

A Comparative study of CT and MRI in patients with extra-pulmonary tuberculosis at tertiary health care center

Akhil Patil^{1*}, Syed Moinullah², Rudresh S Halawar³

¹Assistant Professor, ³Associate Professor, Department of Radiology, Sri Nijalingappa Medical College and HSK hospital, Bagalkot, INDIA.

²Assistant Professor, Sri Siddhartha Medical College, Tumkur, INDIA.

Email: moin.bmc@gmail.com

Abstract

Background: While pulmonary tuberculosis is the most common presentation, extrapulmonary tuberculosis is also an important clinical problem **Aims and Objective:** To study role of CT and MRI in patients with extra-pulmonary tuberculosis at tertiary health care center. **Methodology:** This was a cross-sectional study was carried out in suspected EPTB from October 2013 to August 2015. The study was carried out prospectively in the Department of Radiodiagnosis of Sassoon General Hospital, Pune. This study includes MRI and CT studies of 202 cases of patients with EPTB. All cases from Sassoon General Hospital, Pune referred for MRI and CT who are clinically diagnosed to have extrapulmonary tuberculosis and with supporting evidence from radiographs, USG or lab tests. CT SCAN: Machine: Siemens 128 slice multi-detector CT scan machine and Magnetic Resonance Imaging (MRI): Machine: 1.5 Tesla GE – Signa Hdxt MRI machine was used for the study was used, the sensitivity and Specificity of CT and MRI was calculated by SPSS 19 version software. **Result:** The mean \pm SD, (Min – Max) of age of the group was 25.2 ± 16.3 years (Min = 2 years, Max = 66 years). Of 202 cases studied, 105 cases (52.0%) were males and 97 cases (48.3%) were females. Majority of the cases studied were males. MRI found useful for Hepatic TB, Lymph nodal TB, Ileocaecal TB, Meningeal enhancement, Basal exudates, Marrow changes, Joints, Thickened (Synovium), Bursa (Small abscesses) tuberculosis and CT found useful for Splenic TB (Miliary type), Renal TB (Calcification), Bladder TB (Calcification), Brain (Calcified tuberculoma). **Conclusion:** MRI is also more useful as compared to CT in detection of soft tissue abnormalities and marrow changes in musculoskeletal tuberculosis with CT having a sensitivity of 0.0% in detection of marrow changes. Except for the detection of calcified lesions, CT and MRI didn't show significant difference in evaluation and detection of pleural, abdominal, genitourinary and pericardial tuberculosis.

Key Words: Extra-pulmonary tuberculosis (EPTB), Splenic TB (Miliary type), Renal TB Bladder TB, Brain TB (Calcified tuberculoma).

*Address for Correspondence:

Dr. Syed Moinullah, Door No 3948, MF Manzil, 3rd main, 5th cross, vinobhanagar, Tumkur 572101, INDIA.

Email: moin.bmc@gmail.com

Received Date: 04/09/2017 Revised Date: 19/10/2017 Accepted Date: 14/11/2017

DOI: <https://doi.org/10.26611/1004117>

Access this article online

Quick Response Code:



Website:

www.medpulse.in

Accessed Date:
24 November 2017

INTRODUCTION

While pulmonary tuberculosis is the most common presentation, extrapulmonary tuberculosis is also an important clinical problem^{1,2,3}. The term extrapulmonary tuberculosis has been used to describe isolated occurrence of tuberculosis at body sites other than the lung. However, when an extrapulmonary focus is evident in a patient with pulmonary tuberculosis, such patients have been categorized under pulmonary tuberculosis as per the guidelines of the World Health Organization (WHO)⁴. The recent human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) pandemic has resulted in changing epidemiology and has once again brought extrapulmonary tuberculosis into focus. Whilst,

positive chest x-ray findings and positive tuberculin tests help support the diagnosis of tuberculosis in extrapulmonary sites, negative findings cannot rule it out⁵ and therefore a high index of suspicion through understanding the various imaging appearances will lead to the prompt and early diagnosis of tuberculosis.

