ORIGINAL RESEARCH ARTICLE

A Prospective Comparative Evaluation of Difference between Computed Tomography (CT) Findings of Multi Drug Resistance Tuberculosis and Drug Sensitive Tuberculosis

D. Nageswara Rao[1], Akshay B[2]

[1]Assistant Professor, Department of Radio Diagnosis, Konaseema Institute of Medical Sciences & Research Foundation, [2]Assistant Professor, Department of Radio Diagnosis, Konaseema Institute of Medical Sciences & Research Foundation, Konaseema Institute of Medical Sciences & Research Foundation, Amalapuram A.P., India

Corresponding author: Dr Akshay B Assistant, Professor, Department of Radio Diagnosis, Konaseema Institute of Medical Sciences & Research Foundation, Konaseema Institute of Medical Sciences & Research Foundation, Amalapuram A.P., India

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A B S T R A C T

Introduction: Detecting MDR-TB is still a challenge because it produces inconclusive results and test is sputum sample based which is not available always specially in children. So an alternative non-invasive method of diagnosis is required to save the time and monitor the progress of treatment. Present study has been designed primarily to study in detail the spectrum of the Computed Tomography (CT) findings of multi drug resistance tuberculosis and drug sensitive tuberculosis and secondarily to identify the lesion which is more commonly found in MDR TB that can be used as a tool in early diagnosis of MDR-TB.

Material and methods: This is an observational, prospective and case control study conducted in the department of radiology Konaseema institute of medical science from January 2017 to July 2020. Presence of various findings like fibrosis, atelectasis, cavity (single or multiple), pleural effusion, thickening and calcification, pericardial thickening and effusion, thickness of wall of cavity and cavity consolidation and nodule were recorded.

Result: Number of patients with multiple cavities was significantly higher in cases then control having p value 0.013. Calcification and pleural effusion were significantly higher in control group than cases in our study. But thick wall cavities are significantly more common in MDR TB group.

Discussion and conclusion: From present study we can conclude that there are some findings in the chest which is more common in MDR TB patients than DS TB patients. Patients with multiple thick wall cavities in lungs are suggestive of multidrug resistance tuberculosis. Cavitary consolidation, with bronchiectesis is the other predominant features in our study which suggest the possibility of MDR-TB.

Keywords: Computed Tomography (CT), Multi Drug Resistance Tuberculosis, Drug Sensitive Tuberculosis

INTRODUCTION

Tuberculosis is a communicable infectious disease, due to *Mycobacterium tuberculosis*. Mycobacterium tuberculosis has very ancient origins and its infection to human is as old as origin of human.[1,2] As per fact sheet march 2020 of world health organisation in 2018 total of 1.5 million people died from TB .Tuberculosis is one of the top 10 causes of death and the leading cause from a single infectious agent worldwide. As per report from WHO In 2018, an estimated 10 million people fell ill with tuberculosis (TB) worldwide. The lifetime risk is about 5–10%. India is the highest TB burden country in the world having an estimated incidence of 26.9 lakh cases in 2019 (WHO).[3,4] Over and above MDR TB(multi drug resistant TB) is major concern, it is a form of tuberculosis that is resistant to treatment with isoniazid and rifampicin. Under national tuberculosis programme TB patients are offered CBNAAT/TrueNAT testing for determining resistance to Rifampicin and Cascading test for determining resistance to Isoniazid, Fluoroquinolones and Second Drugs .But detecting MDR-TB is still a challenge because it produces inconclusive results and test is sputum sample based which is not available always specially in children. Progress of treatment cannot be monitored by that. So an alternative non-invasive method of diagnosis is required to save the time and monitor the progress of treatment. There is evidence to difference between MDR-TB and drug-sensitive TB may be possible in computed tomography. Yeom JA, Jeong YJ, Jeon D et al has concluded that The presence of primary MDR TB as detected on a CT scan may help the use of appropriate therapy for infected patients before obtaining a definite diagnosis based on bacteriology.[5] Chung, M. J., Lee, K. S., Koh, W. J. Et al has concluded that there is difference between presentation of

MDR TB and DS TB(drug sensitive TB).[6] Based on above finding present study has been designed primarily to study in detail the spectrum of the Computed Tomography (CT) findings of multi drug resistance tuberculosis and drug sensitive tuberculosis and secondarily to identify the lesion which is more commonly found in MDR TB that can be used as a tool in early diagnosis of MDR-TB.

MATERIAL AND METHODS

This is an observational, prospective and case control study conducted in the department of radiology Konaseema institute of medical science from January 2017 to July 2020. Selection of patients: - Patients with established MDR TB and drug sensitive TB, referred from various departments for various clinical region for CT scan were enrolled for this study based on inclusion and exclusion criteria. In this MDR TB patients are cases and drug sensitive TB are controls.

