
CT in detection and diagnosis of thoracic conditions in symptomatic HIV patients

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Abstract

Thoracic manifestations of HIV positive patients have undergone a gradual metamorphosis due to more awareness about the disease and prolonged longevity of the patients due to better treatment options available now, therefore it is necessary for the radiologist to be aware of changing trends in disease prevalence, epidemiology and the possible pathology. Present study was conducted at Sassoon General Hospital, Pune. Twenty five seropositive patients (ELISA positive) showing signs/ symptoms like fever, cough, breathlessness, hemoptysis, dull note on percussion, lymphadenopathy etc are included in the study. CT sections of thorax were taken at 10mm intervals before and after intravenous contrast administration using spiral mode.

We concluded that M. tuberculosis infection was the commonest opportunistic agent in HIV positive patients, however, community acquired bacterial pneumonia was the most frequent cause of pneumonia in HIV infected patients. We concluded that CT is the most important imaging modality used to evaluate chest in HIV positive patients. Contrast enhanced spiral CT is needed to adequately demonstrate lymphadenopathy and HRCT shows distinct advantage in terms of delineation of parenchymal changes.

Keywords: Human Immunodeficiency Virus (HIV), CT scan, Thoracic manifestations, Mycobacterium tuberculosis.

1. Introduction

Human Immunodeficiency Virus (HIV) is an RNA virus belonging to a group called retroviruses. Nearly all patients infected with HIV experience respiratory infections at some point in the course of their illness. Thoracic manifestations of HIV positive patients have undergone a gradual metamorphosis due to more awareness about the disease and prolonged longevity of the patients due to better treatment options available now. The spectrum of chest manifestations is varied and in order to generate a useful differential diagnosis based on imaging findings, it is necessary for the radiologist to be aware of changing trends in disease prevalence, epidemiology and the possible pathology related to new therapies.

It is not just the etiological agents that are changing but also their clinical and radiological presentation. The radiologist has a large role in not only detecting the presence of disease but also in

narrowing the differential possibilities. It is imperative on the part of the radiologist to integrate the clinical information and generate reasonable differential diagnosis. Hence, this study was aimed to detect thoracic manifestations in Human Immunodeficiency Virus infection using contrast enhanced spiral computed tomography; to characterize and differentiate thoracic lesions in Human immunodeficiency Virus infection.

2. Materials and Methods

Present study was conducted at Sassoon General Hospital, Pune. Twenty five seropositive patients (ELISA positive) showing signs/ symptoms like fever, cough, breathlessness, hemoptysis, dull note on percussion, lymphadenopathy etc. Seropositive patients showing gross abnormality on chest roentgenogram (PA view), leading to etiological diagnosis not necessitating further

imaging by CT were excluded from the study. Transverse CT sections of thorax were taken at 10mm intervals before and after intravenous contrast administration using spiral CT technique. High Resolution Computed Tomography sections were obtained whenever essential. Informed consent was obtained from each patient and study was approved by Institutional Ethics committee.

3. Results

In our study of 25 patients the youngest patient was of 21 years of age and the oldest was of 62 years. Fifteen were male patients and 10 were females. Three patients had normal imaging features on chest radiographs and computed tomography. Eight patients were diagnosed having M tuberculosis infection confirming the fact that, this pathogen is the commonest opportunistic agent in HIV positive patients. Community acquired bacterial pneumonia is the most frequent cause of pneumonia in HIV infected patients. Lymphadenopathy with central low attenuation and peripheral rim enhancement and lung parenchymal infiltrates were the most common CT findings.

Table 1: Age Distribution

Sr. No.	Age in yrs.	No. of patients (n = 25)	%
1	20 – 30	12	48
2	31 – 40	8	32
3	41 – 50	3	12
4	51 – 60	1	4
5	61 – 70	1	4

Table 2: Chest manifestations - CT findings

Sr. No.	C.T. findings	No. of patients	%
1	Normal	3	12
2	Lymphadenopathy	8	32
3	Parenchymal involvement	18	72
4	Lymphadenopathy without parenchymal involvement	2	8
5	Pleural involvement	7	28
6	Pericardial involvement	1	4

Table 3: Thoracic manifestations in HIV positive patients

Sr. No.	Diagnosis	No. of patients	%
1	Normal	3	12
2	<i>Mycobacterium tuberculosis</i>	8	32
3	<i>Pneumocystis carinii</i> pneumonia	2	8
4	Other fungal infection	2	8
5	Mixed Infection (PCP + Bacterial)	1	4
6	Bacterial	4	16
7	Viral	1	4
8.	Lymphoma	2	8
9.	Indeterminate	2	8