MATERIAL AND METHOHDS

This was a cross-sectional study was carried out in suspected EPTB from October 2013 to August 2015. The study was carried out prospectively in the Department of Radiodiagnosis of Sassoon General Hospital, Pune. This study includes MRI and CT studies of 202 cases of patients with EPTB. All cases from Sassoon General Hospital, Pune referred for MRI and CT who are clinically diagnosed to have extrapulmonary tuberculosis and with supporting evidence from radiographs, USG or lab tests. Patients unwilling to give consent, Those who had clinical evidence but did not have any imaging features suggestive of extrapulmonary tuberculosis, All patients having cardiac pacemakers, prosthetic heart valves, cochlear implants or any metallic implants in case of MRI, Pregnant patients in case of CT, All patients having history of adverse reaction to contrast agents used, Claustrophobic patients in case of MRI were excluded from the study Risk Factors : Adverse drug reaction due to contrast agent (gadobenate disodium) used in MRI, Adverse drug reaction due to contrast agent (iopamidol) used in CT, All procedures will be explained to the patients and only after their written consent, investigations will be carried out. CT SCAN: Machine: Siemens 128 slice multi-detector CT scan machine and Magnetic Resonance Imaging (MRI): Machine: 1.5 Tesla

GE – Signa Hdxt MRI machine was used for the study. the sensitivity and Specificity of CT and MRI was calculated by SPSS 19 version software.

RESULT

Table 1: The age distribution of the cases studied (n=202)

Age Group (years)	No. of cases	% of cases
<10.0	39	19.3
10.0 – 19.0	51	25.2
20.0 – 29.0	41	20.3
30.0 – 39.0	27	13.4
40.0 – 49.0	23	11.4
50.0 – 59.0	12	5.9
>60.0	9	4.5
Total	202	100.0

Of 202 cases studied, 39 cases (19.3%) had age less than 10 years, 51 (25.2%) had age between 10 to 19 years, 41 cases (20.3%) had age between 20 to 29 years, 27 cases (13.4%) had age between 30 to 39 years, 23 cases (11.4%) had age between 40 to 49 years, 12 cases (5.9%) had age between 50 to 59 years and 9 cases (4.5%) had age more than or equal to 60 years. The mean ± SD, (Min – Max) of age of the group was 25.2 ± 16.3 years (Min = 2 years, Max = 66 years).

Table 2: The sex distribution of the cases studied (n=202)

Sex	No. of cases	% of cases
Male	105	52.0
Female	97	48.0
Total	202	100.0

Of 202 cases studied, 105 cases (52.0%) were males and 97 cases (48.3%) were females. Majority of the cases studied were males.

Table 3: Sensitivity analysis of some selected parameters studied

Sr. No	Parameters	Gold Std.	Sensiti-vity	Specif-icity	PPV	NPV	Accuracy
1	Hepatic TB	MRI	100.0	99.5	87.5	100.0	99.5
2	Splenic TB (Miliary type)	CT	66.7	100.0	100.0	98.5	98.5
3	Lymph nodal TB	MRI	100.0	97.0	94.4	100.0	98.0
4	Ileocaecal TB	MRI	100.0	100.0	100.0	100.0	100.0
5	RenalTB (Calcification)	CT	66.7	100.0	100.0	99.5	99.5
6	BladderTB(Calcification)	CT	50.0	100.0	100.0	99.5	99.5
7	Brain(Calcified tuberculoma)	CT	83.3	100.0	100.0	99.5	99.5
8	Meningeal enhancement	MRI	71.4	100.0	100.0	97.9	98.0
9	Basal exudates	MRI	77.8	100.0	100.0	99.0	99.0
10	Marrow changes	MRI	0.0	100.0	--	99.5	99.5
11	Joints(Thickened Synovium)	MRI	50.0	100.0	100.0	99.5	99.5
12	Bursa(Small abscesses)	MRI	0.0	100.0	--	99.0	99.0

All values are in%. PPV: Positive Predictive Value, NPV: Negative Predicative Value. MRI found useful for Hepatic TB, Lymph nodal TB, Ileocaecal TB, Meningeal enhancement, Basal exudates, Marrow changes, Joints, Thickened (Synovium), Bursa (Small abscesses) tuberculosis and CT found useful for Splenic TB (Miliary type), Renal TB (Calcification), Bladder TB (Calcification), Brain(Calcified tuberculoma).

