

Atypical Features in Potts Spine on MR Imaging

Prashant Nath Gupta¹, Dinesh Kumar^{2*}, Arvind Srivastav³, Ashish Verma⁴,
Ramvilas Nag⁵, Suman Chaurasia⁶

¹Ex. Resident, ³Professor, ⁴Associate Professor, Department of Radiodiagnosis,

²Ex. Resident, ⁵Senior Resident, Department of Orthopaedics,
Institute of Medical sciences, BHU, Varanasi, Uttar Pradesh, India.

⁶Ex. Resident, Department of Obs & Gynae, ESIC & PGIMSR, KK Nagar, Chennai, Tamilnadu, India.

ABSTRACT

Background: Pott's spine is the most frequently encountered form of musculoskeletal tuberculosis, although spinal tuberculosis may mimic other pathological condition. The purpose of this study is to identify, describe, and sort this above mentioned atypical features for timely institution of therapy with help of MRI.

Materials & Methods: This prospective observational study was carried out in the Department of Radio diagnosis & Imaging, Institute of Medical Sciences, Banaras Hindu University, Varanasi; In collaboration with Department of Orthopaedics, Institute of Medical Sciences, Banaras Hindu University during August 2013 to July 2015. The MRI done using 1.5 Tesla Magnetom Avanto equipped with an actively shielded whole body magnet and spine matrix coil was used for imaging.

Results: The mean age of the present study was 25 years and most common age group was 21-30 years. The most common pattern, on basis of number of vertebrae involved was of synchronous type i.e. 3-4 vertebral involvement followed by ≥ 5 vertebral infected pattern. In present study common type of bone destruction was fragmentary and intraosseous abscess type constituting 22.5% of cases, No significant destruction was noted in 37.5% of cases.

Conclusion: The study is one of such systemic efforts to create basic awareness of those 'atypical' features which should act as 'red flag' indicators while forming the differential diagnosis algorithm. A prompt and accurate diagnosis achieved hence would ensure minimum wastage of health resources and precious time.

Key Words: MRI, Pott's Spine, Tuberculosis.


*Correspondence to:

Dr. Dinesh Kumar,
Ex. Resident, Department of Orthopaedics,
Institute of Medical sciences,
BHU, Varanasi, Uttar Pradesh, India.

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INTRODUCTION

Spinal tuberculosis is more commonly seen in the eastern countries than in the western world, however, recently there has been reviewed interest in tuberculosis in the developed countries of it's re-emergence in immuno-compromised patients.¹

The most preferred imaging modality for diagnosing Pott's spine is MRI. The classic picture of "two contiguous vertebral disease with the destruction of the intervertebral disc" is easily recognized and readily treated. However, there are certain atypical features, which need to be identified / recognized on MR images for timely institution of chemotherapy or appropriate surgical intervention.

Pott's spine is the most frequently encountered form of musculoskeletal tuberculosis, although spinal tuberculosis may mimic other pathological condition. The classical pott's disease with a paravertebral abscess is generally diagnosed on MR imaging, however, when the location and pattern is uncommon, the diagnosed have disastrous consequences.¹

Feature such as skip involvement of vertebral bodies, lamina, pedicle, transverse process and spinous involvement and facet joints in association or in isolation to typical pott's spine are considered to be atypical features and need to be differentiated from the other pathological condition.² Single vertebral involvement in form of concentric collapse of vertebra, ivory vertebrae, circumferential (pan) vertebral involvement is also considered atypical and difficult to be considered and diagnosed pott's spine until unless associated with other features of tuberculosis.² Location such as cranio-vertebral junction, sacroiliac joint, considered atypical, tubercular granuloma in any form extradural, subdural or intramedullary are very rare features and need to be early identified for timely institution therapy, otherwise prognosis could deteriorates as time delay.² The purpose of this study is to identify, describe, and sort this above mentioned atypical features for timely institution of therapy with help of MRI.

MATERIAL & METHODS

This prospective observational study was carried out in the Department of Radio diagnosis & Imaging, Institute of Medical Sciences, Banaras Hindu University, Varanasi; in collaboration with Department of Orthopaedics, Institute of Medical Sciences, Banaras Hindu University during August 2013 to July 2015.

Pre scan evaluation of patients

Clinically suspected subjects of Pott's disease sent from department of orthopaedics, paediatrics, neurology, neurosurgery Institute of Medical Sciences, Banaras Hindu University, Varanasi.

A) The following relevant information were recorded:

- Age and gender of each patient was taken into consideration.
- Clinical history was elicited.

B) Patients' guardians were explained the procedure of the MRI; written informed consent was taken and then patients were subjected to imaging of the spine.

Inclusion criteria

1. Subset -1:

MRI of patients with clinically suspected Pott's spine were analysed, those not having typical features of Pott's spine (pre-vertebral abscess, psoas, paraspinal abscess, musculofasciitis, subligamentous spread) but having atypical features as follows:

- a) Sacral involvement in isolation.
- b) Cranio-vertebral junction involvement in isolation or in association
- c) Posterior elements involvement in isolation or in association.
- d) Skip involvements.
- e) Intraspinous lesion (granuloma epidural, subdural, intramedullary).
- f) Solitary vertebral disease (Ivory vertebrae, concentric collapse).
- g) Tubercular plexopathies.