Table 4: Parenchymal involvement in the lungs

Sr. No.	Parenchymal lesion	No. of patients
1	Centrilobular nodule	8
2	Interstitial nodule	5
3	Ground glass opacities	5
4	Consolidation with cavitation	2
5	Consolidation without cavitation	8
6	Empysematous change	3
7	Cavitary lesion	2
8	Peribronchial thickening	5
9	Fissural thickening	1
10	Bronchiectasis	4
11	Atelectasis	2
12	Mass lesion	1

Table 5: Lymphadenopathy in the chest

Sr. No.	Lymphadenopathy in the chest	No. of patients
1	Distribution	
	Pretracheal	4
	Paratracheal	4
	Hilar	3
	Subcarinal	2
	Aortopulmonary	3
2	On NECT :	
	Homogeneous	2
	Central low attenuation	5
3	On CECT :	
	Peripherally enhancing	5
	Homogeneously enhancing	1
4	Calcified	1

Figure 1a: Thick walled cavitary lesions due to M tuberculosis



Figure 1b: Spontaneous pneumothorax in Pneumocystis carinii

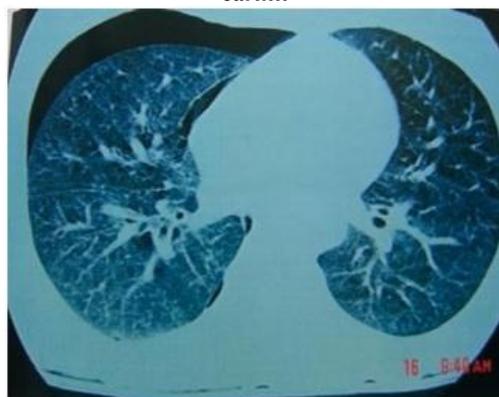


Figure 2a: Abscess due to *S. aureus* infection

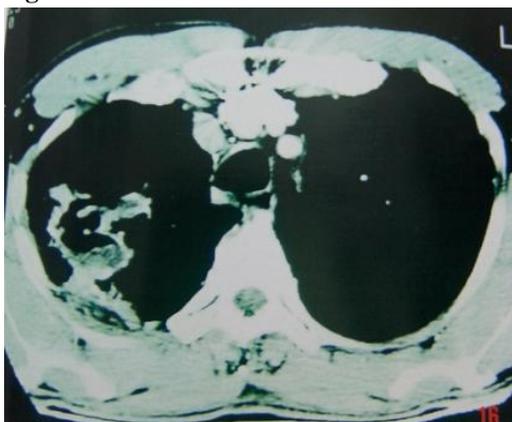


Figure 2b: Empyema due to Gram positive organisms



Figure 3a: Septic pulmonary embolism (showing filling defect in left pulmonary artery)

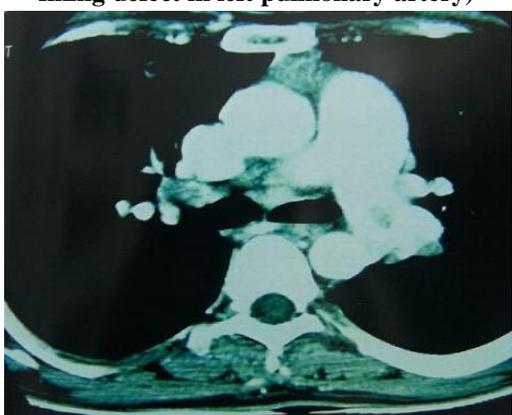


Figure 3b: Septic pulmonary embolism (lung window)

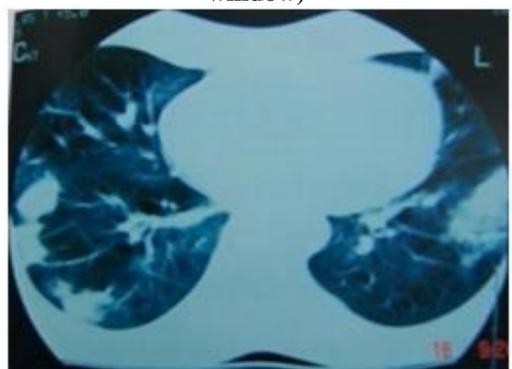


Figure 3c: Septic pulmonary embolism (mediastinal window)



4. Discussion

In this study mycobacterium tuberculosis turned out to be the most common opportunistic infection of thorax in HIV positive patients. This is in comparison with the well-established fact that mycobacterium tuberculosis is the most common opportunistic infection in HIV positive patients. Worldwide one estimate of WHO suggests that there are more than 4 million individuals affected by both these organisms. Mycobacterium tuberculosis tends to occur early in the course of HIV infection with lesser degree of immunosuppression.

Pastores *et al*[1] studied chest radiographs and CT scan observations in 25 patients with tuberculosis and HIV infection.