DISCUSSION

There are so many Types of Extra-Pulmonary Tuberculosis but important forms are - Lymph nodal Tuberculosis (Scrofula): The word scrofula comes from Latin for glandular swellings and from French for full necked sow. In India and other developing countries, lymph nodal tuberculosis continues to be the most common form of extrapulmonary tuberculosis and lymphadenitis due to non-tuberculous mycobacteria (NTM) is seldom seen⁶⁻⁹. Pleural tuberculosis: Pleural tuberculosis is a major treatable cause of exudative pleural effusion¹⁰. Tuberculous pleural effusion is categorized as extrapulmonary despite an intimate anatomic relationship between pleura and the lungs¹¹⁻¹³. Among extrapulmonary presentation of tuberculosis, pleural effusion is second only after tuberculous lymphadenitis according to numerous studies¹⁴⁻²⁴. Pleural tuberculosis is more common among men. The effusion occurred on average at young age, with no preference for either the right or left side. It normally affects no more than two thirds of the hemi thorax and it is generally unaccompanied by pulmonary infiltrates. Abdominal tuberculosis: Abdominal tuberculosis is the term used to encompass tuberculosis of the gastrointestinal tract, peritoneum, omentum, mesentery and its nodes and other solid intra-abdominal organs such as liver, spleen, gastrointestinal tract and adrenal glands. Genitourinary tuberculosis: Renal tuberculosis: Although renal tuberculosis is usually spread hematogenously from the lung, radiographic evidence of pulmonary tuberculosis is present in less than 50% of the patients and in only 10% of these cases is the disease active. Renal tuberculosis is usually the sequelae of a primary pulmonary infection that had occurred as long as 10-15 years earlier. Tubercle bacilli lodge in the corticomedullary junction and form cortical granulomas. Female genital tuberculosis: Tuberculous infection of the female genital system may cause menstrual disorders, gestational complications, neonatal tuberculosis, antituberculosis drugs side effects during pregnancy, increased drug-resistance and infertility²⁴. Male genital tuberculosis: Tuberculosis may affect the whole male genital tract, with lesions in the prostate, seminal vesicles, deferent ducts, epididymis, penis and testes²⁵. Musculoskeletal tuberculosis: Skeletal tuberculosis constitutes about 10% of extrapulmonary disease in India. Various forms of musculoskeletal tuberculosis are described below. Spinal tuberculosis (Pott's spine): It is the most common form of skeletal tuberculosis. Dharmalingam showed that the mean age of diagnosis of tuberculous spondylitis was 36.5 years and peak incidence is in the second decade of life (27.3%). There were 24 males and 9 females. The majority of the lesions involved the thoracic spine (30.3%), followed by

