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Research Article

Computed Tomography (CT) Scan Features of Pulmonary Drug-Resistant Tuberculosis in Non-HIV-Infected Patients

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Abstract

Objective: To describe the CT findings of pulmonary drug-resistant tuberculosis (DR-TB) in non-HIV-infected patients.

Materials and Methods: This cross-sectional study was conducted between 20 March 2012 and 20 November 2013. One-hundred patients with multi drug resistant TB were enrolled in the present study. All the Chest computed tomography (CT) examinations of the patients were assessed in terms of the presence of Parenchymal calcifications, Cavity, Nodular infiltration, lymphnodes, and pleural effusion, Emphysema, Bronchiectasis, Hydropneumothorax and Consolidation and reviewed by a radiologist with at least 10 years of experience.

Results: The most frequent patterns of lung involvement were Lymphnode calcification (85%) followed by Bronchiectasis (76%), Cavity (75%) and Nodular infiltrations (70%), and the Pleural calcification was the least (0%). Mediastinal lymph no decalcification was common in females and mediastinally mphadenopathy and emphysema were common in males.

Conclusion: Calcified lymphnodes, bronchiectasis, cavity and nodular infiltration were the most common findings, respectively. Therefore, the CT scan is recommended to predict the likely outcome of treatment.

Keywords: *Computed tomography; Tuberculosis; Drug-resistant TB; HIV; Mediastinal*

Abbreviations: MDR: Multidrug-resistant; XDR: Extensively drug-resistant; CT: Computed tomography

Introduction

Tuberculosis is one of the major health problems worldwide and multidrug-resistant (MDR) and extensively drug-resistant (XDR) tuberculosis with higher mortality and also treatment failure are the main concern in this area [1-3].

XDR is resistant to fluoroquinolone and at least one of three injectable drugs includes: capreomycin, kanamycin, and amikacin and also both isoniazid and rifampicin. MDR TB is defined as resistant to at least isoniazid and rifampin [2,4].

Appropriate and immediate diagnosis of drug-resistant TB are very important [5] but laboratory evaluation is needed to diagnose is because diagnosis cannot be made by only clinical signs [6,7]. Culture and drug-susceptibility test are two methods that are time consuming and usually need several weeks, are defined as the standard criterion for detecting drug-resistant TB [8]. Thus, computed tomography (CT) scan examination seems to can play an important role in detection and screening of suspicious patients for drug-resistant TB. However, to the best of our knowledge, there has been no report describing the CT scan findings of pulmonary DR-TB, particularly in non HIV-infected patients.

The purpose of this study, therefore, was to describe the CT findings of pulmonary drug-resistant TB in non-HIV-infected patients.

Materials and Methods

The present study was approved by our Institutional Review Board. Patient informed consent was waived for this study.

This cross-sectional study was conducted between 20 March 2013 and 20 November 2014. one- hundred patients admitted to Baqiyatallah Hospital in Tehran with multi drug resistant (MDR) TB with no history of anti-tuberculosis chemotherapy or a history of less than one month of therapy were enrolled in the study. Patients were selected using simple sampling method.

Chest X-ray and spiral- Chest computed tomography (CT) scans were available for all patients. All the CT examinations of the patients were reviewed by a radiologist with at least 10 years of experience.

Each CT-scan was assessed in terms of the presence of Parenchymal calcifications, Cavity (Thin cavity = wall thickness less than 4mm, thick cavity= wall thickness more than 4mm), Nodular infiltration (Micro nodules = Nodule with a diameter of less than 2 mm, macro nodules = Nodule with a diameter of more than 2 mm), lymphnodes, Pleural effusion, Emphysema, Bronchiectasis, Hydro pneumothorax and Consolidation. We considered Data were analyzed using statistical package for social sciences (SPSS) version 13 (SPSS Inc. Chicago, IL) for windows by using Fisher exact test, Chi square test and independent simple t-test. A p value of less than 0.05 considered as statistically significant.

Results

Eventually 100 patients, 57 males and 43 females, with a mean age of 47 ± 20.23 underwent analysis. Seven patients had a positive history of tuberculosis in the family. There was no significant correlation between positive history for tuberculosis in the family and specific finding in Ct-Scan in this study.

In 41% of Study individual right lung and in 45% left lung was involved while 14% showed bilateral involvement. The mean duration of disease inpatients was 2.37 ± 1.03 years. There was no significant relation between imaging findings and duration of disease ($p>0.05$).

