

## Original article

# Study of usefulness of CT scan as compared to chest radiography in pediatric pulmonary tuberculosis cases

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### Abstract

**Introduction:** Most of the cases are not diagnosed and treated appropriately. The major reasons for delay in the diagnosis of TB in children are low prevalence of clinical manifestations as well as low number of tuberculous bacilli in patient's pulmonary secretions.

**Methodology:** All infants and children between 2 months to 14 years of age suspected to have pulmonary tuberculosis admitted in a tertiary health care centre were enrolled

**Results:** In our study CT scan detected lymphadenopathy most frequently at the hilum (60%), followed by right paratracheal (57%), pretracheal (54%), subcarinal (46%), prevascular (17%), left paratracheal (14%), and para-esophageal (8%).

**Conclusion:** CT scans have advantages over conventional radiographs in diagnosing tuberculosis in pediatric patients and can detect the disease in patients whose chest radiographs are normal or equivocal.

### Introduction:

Most of the cases are not diagnosed and treated appropriately. The major reasons for delay in the diagnosis of TB in children are low prevalence of clinical manifestations as well as low number of tuberculous bacilli in patient's pulmonary secretions.<sup>(1)</sup> Early diagnosis and prompt treatment are very important in the diagnosis of childhood pulmonary TB. Frequent radiological findings of TB in children are hilar and mediastinal lymphadenopathy with central necrosis and airspace consolidations. Chest radiographs provide important information but Computed Tomography (CT) has advantages over it in diagnosing TB in pediatric patients and can detect the disease in patients whose chest radiographs are inconclusive or complications of TB are suspected<sup>(2)</sup>

CT-thorax gives important information about presence and nature of lymphadenopathy, bronchiectasis, pleural and chest wall lesions especially in patients who are symptomatic Mantoux positive with normal X-ray. A major advantage of CT is its ability to image bone, soft tissue and blood vessels all at the same time.

The purpose of this study was to establish CT scan as a useful diagnostic technique compared to chest radiography in revealing and confirming lymphadenopathy or parenchymal lesions and detecting complications of pulmonary tuberculosis.

### Material and methods:

A prospective observational study done in a tertiary health care centre of a large metropolitan city.

**Inclusion criteria :**

All infants and children between 2 months to 14 years of age suspected to have pulmonary tuberculosis admitted in a tertiary health care centre were enrolled .

**Exclusion criteria :**

1. Patients with non-tuberculous pulmonary lesions.
2. Patients already on anti-tuberculous treatment (ATT).

Chest X-ray was done in all patients having complaints pertaining to respiratory system or close contact with TB patient or a positive Mantoux test . A Radiology Lecturer (M.D.) and a senior Pediatrics reported independently on each X-ray. In CXR, particular attention was given to the pattern of pulmonary parenchymal lesions, cavities within the parenchymal lesions; mediastinal lymphadenopathy; airway or pleural complications.

Chest CT scans were performed in all 50 patients 7-10 days after initial chest radiography for one or more of the following reasons to evaluate unusual findings on radiographs such as masslike lesions or widespread nodules; to find or confirm lymphadenopathy; and to detect or evaluate complications such as airway narrowing with or without atelectasis or empyema, pleural effusion, cavities and bronchiectasis. The CT scans were reported by a M.D Radiologist.

**Results**

Among the 50 cases, twenty one (42%) were male and twenty nine female (58%) . There was no significant association between gender and the X-ray or CT findings .

The chest X-ray appeared normal in 6 (12.2%) patients. The CT detected mediastinal lymphadenopathy in 3 of them, consolidation in 2 and consolidation with mediastinal lymphadenopathy in 1 patient.

CT thorax has showed mediastinal lymphadenopathy in 35 patients (70%) as most common finding, followed by consolidation in 24 (48%), systemic dissemination in 10 (20%), pleural effusion in 10 (20%), calcification in 10 (20%), necrotic lymphadenopathy in 6 (12%), bronchial wall thickening in 3 (6%), empyema in 3 (6%), cavitation in 2 (4%), collapse in 2 (4%) and miliary nodule in 1 (2%) patient .