2. Subset-2:

Patients with spinal involvement but who were not proven cases of tuberculosis and who did not have the classical appearance of either tuberculosis or metastasis (patients were followed up till a diagnosis was established). They did not have any significant past history of trauma, osteoporosis, or malignancy.

Exclusion criteria

1. Patients with co-associated morbidity like diabetes.
2. Patients who were diagnosed of malignancy on follow-up.
3. Any absolute contraindication for MRI such as ferromagnetic implants, cardiac pacemaker and aneurysmal clips.

Equipment

The present study was done using 1.5 Tesla MRI Magnetom Avanto (Version; BV-I7A, Siemens medical system, Erlanger, Germany) equipped with an actively shielded whole body magnet and spine matrix coil was used for imaging.

Protocol and technical parameters

MRI of spine was contemplated with advanced pulse sequence, namely T1Sagittal, T2 (Axial: Sagittal: T2 Coronal), and STIR (Axial: Coronal), T1 fat suppressed, post gadolinium (Axial: Sagittal: Coronal).

Post imaging analysis

MR Scan were evaluated for

- a) Presence/ absence of osseous involvement.
- b) Site of lesion.
- c) Number of vertebral/disc involved.
- d) Extension of lesion.
- e) Patterns of involvement.
- f) Type of bony destruction.
- g) Extra vertebral extension.

Compacted table were prepared and evaluated for various parameters, described in literature under Atypical Pott's spine.

Table 1: Age incidence in present study

Age	Number of cases	Percentage
10-20	9	22.5
21-30	11	27.5
31-40	8	20.0
41-50	5	12.5
51-60	6	15.0
>60	1	2.5
Total	40	100.0

Table 2: Incidence of no. of cases versus no. of vertebrae infected, as depicted on MR study.

No. of vertebra	Number of cases	Percentage
0	3	7.5
1	6	15
2	6	15
3-4	13	32.5
≥5	12	30

RESULTS

The mean age of the present study was 25 years and most common age group was 21-30 years (table 1). The most common pattern, on basis of number of vertebrae involved was of synchronous type i.e. 3-4 vertebral involvement followed by ≥5 vertebral infected pattern (Table-2).

Involvement of all 4 segments was rare constituting only 2.5% of total cases, while that of one segment of vertebral column was the most common pattern of disease accounting 47.5% of cases in present study (table 3).

In present study common type of bone destruction was fragmentary and intraosseous abscess type constituting 22.5% of cases, No significant destruction was noted in 37.5% of cases (table 4). Frequency of presence of granulation, pre-sacral abscess formation and thecal sac in isolated involvement of sacrum was found to be 50%. Paraspinal abscess was found in both cases of isolated pedicle involvement. Post contrast enhancement in vertebrae was found in all cases (Table 5). Both brachial and sacral plexopathy presented with osseous lesions, abscess formation and contrast enhancement along the nerve sheaths (Table 6).

Table 3: Incidence of Synchronous multiple lesions in pott's disease as observed on MR Study

Segment involved	No. of cases	Percentage
All four segment involved	1	2.5
Any three segment involved	3	7.5
Any two segment involved	17	42.5
Only one segment involved	19	47.5

Table 4: Pattern of bone destruction as atypical features depicted on MR imaging (n=40)

Bone destruction pattern	No. of cases	Percentage
No significant destruction	15	37.5
Fragmentary	8	20.0
Sclerotic	2	5.0
Subperiosteal	6	15.0
Intra osseous abscess	9	22.5

Table 5: Various MR features in Atypical tuberculous spondylitis (CV junction, Isolated sacrum and pedicle)

Site of lesion (No. of cases)	Granulation Tissue (present in)	Abscess	Post contrast enhancement in vertebrae	Paraspinal inflammation	Spinal cord/theal sac compression
CV junction (2)	2	0	2	2	1
Sacrum (2)	1	1	2	2	1
Pedicles (2)	0	2	2	2	0

Table 6: MR features of plexopathy (Brachial + sacral) in Pott's spine

Plexus	Osseous lesion	Enhancement along nerve sheath (T1+C)	Clinical features of Radiculopathy	Abscess	Thecal sac/spinal cord compression
Brachial (n=1)	Present	Present	Present	Present	Present
Sacral (n=2)	Present	Present	Present	Present	Present

DISCUSSION

Tuberculosis (TB) of the spine is an ancient disease. In 1782, Sir Percival Pott described spinal TB and surgical treatment of paravertebral abscess. Hence, spinal TB was called 'Pott's Disease'. Spinal TB accounts for 50% of the cases of skeletal TB, 15% of the cases of extrapulmonary TB and 2% of all tubercular cases (Dass et al, 2002)³. TB continues to be an important public health problem in developing countries especially in deprived socioeconomic groups, older people, immune-compromised patients and drug resistant cases.