Inclusion criteria

1) Sputum positive cases of tuberculosis (both MDR-TB and drug sensitive TB),
2) Drug sensitive cases of pulmonary tuberculosis as cases.
3) Primary or acquired multi drug resistance tuberculosis as control.

Exclusion criteria

1) Sputum negative cases
2) Patients with diabetes and malignancy
3) Old and healed TB cases.

Method: All examinations were performed with a 16 slice GE revolution CT scan using a dedicated chest CT protocol. With a collimation of 5 mm serial section of lungs were taken. Images were reformatted in various planes and reconstruction was done at 3mm thickness and 3mm interval. Presence of various findings like fibrosis, atelectasis, cavity (single or multiple), pleural effusion, thickening and calcification, pericardial thickening and effusion, thickness of wall of cavity and cavity consolidation and nodule were recorded. For categorisation of cavity wall thickness, less than 3mm was considered thin, between 3 to 6 mm was considered medium and more than 6 were considered thick.

Ethics: Present study is approved by institutional ethics committee. A written informed consent was obtained from all patients before enrolling them for study.

Sample size: Based on exclusion and inclusion criteria twenty patients with MDR TB and 20 patients with drug sensitive TB were enrolled for this study.

STATISTICAL ANALYSIS

Data was collected on Microsoft excel sheet in the form of number and proportion and for calculation of p value chi square test was used.

RESULT

In present study most of the patients in MDR TB group below 40 years of age and both case and control group are matching with each other with respect to age having p value .220. There was male predominance in both groups without any significant difference with respect to sex. Most of the patients were on ATT in MDR TB group, there is statistically significant difference between two groups. Table1

Table2: In this study we have observed that cavity was present in consolidation as well as node or mass, cavity in consolidation was more common in drug sensitive TB than MDR TB. Cavity in node and mass was equally present in both groups. But these finding were not significant statistically having p value 0.20. (fig 1)Tree in bud pattern and Centrilobular nodules were more common in MDR TB patients than DS TB but without any statistically significant difference with p value .32. In present study single cavity lesions are more common in control group but there is no significant difference in the number of single cavity lesion between case and control. Number of patients with multiple cavities was significantly higher in cases then control having p value 0.013. Calcification and pleural effusion were significantly higher in control group than cases in our study. Consolidation in cavity and nodule are more common in MDR TB group than DS TB group but was not significant statistically. Thickening of pericardium and effusion are found in 2 patients in MDR TB and 4 patients in DS TB group without any significance. Fibrosis was present in 4 patients in MDR TB in 4 patients in DS TB group. This difference is not significant statistically. Atelectasis was present in 4 patients in MDR TB in 4 patients in DS TB group. This difference is not significant statistically. Bronchiectasis was present in 11 patients in MDR TB in 4 patients in DS TB group. This difference is significant statistically. Nodular infiltration was present in 5 patients in MDR TB in 4 patients in DS TB group. This difference is not significant statistically. Thin wall cavities are more common in DS TB group but intermediate wall cavities are more common in MDR TB group. But thick wall cavities are significantly more common in MDR TB group.

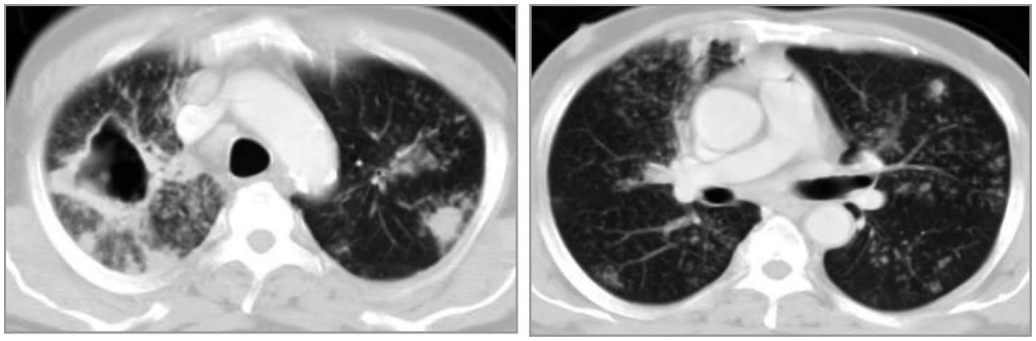

Figure-1: Irregular thick walled cavity noted with centrilobular nodules & granulomas and extensive endobronchial spread characterized by tree-in-bud pattern and centrilobular nodules