the lumbar spine (27.2%)²⁶. Pericardial Tuberculosis: Involvement of the pericardium by nodal rupture is common in pericardial tuberculosis because of the close anatomic relationship between the mediastinal lymph nodes and the posterior pericardial sac. The pericardium can also be involved in miliary spread of the disease²⁷. When the pericardium is involved with tuberculosis by nodal rupture, lymphadenopathy and pericardial thickening with or without effusion may be seen on CT scans²⁷. In the present study we have made an attempt to characterise the imaging findings of extrapulmonary tuberculosis on CT as well as MRI and to compare the CT and MRI findings of this disease. Over the span of these two and half years we have conducted a comparative study of patients who underwent CT and MRI scan who were suspected to have extrapulmonary tuberculosis. The statistical analysis and comparison of CT and MRI findings was done using Wilcoxon's signed rank test method of calculating statistical significance. A total of 202 patients were included. Almost all these patients had a prior ultrasound, radiograph or lab tests favoring the clinical diagnosis of extrapulmonary tuberculosis. In our study, we found maximum number of patients in the age group of 10-19 years age group (51cases) (25.2%), followed by 20-29 years age group (41 cases) (20.3%). Hence most commonly affected age group in our study is 10-19 years age group. According to RNTCP, almost 70% of TB patients are aged between the ages of 15 and 54 years of age. While two thirds of the cases are males, TB takes a disproportionately larger toll among young females, with more than 50% of female cases occurring before 34 years of age. However this study included the pulmonary tuberculosis cases also. According to a study done by S.Rama Prakasha, G Suresha, Ivor Peter D'sa, Shobha S Shetty and S Ganesh Kumar (from 2005 to 2011)(132), maximum number of patients with extrapulmonary tuberculosis were seen in the 15-44 years age group(50.95%). In our study, 58.9% of cases were seen in 10-40 years age group. In our study males (52%) are more commonly affected than females (48%). It is consistent with study done by S.RamaPrakasha Both MRI and CT are very useful imaging modalities in evaluating patients suspected of extra pulmonary tuberculosis which help in early detection and management of these patients. CT is a more useful modality for detecting calcified lesions as compared to MRI with MRI having lower sensitivity values in detecting calcified lesions in all organs. CT is also useful in performing imaging guided biopsies for definitive diagnosis of the disease. CT has the advantage of faster scanning time as compared to MRI. Respiratory gating and breath hold is required for abdominal and chest MRI scans which may be difficult in critically ill patients. MRI is also problematic in

claustrophobic patients. CT is the most readily available cross-sectional imaging modality, is easy to use and is comparatively cheap. MRI has the advantage of lack of radiation exposure as compared to CT. MRI is a more useful modality in detection of meningitis, basal exudates in intracranial tuberculosis as compared to CT. CT showed a sensitivity of 71.4 % and 77.8% in detection of meningitis and basal exudates respectively. MRI is also more useful as compared to CT in detection of soft tissue abnormalities and marrow changes in musculoskeletal tuberculosis with CT having a sensitivity of 0.0% in detection of marrow changes. Except for the detection of calcified lesions, CT and MRI didn't show significant difference in evaluation and detection of pleural, abdominal, genitourinary and pericardial tuberculosis.

CONCLUSION

MRI is also more useful as compared to CT in detection of soft tissue abnormalities and marrow changes in musculoskeletal tuberculosis with CT having a sensitivity of 0.0% in detection of marrow changes. Except for the detection of calcified lesions, CT and MRI didn't show significant difference in evaluation and detection of pleural, abdominal, genitourinary and pericardial tuberculosis.