Spine is the most frequent location of musculoskeletal TB. The wide range of clinical presentations results in difficulties and delay in diagnosis. Advanced disease mimics other infections and malignancy. The diagnosis of spinal infections relies on three main factors: clinical symptoms, bacteriological culture and imaging such as Magnetic Resonance Imaging (MRI) (Garcia et al, 2013)⁴. Typical spinal tuberculosis is readily diagnosed and treated. Certain atypical clinical and radiologic presentations of spinal tuberculosis are described. Failure to recognize these presentations may lead to delay in diagnosis and initiation of treatment. In some atypical forms of the disease, this may have disastrous consequences (Ketan et al, 2002)⁵.

The first point is site, patterns and spectrum of involvement (single vertebral disease to synchronous multi-level disease of involvement) in atypical Pott's and their difference from typical Pott's spine. Various atypical sites of involvement and their MRI features and their difference with typical Pott's disease and other differentials are discussed. Complications like perineural spread and plexopathies were also noted that were not previously discussed in literature. In last few common differentials mimicking Pott's spine have been enumerated.

In current study most of the patients belonged to the age group of 21-30 years. A study done by Zaidi et al [2010]⁶ similar resultants were recorded but the mean age of presentation was higher (42.4+16.75 years). Pott's disease was found to be most frequent (22.7%) in the age group of 31-40 years in present study. Osborn AG, [2009]⁷ stated that in the developing countries, disease was prevalent in the younger age group, while in the western world, it was found more commonly in the middle age (mean 40- 45 years).

In 40 cases of Atypical Pott's in present study, the most common pattern, on basis of number of vertebrae involved was of synchronous involvement of 3-4 (32.5%) vertebral, followed by 5 vertebral involvement pattern (30%); 7.5% of all cases were

observed without bony involvement, 2 vertebral involvement pattern, as seen in most of the cases of typical Pott's, was seen in 15% of all cases. In study done by Zaidi et al [2010]⁸ multiple vertebrae were affected in most of the cases and a majority had 2 vertebrae involved (60%), followed by the involvement of 3-4 vertebrae (25%), and while a single case had a single vertebra involved. In a study done by Narlawar et al [2002]⁹ the lamina were most commonly involved (72.7%) followed by pedicles (60.6%); spinous processes (57.5%), and transverse processes (36.4%). Bone destruction and marrow changes were seen in all patients. Involvement of the entire posterior arch was seen in eight patients, they concluded in tuberculosis of the posterior element of the spine, MRI is useful in evaluating the extent of involvement and response to therapy of isolated tuberculosis of posterior elements as involvement of posterior elements by tuberculosis is not so uncommon.

In present study most common type of bone destruction was intraosseous abscess type constituting 22.5% of cases. No significant destruction except marrow edema was noted in 37.5% cases, subperiosteal (15%), sclerotic (5%). In previous study done by Tariq et al [2004] stated that axial CT scans demonstrate the fragmentary type of bone destruction being the most common pattern of the vertebrae destruction (48.2), subperiosteal (17.2%), sclerotic (10.3%) were other pattern noted.

A more aggressive and descriptively varied pattern of vertebral destruction was seen in the present study which is seen more commonly with malignancies and again remains an uncommonly described feature in the literature. Apart from the above described variations, a bewildering array of permutations and combinations of the hitherto mentioned "atypical" features is noted. The difference in study may be attributed to the selection of atypical cases only, as well as use of MRI in present study which is superior in identifying the marrow edema.

On search of on-line literature it could not be found any mention of tubercular plexopathies however Gopalakrishnan et al, (2002)¹⁰ reported a case of cervico thoracic junctional area spinal tuberculosis presented as painful radiculitis of the upper extremity, however there was frank bony destruction and paravertebral abscess. In present case it was predominant plexopathy with mild erosion of spinous process, which was only seen in post contrast study and plain radiographs were normal. The presence of pre/paravertebral abscess and the involvement of contiguous vertebrae and intervening discs make the diagnosis of spine TB quite obvious (Palle et al, 2010)¹¹. In cases where these classical features of spine TB are not present, there may be some difficulty in differentiating tuberculous lesions from malignant infiltration.

Atypical forms of spinal TB are uncommonly reported and because of insufficient emphasis and description in the medical literature, still continue to be a source of diagnostic delays and errors. Delay in diagnosis may lead to multiple complications; which may vary according to site of affection like retropharyngeal abscess and basilar invagination in Cranio- Vertebral junction Pott's and sacral plexopathy in case of sacral region Pott's spine.

The magnetic resonance technique also enables detection of various patterns of peri-vertebral soft tissue involvement which differ both in qualitative description as well as quantitative affection when compare to previous observations. Advances in high field MRI have enabled the detection of fine changes like neural involvement and peri-neural spread of disease.

CONCLUSION

The results of this study hereby compile the observation which most radiologists in the subcontinent must have come across at some or other time of their practice. The study is one of such systemic efforts to create basic awareness of those 'atypical' features which should act as 'red flag' indicators while forming the differential diagnosis algorithm. A prompt and accurate diagnosis achieved hence would ensure minimum wastage of health resources and precious time.

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