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Variables		MDR TB(n=20)	DS TB(n=20)	P value
Age in years	below 20	1	2	.220
	21 to 40	13	7	
	41 to 60	3	8	
	More than 60	3	3	
Sex	Male	12	11	.749
	Female	8	9	
ATT status	Yes	8	2	.028
	No	12	18	

Table-1: Demography of the patients with MDR TB and DS TB

CT finding				MDR TB (n=20)	DS TB (n=20)	P value
cavity	In consolidation	Absent		7	11	.20
		Present		13	9	
	In node or mass	Absent		9	10	.75
		Present		11	10	
Tree in bud pattern and Centrilobular nodules		Absent		6	9	.32
		Present		14	11	
Single cavity		Absent		9	4	.09
		Present		11	16	
Multiple cavity		Absent		2	9	0.013
		Present		18	11	
Calcification		Absent		12	4	.009
		Present		8	16	
Pleural effusion		Absent		8	2	.02
		Present		12	18	
Pleural thickness		Absent		17	16	.677
		Present		3	4	
Consolidation		Cavity	Absent	5	10	.10
			Present	15	10	
		Nodule	Absent	8	11	.342
			Present	12	9	
pericardial thickening		Absent		18	16	.375
		Present		2	4	
Pericardial effusion		Absent		18	16	.375
		Present		2	4	
Fibrosis		Absent		16	15	.70
		Present		4	5	
Atelectasis		Absent		16	18	.37
		Present		4	2	
Bronchiectasis		Absent		9	16	.0265
		Present		11	4	
Miliary pattern		Absent		19	18	.54
		Present		1	2	
Nodular infiltration		Absent		15	16	.70
		Present		5	4	
Thickness of cavity wall (in mm)	Less than 3	Absent		18	14	.375
		Present		2	6	
	3 to 6	Absent		13	16	.09
		Present		7	4	
	More than 6	Absent		10	17	.018
		Present		10	3	

Table-2: Comparisons between CT finding in two groups,

DISCUSSION

In present study as per selection criteria 40 patients were enrolled for this study three years and four month study period. We have observed that MDR TB is more common in younger people and there is male predominance but there is no statistically significant difference between two groups. Hyejin Cheon et al has reported that mean age of MDR TB patients were 41.4 ± 13 years with male predominance which support our study.[7] Most of the patient in MDR TB group has taken ATT and there is statistically significant difference between two groups. This finding corroborates with the finding of Sharma M, Roy N, Banerjee R, Kishore J, Jakhar A et al.[8]

Regarding CT finding in both groups, cavities in the consolidation was more common in MDR TB group but without any significant difference with DS TB group, but cavity in node or mass was equally present in both groups. This finding corroborates with the finding of Li D, He W, Chen B, Lv P.[9] Tree in bud pattern and Centrilobular nodules are common in both group which is supported by the work of various author.[9,10] Lesions with multiple cavity are more common in MDR TB then single cavity which is significant statistically. Chung, M. J., Lee, K. S., Koh, W. J., Kim et al has reported the same.[6] Calcification and pleural effusion was significantly more common in DS TB group than MDR TB group. Pleural thickness was not common but consolidation of cavity and nodule are more common in MDR TB than DS TB group without any statistical significance which corroborates with the finding of Cha J, Lee HY, Lee KS, Koh WJ, Kwon OJ, Yi CA, Kim TS, Chung MJ.[11] Pericardial thickening and effusion was less common in both group which was not significant statistically.[6] Fibrosis and atelectasis was equally present in both group but bronchiectesis was more common in MDR TB group this finding is significant statistically and supported by the work of Kim HC, Goo JM, Lee HJ *et al* and Joshi AR, Mishra S, Sankhe AP, Bajpai AR, Firke V.[10,12] Miliary pattern is rare in both group and nodular infiltration was equally present in both group. This finding corroborates with the finding of Kahkouee S, Esmi E, Moghadam A, Karam MB, Mosadegh L, Salek S, Tabarsi Pet al.[13] Thickness of the wall of cavity are significantly more in MDR TB group this finding is supported by the work of Kahkouee S, Esmi E, Moghadam A, Karam MB, Mosadegh L, Salek S, Tabarsi P et al.[14]

CONCLUSION

From present study we can conclude that there are some findings in the chest which is more common in MDR TB patients than DS TB patients. Patients with multiple thick wall cavities in lungs are suggestive of multidrug resistance tuberculosis. Cavitary consolidation, with bronchiectesis is the other predominant features in our study which suggest the possibility of MDR-TB. Calcification and pleural effusion are characteristic of drug sensitive tuberculosis.

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