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Original Research Paper

Orthopaedics

SPINAL TUBERCULOSIS: ROLE OF MRI IN DECIDING THE DURATION OF ANTITUBERCULAR THERAPY

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ABSTRACT **Introduction:** The most common extrapulmonary location of TB is the spine, accounting for more than 50% of musculoskeletal TB. MRI is the most valuable method for detecting early disease and is the preferred technique to define the activity and extent of infection. It is also considered the imaging modality of choice for follow-up of tuberculous patients managed by operative or nonoperative treatment of tuberculous spine. Follow-up MRI can make a big difference in spinal tuberculosis; it can clearly show the change in the vertebral body and intervertebral space, paraspinal abscess, and the kyphosis angle after the treatment, which can provide a reference for clinical treatment and estimating prognosis. **Aims and Objectives:** Role of MRI in deciding stoppage of anti-tubercular treatment in spinal tuberculosis. **Materials and Methods:** This is a retrospective and prospective observational study on 62 patients of all ages and either sex of spinal TB who sequentially underwent MRI pre-treatment and every 6 months after starting treatment till complete resolution. **Results:** Out of 62 spinal tuberculosis patients, higher incidence is noted in females (42 patients,65%) with the most common age group affected being 21 to 30 years (20 patients,32%) with predominant involvement of thoracic spine (35 patients, 56.5%) followed by lumbar spine (16 patients,25.8%) and cervical spine (3 patients,4.8%), with 8 patients (12.9%) having skip lesions. Of 62 patients, 34 (54.8%) were positive for gene expert, and 17(27.4) were positive for culture. 36 (56%) patients underwent decompression and instrumentation, and 26 (46%) were managed conservatively. At the end of the study,42 patients showed complete or near complete resolution. A total (42 patients,67.7%) had stopped AKT based on MRI resolution. The remaining 20 patients (32.3%) with partial and no resolution were continued on AKT for 18 months. **Conclusion:** MRI is the best modality to diagnose and monitor response to antitubercular treatment and is the best modality to stop antitubercular therapy depending upon complete resolution.

KEYWORDS : MRI in TB spine, marrow edema, complete /partial resolution /no resolution, ATT.

Tuberculosis (TB) is caused by Mycobacterium tuberculosis. (1) (2) The most common extrapulmonary location of TB is the spine, accounting for more than 50% of musculoskeletal TB. In developing countries, the disease has an aggressive course, particularly in children and young adults resulting in abscess formation. (3) (4) (5) Consequently, neurologic complications and spinal deformities are frequently observed.

Vertebral tuberculosis is the most common form of skeletal tuberculosis and it contributes about 50 percent of all cases of skeletal tuberculosis. (2), If untreated, spinal TB carries the risk of serious complications due to vertebral collapse and spinal cord compression. Diagnosis is often difficult because many diseases such as gram-positive, gram-negative, and fungal infections and malignant disease processes involving the vertebrae may lead to similar imaging findings. (3-6) Magnetic resonance imaging (MRI) is now the preferred imaging modality for patients with suspected spinal TB. In most cases, TB of the spine is caused primarily by the hematogenous spread of pulmonary infection. (6). As the

vertebral bodies collapse into each other, a sharp angulation (or kyphos) develops. Caseation and cold abscess formation may extend into the neighboring vertebra or escape into the paravertebral soft tissue. (7) (8) (9). Surgery is indicated in the presence of complications such as failure of treatment, significant or worsening neurological deficit, kyphosis, and cold abscess. (7,8) Modern antituberculous drugs have accelerated the rate and quality of recovery and have minimized the incidence of mortality, complications, and relapse. (9,10).

MRI is the most valuable method for detecting early disease and is the preferred technique to define the activity and extent of infection. It is also considered the imaging modality of choice for follow-up of tuberculous patients managed by either operative or nonoperative treatment tuberculous spine (10) (11) (12).

Follow-up MRI can make a big difference in spinal tuberculosis (13)(14)(15). It can clearly show the change in the vertebral body and intervertebral space, paraspinal abscess, and the kyphosis angle after the treatment, providing a reference for clinical treatment and estimating prognosis. (16)(17)(18)

MATERIAL AND METHODS

The study was a retrospective and prospective observational study conducted in the Department of Orthopaedics, H.B.T. Medical College, and Dr. R. N. Cooper Hospital, Juhu, Mumbai. The study was conducted on patients treated with antitubercular therapy over 5 years.