The CT findings of the patients with TB are summarized in Table 1. The most frequent patterns of lung involvement were Lymph node calcification (85%), Bronchiectasis (76%), Cavity (75%) and Nodular infiltrations (70%), while the Pleural calcification was the least (0%).

Ct findings	Frequency %
Parenchymal calcifications	39
Size reduction	42
Cavity	75
Thin Cavity	42
Thick Cavity	57
Nodular infiltration	70
Macro nodules	31
Calcified lymph nodes	85
Hilum Calcifiedl ymph nodes	82
Mediastinal Calcified lymph nodes	63
Non-calcified lymph nodes	3
Mediastinal lymphadenopathy	6
Pleural effusion	18
Pleural thickening	57
Pleural calcification	-
Emphysema	6

Hydropneumothorax	9
Bronchiectasis	76
Pre-bronchial thickening	64
Consolidation	39

Table 1: *Frequency of CT-Scan findings in patients with tuberculosis.*

CT-scan findings with regard to patient´s gender are shown in Table 2. There was no significant relation between gender of patients and CT-Scan findings in most cases ($p > 0.05$) but about mediastinal lymph no decalcification, mediastinal lymphadenopathy and emphysema this relation was significant ($p < 0.05$) so that mediastinal lymph no decalcification was more common in females and mediastinal lymphadenopathy and emphysema were more common in males.

Ct findings	Female %	Male %
Parenchymal calcifications	41.9	36.8
Size reduction	34.9	47.4
Cavity	78.9	69.8
Thin Cavity	34.9	47.4
Thick Cavity	55.8	57.9
Nodular infiltration	65.1	73.7
Macro nodules	23.3	36.8
Calcified lymphnodes	84.2	86
Umbilical Calcified lymphnodes	84.2	79.1
Mediastinal Calcified lymph nodes	76.7	52.6
Non-calcified lymph nodes	-	5.3
Mediastinal lymphadenopathy	-	10.5
Pleural effusion	20.9	15.8
Pleural thickening	48.8	63.2
Pleural calcification	-	-
Emphysema	-	10.5
Hydropneumothorax	7	10.5
Bronchiectasis	72.1	78.9
Pre-bronchial thickening	58.1	68.4
Consolidation	48.8	31.6

Table 2: *CT-scan findings and gender of patients.*

There was no significant relation between patient´s age and CT findings except for bronchiectasis ($p > 0.05$). The mean age of patients with bronchiectasis was 63 years and in other cases was 47 years.

Discussion

We found that Drug-resistant TB has specific imaging findings such as Calcified lymph nodes, Bronchiectasis, Cavity and Nodular infiltration. According to our findings mediastinal calcified lymph nodes were more common in females, while mediastinal lymphadenopathy and emphysema were more common in males.

We found no significant relation between imaging findings and duration of disease and also this relation was not significant with side of involved lung.

According to current study, there was no significant correlation between positive history for tuberculosis in the family and specific findings in CT scan in this study. It was consistent with the results of other studies [9,10].

According to Cha., *et al*. who conducted a study on sixty eight patients with drug-resistant tuberculosis, the most common imaging findings in these patients were nodules, reticulo-nodular densities, consolidation and cavities. In this study it was reported that there is no significant relation between drug resistance and imaging findings [11].

Yeom., *et al*. demonstrated that bilateral involvement, segmental or lobar consolidation and cavities were more frequently seen in primary MDR TB patients [9]. In our study Cavity was among the most common findings.

In another study Fishman., *et al*. concluded that Patients who developed MDR TB during an outbreak, showed non cavitary consolidations and pleural effusions and also reported that approximately one-third of patients did not show the expected radiographic pattern [10].

In our study consolidations and pleural effusion were not among the most common findings and also the unexpected radiographic finding was much less.

Lee., *et al.* reported that micro nodules, consolidations, cavities and bronchiectasis were the most frequent CT abnormalities in extensively drug-resistant pulmonary tuberculosis patients which is in concordance with the present study [5].

Conclusion

In conclusion there are specific imaging findings in patients with drug-resistant tuberculosis. Calcified lymphnodes, Bronchiectasis, Cavity and nodular infiltration were the most common findings respectively. Therefore, the CT scan is recommended to predict the likely outcome of treatment. Finally further studies with control group are suggested to confirm the results of the present study.

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