*. [5] showed that HRCT was more specific and more sensitive than Gallium scintigraphy in diagnosing PCP. Richards PJ *et al*. [10] showed that the use of HRCT may help avoid unnecessary delay in diagnosing PCP and allows early medical intervention.

In 2 cases (3.84%) bacterial pneumonia was diagnosed based on clinical features, HRCT and sputum culture and treated with appropriate antibiotics. They responded to treatment within a week.

The relationship between smokers and their abnormal HRCT findings in the present study was not significant.

In 33 patients with normal chest X-ray and normal HRCT, the respiratory complaints might be due to upper respiratory infections or other nonspecific airway diseases. They were treated symptomatically and they responded to the treatment.

CONCLUSION

Despite the development of effective therapies and better prophylaxis of opportunistic infections, pulmonary complications of HIV/AIDS remain an important cause of morbidity and mortality.

Though chest X- ray remains the main stay of thoracic imaging in HIV infected patients, the absence of changes in chest radiograph should not exclude the diagnosis of pulmonary diseases. CT/ HRCT of chest play an important role in establishing an accurate diagnosis when CXR findings are equivocal or non specific. HRCT of chest is a useful cost-effective investigation that can help in suspecting a probable diagnosis of pulmonary diseases and start empirical treatment early before reaching a definitive diagnosis using invasive and laborious investigations. Furthermore HRCT of chest is superior in demonstrating the distribution and extent of

parenchymal abnormalities and can localize the lesions in the lungs and helps further diagnostic accuracy in invasive investigations.

So, it may be concluded that, HRCT of the chest must be included as the diagnostic algorithm for detecting early lesions in HIV seropositive patients with pulmonary symptoms with normal chest X- ray, before contemplating for invasive investigations like bronchoscopy, BAL & FNAC etc, as it may reveal additional information and thus helps to avoid unnecessary delay and allows early medical intervention in treating the pulmonary disease.

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