Inclusion Criteria

1. Patients diagnosed with Spinal Tuberculosis.
2. All age groups.
3. Patient / Guardian of minor patients who consent to take complete ATT course as advised.

Exclusion Criteria

1. Spinal Tuberculosis associated with HIV/ Immuno-compromised.
2. Patients not compliant to treatment

All the patients with spinal tuberculosis who started on ATT from April 2019 to April 2023 in Cooper Hospital and who fell into the inclusion criteria were included in the study after informed consent and ethics committee approval. Patients' previous records are followed and they are further followed in OPD regularly MRI is done at 6 months and 12 months, then every 6 months up to 24 months if no recovery at 12 months. Data was entered and compiled in MS Excel sheet and master charts and was analyzed using Statistical Package for Social Sciences (SPSS, Inc., Chicago, Illinois).

MRI findings- Before starting AKT
MRI findings- Post therapy at 6 months, at 12 months
Other investigations like HB, ESR, CRP, LFT, and RFT were also done.

In consultation with the chest TB department, treatment has been given according to the WHO regimen for osteoarticular TB (NTEP). The DOTS regimen recommended by WHO for extrapulmonary TB is given i.e. Intensive phase for 2 months Isoniazid, Rifampicin, Pyrazinamide, Ethambutol (HRZE) + Continuation phase for 10 months (Total duration 12 months) Isoniazid, Rifampicin, Ethambutol (HR) daily regimen. (12) (19) (20). In multidrug-resistant cases, the duration was 24 months. Surgery was done on indicated patients. (21)

All the patients were regularly followed up at intervals of one month during the treatment to assess the clinical improvement and compliance of the patient. The improvement was assessed with radiographs and a haemogram with ESR and C-reactive protein at intervals of one month till the treatment was completed. MRI was done at the end of 6 months and then at 12 months. (7) (5) (10) (22)

Treatment duration has been increased if the patient still has persistent clinical symptoms and/ or radiological (MRI) or hematological parameters suggestive of active disease even after 12 months of chemotherapy. ATT has been continued till the MRI shows complete healing and clinical parameters are normal. After completion of treatment, patients will be called at the interval of every three months and assessed to find local recurrence of spinal TB. (22)

MRI Findings In

a. Completely healed and near completely healed cases
1. Resolution of marrow edema.
2. The destroyed areas of bone may get reconstituted, sometimes the marrow of the diseased bone after healing gets replaced by fat.
3. Complete resolution of paravertebral collections. (14) (23) (24)

b. Partially healed cases
1. Resolution of marrow edema
2. Fatty replacement of marrow.
3. Persistence of enhancement in the paravertebral collection. (14) (23) (24)

c. Non-healed cases
1. No resolution of marrow edema
2. No fatty replacement of marrow.
3. Persistence of enhancement in the paravertebral collection. (14) (23) (24)

The procedure is done- C arm Guided closed Biopsy / Open biopsy / Debridement / Decompression and Instrumentation following middle path regime.

Treatment duration increases if the patient still has persistent clinical symptoms and radiological (MRI) or hematological parameters suggestive of active disease even after 12 months / 18 months of chemotherapy. ATT continued until the MRI showed complete healing and clinical parameters were normal. After completion of treatment, patients will be called at the interval of every three months and assessed to find local recurrence of spinal TB.

RESULTS

Out of 62 spinal tuberculosis patients, higher incidence is noted in females (42 patients,65%) with the most common age group affected being 21 to 30 years (20 patients,32%) with predominant involvement of thoracic spine (35 patients, 56.5%) followed by lumbar spine (16 patients,25.8%) and cervical spine (3 patients,4.8%), with 8 patients (12.9%) having skip lesions. Out of 62 patients, 34 patients (54.8%) were positive for gene expert, 17(27.4) patients were positive for culture, and 29 patients (46.8%) were positive for histopathology. In our study, 8 patients (12.9%) were positive for all gene experts, culture, and histopathology. 54 patients (87.1%) had taken CAT 1 AKT and 8 patients (12.9%) had taken MDR TB AKT. 36 (56%) patients underwent decompression and instrumentation and 26 patients (46%) were managed conservatively. At the end of the study duration, 27 (43.5%) patients showed complete resolution and 15 patients (24.2%) were near complete resolution. A total (42 patients,67.7%) had stopped AKT based on MRI resolution. The remaining 20 patients (32.3%) with partial and no resolution were continued on AKT for 18 months.