Systemic dissemination in the form of vertebral involvement was detected in 3 patients, mesenteric lymphadenopathy in 1, hepatosplenomegaly in 6 patients. On abdominal USG, one patient had mesenteric lymphadenopathy. Extrapulmonary involvement was revealed in another patient who had seizures, CT brain showed intracranial tuberculoma in that patient.

**Table No.1 : Association between Chest X-Ray-consolidation and CT Thorax consolidation.**

Consolidation	Chest X-ray	Confirmed by CT	
		Yes	No
Yes	18	16	2
No	32	8	24
<b>Total</b>	50	<b>24</b>	26

CT showed consolidation in ten patients (71.4%) in the age group of 10 to 14 yrs, seven (29.2%) in age between 5 to 10 yrs and seven (58.3%) in age of less than 5 yrs.

Mediastinal lymphadenopathy was confirmed in 24 (85.7%) out of 28 patients on CT ,the remaining 4 had additional findings. **In 11 patients mediastinal enlarged nodes were not detected in chest x ray, but revealed in CT scan examination.** Pearson Chi-Square test showed significant association with p value of 0.000623.

Calcification in CT scan was seen in 9 patients (18%) whereas in X-ray it was reported only in 1 patient. Pearson Chi-square test showed significant association with a p value 0.031.

X-ray had shown miliary nodules in one patient, which was confirmed on CT. Pearson Chi-sqaure test has shown significant association.

**Table No.2 : Association of Pediatrician and Radiologist’s radiographic reporting :**

Finding	Reporting		CT thorax	Statistical significance
	Radiologist	Pediatrician		
<b>Consolidation</b>	16 (66.6%)	17 (70.8%)	24	Yes
<b>Lymphadenopathy</b>	28 (68%)	31 (75.6%)	41	Yes

### **Discussion:**

In our study CT scan detected lymphadenopathy most frequently at the hilum (60%), followed by right paratracheal (57%), pretracheal (54%), subcarinal (46%), prevascular (17%), left paratracheal (14%), and para-esophageal (8%).

The sensitivity of detecting radiographic features consistent with pulmonary tuberculosis was 88.89% and specificity was 75% by CT scan thorax in our study. 95% confidence interval was 65.32% to 98.63% . In a study by Richard VP De Villiers et al <sup>(3)</sup> (2004) radiographs of paediatric patients suspected of having pulmonary TB over a 6-year period were examined by a experienced radiologist in two sittings separated by a 6 weeks interval. On the first sitting, only standard radiographs were examined and on the second sitting, these were supplemented with high-kV radiographs. Differences in the detection of each recognized radiological feature of pulmonary TB before and after the addition of the high-kV film were analysed for statistical significance but no statistically significant differences for the detection of radiographic features consistent with pulmonary TB or for the diagnosis of pulmonary TB were demonstrated between the two sittings. **Specificity increased from 74.4% to 86.6% with the addition of the high kV view and sensitivity remained constant at 38.8%.**

In the present study CT Scan proved to be more accurate in detecting post-primary tuberculosis such as cavitation, bronchial wall thickening, collapse, centrilobular nodules and a tree-in-bud appearance as compared to chest X-ray. X-ray detected such findings in 32.4% patients but CT Scan detected it in 78% patients. CT scan detected vertebral involvement in 3 patients in form of erosion, collapse of vertebrae and paravertebral abscess<sup>(4)</sup>

Similarly in a study by M. Bakhshayesh Karam et al<sup>(5)</sup> (2002) cavitation was seen in chest radiography in 40% to 87% (mean 50%) of patients sometimes during the course of the disease. The most common complication of tuberculous cavitation is endobronchial spread which is detected radiographically in 19% to 58% and by HRCT in up to 98% of cases.

### **Conclusion:**

CT scans have advantages over conventional radiographs in diagnosing tuberculosis in pediatric patients and can detect the disease in patients whose chest radiographs are normal or equivocal.

### **References:**

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