Table 6: Comparisons of Chest radiographs and CT scan observations with Pastores' study

Findings	Pastores' study (n= 25)	Present study
Parenchymal abnormalities	16 (64%)	6
Adenopathy	25 (100%)	5
Cavities	3 (12%)	2
Pleural effusion / thickening	8 (32%)	4
Miliary pattern	3 (12%)	1

Unlike Pastores *et al*[1] we found more cases with parenchymal abnormality than adenopathy. This may be explained by the higher prevalence of post primary tuberculosis.

Greenberg S.D. *et al*[2] in their study of chest radiograph of 133 adult patients with AIDS observed the following pattern.

Primary mycobacterium tuberculosis	: 38 (28%)
Post primary mycobacterium tuberculosis	: 48 (36%)
Normal	: 19 (14%)
Atypical infiltrates	: 17 (13%)
Minimal radiographic changes	: 7 (5%)
Miliary pattern	: 4 (3%)

Goodman P.C.[3] concluded that patients with early HIV infection will have chest films more typical of post primary pattern of tuberculosis while those with advanced disease are more likely to have a primary tuberculosis pattern.

Pombo F *et al*[4] reported four patterns of enhancement in tuberculous lymph nodes demonstrated by CT, i.e., peripheral rim enhancement (most common), Inhomogeneous enhancement, homogenous enhancement and homogenous non-enhancing nodes. In present study of the 8 patients who had adenopathy, 5 had peripheral rim enhancement while one patient had homogenous enhancement.

Fishman *et al*[5] studied intra thoracic lymphadenopathy in HIV positive patients. In their study they observed that mycobacterial disease accounted for 78% of infections and lymphoma was the most common among tumors. This is similar to findings in present study where mycobacterium tuberculosis and lymphoma accounted for six and two cases respectively.

It has been reported that between 5% to 30% of HIV positive patients developed bacterial pneumonia in their course of illness.[6,7,8] Radiographically bacterial pulmonary infections results in the focal pulmonary consolidation, both segmental and sub-segmental in distribution. These features allow easy differentiation from infection due to PCP. Amorosa *et al*[6] documented that lobar consolidation, nodules and focal infiltrations with or without associated pleural effusions were typical of bacterial infections and are unusual in patients with PCP. Of the 4 patients in present study who had bacterial pneumonia, one had loculated pleural effusion one had infected pleural effusion (empyema) which turned into hydro pneumothorax after surgical intervention to drain the fluid collection. One of the patients had lung abscess due to staphylococcus aureus. Venot *et al*[9] reported a case of HIV positive patient who presented with pneumococcal pneumonia with abscess. Nocardiosis is an uncommon bacterial disease often observed in immunosuppressed patients.[10]

In present study there were 2 cases of fungal infections. One of the patients who had septicemia, presented with sudden onset of breathlessness and was found to have multiple septic emboli along with pulmonary artery thromboembolism. Second patient had focal areas of consolidation surrounded by rim of ground glass attenuation and was diagnosed with invasive aspergillosis. Heussel *et al*[11] had concluded that frequency of fungal pneumonia had increased dramatically due to AIDS and other immunodepressed states and for their radiological

differentiation; experience, local epidemiology and clinical information are necessary.

In present study, one case of cytomegalovirus pneumonia was observed. Patient had "normal" chest radiograph. However HRCT evaluation revealed areas of ground glass attenuation, airspace consolidation and small nodules. Franque *et al*[12] had concluded that CMV pulmonary infection usually consists of mixture of patterns on thin section CT, most common being ground glass attenuation, areas of consolidation and small nodules.

In present study, 2 cases of Non Hodgkin's Lymphoma were present. One of the patients had lung parenchymal lesions too. ARL is seen in 5% of patients having AIDS. Most common cell type is B cell NHL. Thoracic involvement is common in patients who have ARL. Primary pulmonary ARL is less frequent [13]

In present study, 2 patients who had mixture of patterns on CT which included focal areas of consolidation, tree in bud pattern, ground glass opacity and lymphadenopathy and were proposed to have infective disease and patients could not be followed up. It was observed that five of the patients who had "normal" chest radiograph were found to have abnormalities on HRCT. Three of them were diagnosed as *M.tuberculosis* infection, 4th as *Pneumocystis carinii* infection and the 5th CMV pneumonia. These observations are in consonance with the study done by Kang *et al*[14] who had concluded that CT was more sensitive and specific than chest radiography in the detection of pulmonary infection and tumours in patients with AIDS.

Castaner E *et al* have also concluded in their study that the greatest value of CT is in excluding lung disease when the radiographic findings are equivocal and in confirming the presence of clinically suspected disease when radiograph is normal[15].

5. Conclusions

M tuberculosis infection was the commonest opportunistic agent in HIV positive patients, however, community acquired bacterial pneumonia was the most frequent cause of pneumonia in HIV infected patients. We concluded that CT is the most important imaging modality used to evaluate chest in HIV positive patients. Contrast enhanced spiral CT is needed to adequately demonstrate lymphadenopathy and HRCT shows distinct advantage in terms of delineation of parenchymal changes.

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