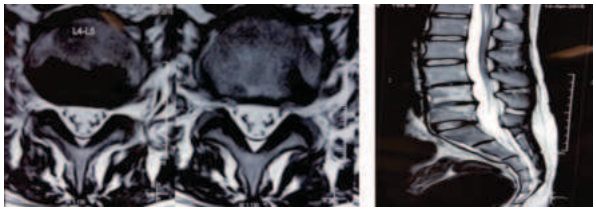
Outcome at Different Intervals on MRI

Outcome	OVER FINAL MRI		MRI at 6 Months		MRI at 12 Months	
	Frequency	%	Frequency	%	Frequency	%
Near Complete Resolution	15	24.2	8	12.9	12	19.4

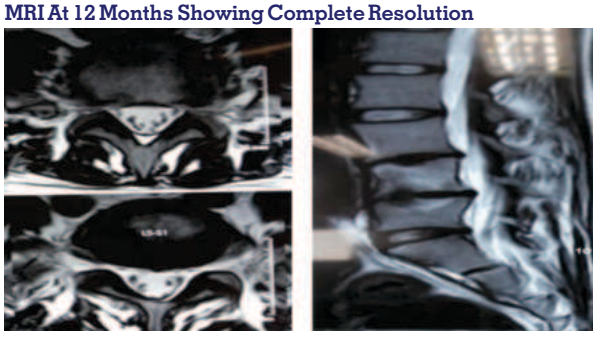
No Resolution	2	3.2	4	6.5	1	1.6
Partial Resolution	18	29.0	28	45.2	7	11.3
Complete Resolution	27	43.5	22	35.5	12	19.4
Lost to follow up	0	0	0	0	30	48.4
Total	62	100.0	62	100.0	62	100.0

As seen in the above table, on the Overall final MRI (Including those who show resolution at 6 months and 12 months), Complete Resolution and Near Complete Resolution were observed in 43.5% and 24.2% respectively, Partial Resolution in 29% and no resolution in 3.2%. On MRI at 6 Months, Complete Resolution and Near Complete Resolution were observed in 35.5% and 12.9% respectively, Partial Resolution in 45.2%, and no resolution in 6.5%. On MRI at 12 Months, Complete Resolution and Near Complete Resolution were observed in 19.4% and 19.4% respectively, Partial Resolution in 11.3%, and no resolution in 1.6%.

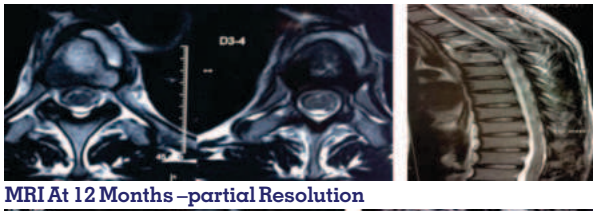
Case 1 MRI At Presentation



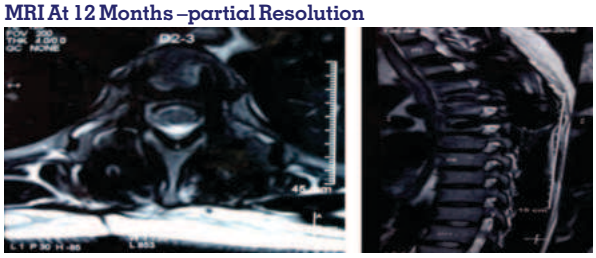
MRI At 12 Months Showing Complete Resolution