REFERENCES

- Fanning A. Tuberculosis: 6. Extrapulmonary disease. *CMAJ* 1999; 160: 1597-603.
- Iscman MD. Tuberculosis in relation to human immunodeficiency virus and acquired immunodeficiency syndrome. In: Iseman MD, editor. *A clinician's guide to tuberculosis*. Philadelphia: Lippincott Williams and Wilkins 2000; 199-252.
- Dutt AK, Stead WW. Epidemiology. In: Schlossberg D, editor. *Tuberculosis and nontuberculous mycobacterial infection*. Philadelphia: W.B. Saunders Company; 1999; 3-16.
- Maher D, Chaulet P, Spinaci S, Harries A. *Treatment of tuberculosis: guidelines for national programmes*. Geneva: World Health Organization; 1997.
- GulgunEngin, Bulent Acunas, Gulden Acunas, MehtapTunaci. Imaging of extrapulmonary tuberculosis. *RadioGraphics* 2000; 20:471-488.
- Dandapat MC, Mishra BM, Dash SP, Kar PK. Peripheral lymph node tuberculosis: a review of 80 cases. *Br J Surg* 1990; 77: 911-2.
- Subrahmanyam M. Role of surgery and chemotherapy for peripheral lymph node tuberculosis. *Br J Surg* 1993; 8: 1547-8.
- Jawahar MS, Sivasubramaniam S, Vijayan VK, Ramakrishnan CV, Paramasivan CN, Selvakumar V, et al. Short-course chemotherapy for tuberculous lymphadenitis in children. *BMJ* 1990; 301: 359-62.
- Talavera W, Miranda R et al. *Extra pulmonary tuberculosis, in tuberculosis: current concepts and treatment*, Friedman, LN, Ed., CRC press, 2001.
- Davis M. Epestrin ECCP, Levis R K, et al. Tuberculosis pleural effusion. *Chest*. 1987; 91: 106-109.
- Valdes L, Pose A, San Jose E, Martinez Vazquez JM. Tuberculous pleural effusions. *Eur J Intern Med*. 2003; 14:77-88.
- Light RW. Management of pleural effusions. *J Formos Med Assoc* 2000; 99: 523-31.
- Ferrer J. Pleural tuberculosis. *EurRespir J* 1997; 10 : 942-7.
- Raviglione MC, Narain JP, Kochi A. HIV-associated tuberculosis in developing countries: clinical features, diagnosis and treatment. *Bull World Health Organ* 1992; 70 : 515-25.
- Theuer CP, Hopewell PC, Elias D, Schechter GF, Rutherford GW, Chaisson RE. Human immunodeficiency virus infection in tuberculosis patients. *J Infect Dis* 1990; 162 : 8-12.
- Haas DW, Des Prez RM. Tuberculosis and acquired immunodeficiency syndrome: a historical perspective on recent developments. *Am J Med* 1994; 96 : 439-50.
- Shafer RW, Kim DS, Weiss JP, Quale JM. Extrapulmonary tuberculosis in patients with human immunodeficiency virus infection. *Medicine (Baltimore)* 1991; 70 : 384-97.
- Antonucci G, Girardi E, Armignacco O, Salmaso S, Ippolito G. Tuberculosis in HIV-infected subjects in Italy: a multicentre study. *The Gruppo Italiano di Studio Tuberculosis e AIDS*. *AIDS* 1992; 6: 1007-13.
- Jones BE, Young SMM, Antoniskis D, Davidson PT, Kramer F, Barnes PF. Relationship of the manifestations of tuberculosis to CD4 cell counts in patients with human immunodeficiency virus infection. *Am Rev Respir Dis* 1993; 148: 1292-7.
- LadoLado FL, Barrio Gomez E, Carballo Arceo E, Cabarcos Ortiz de Barron A. Clinical presentation of tuberculosis and the degree of immunodeficiency in patients with HIV infection. *Scand J Infect Dis* 1999; 31: 387-91.
- Lee MP, Chan JW, Ng KK, Li PC. Clinical manifestations of tuberculosis in HIV-infected patients. *Respirology* 2000; 5: 423-6.
- Poprawski D, Pitisuttitum P, Tansuphasawadikul S. Clinical presentations and outcomes of TUBERCULOSIS among HIV-positive patients. *Southeast Asian J Trop Med Public Health* 2000; 31 (Suppl 1): 140-2.
- Reported tuberculosis in the United States, 1999. Atlanta: Centers for Disease Control and Prevention, August 2000.
- Ghosh K, Ghosh K, Chowdhury JR. Tuberculosis and female reproductive health. *J Postgrad Med*. 2011; 57:307-13.
- Figueiredo AA, Lucon AM. Urogenital tuberculosis: update and review of 8961 cases from the world literature. *Rev Urol*. 2008; 10: 207-17.
- Dharmalingam M. Tuberculosis of the spine-Sabah experience. *Epidemiology, treatment and results*. *Tuberculosis* 2004; 84:24-28.
- Levitt RG, Glazer HS, Roper CL, et al. Magnetic resonance imaging of mediastinal and hilar masses: comparison with CT. *AJR* 1985; 145:9- 14.

Source of Support: None Declared
Conflict of Interest: None Declared