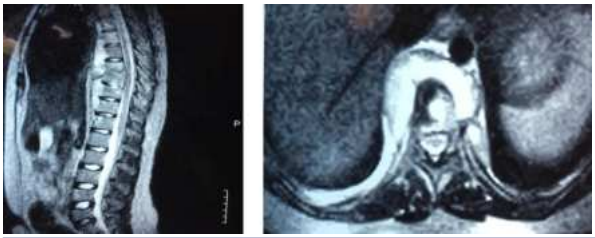
Case 2 MRI At Presentation



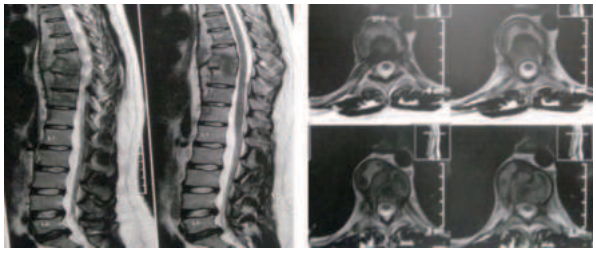
MRI At 12 Months –partial Resolution



Case 3 MRI At Presentation



MRI At 12 Months – No Resolution



Discussion

In the present study, at 12 months, Complete Resolution and Near Complete Resolution were observed in 43.5% and 24.2% respectively, Partial Resolution in 29% and no resolution in 3.2%. On MRI at 6 Months, Complete Resolution and Near Complete Resolution were observed in 35.5% and 12.9% respectively, Partial Resolution in 45.2%, and no resolution in 6.5%. On MRI at 12 Months, Complete Resolution and Near Complete Resolution were observed in 19.4% and 19.4% respectively, Partial Resolution in 11.3%, and no resolution in 1.6%. All repeat MRIs showed healing in progress and a significant reduction of lesions. In patients not showing clinical improvement and a satisfactory fall in ESR and MRI suggestive of no resolution, treatment was extended till the normalization of ESR, disappearance of constitutional symptoms, and resolution on MRI.

Kotil et al 39 reported regression of spondylodiscitis in 30 of 44 patients as the criteria for healing after 12- 15 months of chemotherapy. Cormican et al 37 in a retrospective analysis reported the mean duration of ATT for 13 months (range of 9–24 months) in 31 patients. MRI evaluation was not done in all patients at follow-up; diagnostic criteria of healing were not defined. Also, variable treatment duration was used. The end point of treatment and criteria of treatment were not defined. (26). Watts et al 60 (1996) have expressed discontent with SCC and recommend 12-18 months long chemotherapy. Moon et al (2002)12 reported excellent results using 12-18 months long therapy (27). .Nene et al 36 (12–27 months), Kotil et al 39 (11–15 months), Ramachandran et al 34 mean 11.2 months (range 6–18 months), Cormican et al 37 mean 13 months (9–24 months) also reported variable duration of treatment. (28)

In the absence of any fixed guidelines, the treatment duration of these patients was extended till there was a complete resolution of symptoms, a significant fall in ESR to normal, and an MRI showing healed lesions. The tendency throughout is to terminate the therapy as early as allowed. Indian Council of Medical Research and British Medical Research Council in Madras (1989) compared the role of 6 and 9 months of chemotherapy with and without surgery and concluded that 6 or 9 months of HR regimen had better results than previous regimens

CONCLUSION

At final conclusion from our study most of the patient they have complete resolution and near complete resolution in 42 patients out of 62 (67.7%). That is considered to be significant. In all these patients we stopped AKT. Hence MRI is considered to be most important investigation in order to stop AKT in spinal tuberculosis. Other parameters to be used along with MRI are clinical recovery, radiological recovery, ESR, and CRP. Other patients those who shows partial resolution and no resolution were further followed with the continuation of AKT. Hence, it is suggested not to stop AKT within a fixed time frame and we need to evaluate spinal lesions clinically, haematologically, radiologically, and by MRI to document the healing of the lesion after 6 months of AKT and subsequently decide on the continuation or stoppage of treatment.

Another thing that is observed from MRI finding is different

type of resolution can be classified as no resolution, partial resolution, near complete resolution, and complete resolution. Based on this classification treatment is continued for those with no or partial resolution and stopped in near complete and complete resolution patients.

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