Purpose

Changes in the epidemiology of tuberculosis has lead to its increased incidence in industrialised nations [1].

The resurgence of extrapulmonary tuberculosis can be ascribed to the emergence of drug resistant strains and an increase in the number of immunocompromised individuals.

In particular osteoarticular involvement has recently shown a marked rise and presently accounts for 10% of extrapulmonary tuberculosis [2].

Extrapulmonary tuberculosis is one of the great mimics of medicine and can even masquerade as malignancy. The protean manifestations of musculoskeletal tuberculous infections have been well described [3].

This can result in a delay in diagnosis, which potentiates the risk of serious morbidity.

Aim of the study was to depict the unusual presentations of musculoskeletal tuberculosis
Methods and Materials

50 proven patients of musculoskeletal tuberculosis were studied from June 2007 to Nov 2009 at our Institute.

- Nine of these patients showed up with unusual manifestations of osteoarticular tuberculosis.
- Imaging was done using plain radiography, multi slice CT and a 1.5 T MRI Scanner available in the institute.
- The time interval between the presentation of the patient and the investigation by various modalities was within 7 to 10 days.
- Subsequently patients were started on Anti tubercular treatment.
- Lab investigations including ESR and Mantoux test was done in all patients
- Diagnosis of tuberculosis was established with a combination of one or more of the following:

  1. PCR for Tuberculosis positivity.
  2. Response to Antituberculous therapy.
  3. FNAC/ Open Biopsy and histopathological confirmation.

- There after, patients underwent medical and surgical (wherever applicable) treatment by using four drugs ATT regime for 9 months to 1 year.
Results

Five clinical syndromes of osteoarticular tuberculosis have been described. Spondylitis (50%) the most common clinical manifestation followed by peripheral arthritis (30%), osteomyelitis (19%), tenosynovitis, bursitis and Poncet disease (1%) [2].

Unusual manifestations of Tuberculous spondylitis

Spinal TB is an uncommon condition in developed nations and its symptoms are not so unique as to indicate the proper diagnosis. Spine is the most common site of musculoskeletal tuberculous infection and thoracolumbar region is the most commonly affected region. Majority of patients have two or more adjacent vertebrae affected at the time of presentation.

Atypical presentations include isolated involvement of the posterior elements with sparing of the vertebral bodies, infection confined to one vertebra and ivory vertebra.

Isolated vertebral involvement (Case A)

The classic radiologic picture of two vertebral involvement with destruction of the intervening intervertebral disc is easily diagnosed and treated but its atypical forms are often misdiagnosed and mistreated.

Discontiguous vertebral involvement (Case B)

- Tubercular spondylitis commonly involves the thoracic and lumbar spine.
- The most common presentation of tubercular spondylitis involves destruction adjacent to the endplates of two (or more) vertebral bodies (paradiscal type).
- Skip lesions involving many vertebrae at different levels occurs rarely [4].
- Multiple non contiguous vertebral involvement can be easily mistaken for metastatic malignancy.
- Factors that distinguish TB from neoplastic disease include the presence of paravertebral abscesses and subligamnetous spread.

Posterior element involvement (Case C)

- The neural arch or posterior elements include spinous processes, laminae, transverse processes, articular processes, and pedicles.
- Classical Spinal TB with vertebral body involvement commonly presents as clinical kyphosis. Contrary to it, in isolated posterior element TB, kyphosis is rare unless there destruction of the corresponding facet joints. This is because the main stabilising anterior and middle column is intact in posterior arch TB.
Conventional radiographs are not very useful in posterior element TB because lesions < 1.5 cm are missed as a result of overlapping shadows. Very good quality radiographs with cone down penetrating views are essential to detect small early involvement. Even then studies have quoted positive radiographs only in 10% cases [5].

Distinguishing features of posterior element TB on CT includes bony destruction localized to the vertebral arch.

MRI is the best imaging modality to demonstrate the abnormal soft tissue involvement. Spread of the abscess can be well demonstrated by MRI.

The smooth margin of a cold abscess due to its subligamental spread contrasts with the irregular margin of a pyogenic abscess, which can destroy the paraspinal ligament.

**Tubercular osteomyelitis with bone sclerosis (Case D)**

- Tubercular osteomyelitis constitutes 2 to 3% of all osteoarticular tuberculosis [6].
- Classic features of osteoarticular tuberculosis are metaphyseal or epiphyseal destruction that lacks sclerosis.
- The lesion may penetrate the physis to involve joints.
- Radiographs reveal irregular cavities and areas of bone destruction with little surrounding sclerosis unless secondary infection through a sinus supervenes [6].

**Tubercular osteomyelitis mimicking neoplasia (Case E)**

- Radiographic features of tuberculosis include osteopenia, osteolytic foci with poorly defined edges. These findings are non specific and can be found in a host of pathologies including neoplasia.
- There are a few radiographic findings which favour tuberculosis over neoplasia. These include presence of small juxtacortical abscesses, rings of inflammatory tissue due to cortical destruction and spread of infection to the extra osseous tissues [7].

**Tuberculous dactylitis is an unusual form of osseous tuberculosis (Case F)**

- Spina ventosa: This is an unusual form of tuberculosis rarely seen.
- There is spindle shaped expansion of the short tubular bones with multiple layers of subperiosteal new bone. This appearance is termed spina ventosa ("wind filled sail") [8].

**Tuberculous osteitis of the Skull (case G)**

- Tuberculosis of the skull base is rare.
• Though infection with immunodeficiency virus has once again caused a rise in the prevalence of tuberculosis in general, tuberculous osteitis does not seem to be on the rise [9].
• The skull base is involved in contiguity either from the mastoid air cells, middle ear, paranasal sinuses or from the convexity.

**Tuberculous tenosynovitis (Case H)**

• This is a relatively uncommon presentation of mycobacterial tuberculosis [10].
• Tendons of the hands and wrist are the more common presentations.
• Involvement of the foot and ankle is much less commonly reported.
Fig. 0: Case A Fig 1(Sag T1 post Gad MRI) : reveals enhancing tissue in D12 vertebral body. The other vertebral bodies and the adjacent intervertebral discs are normal

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case A Fig 2 (Coronal T2 W): reveals Hyperintensity of the D12 vertebral body consistent with edema and an associated left paravertebral abscess.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case A Fig 3 (Axial T1 & T2 W): Hypo and Hyperintensity of the D12 Vertebral Body respectively consistent with edema

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case B Fig 1: (NCCT Sag Reformated image) Evidence of destruction of D5, D12 and L1 vertebral bodies (white arrows).

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
**Fig. 0**: Case B Fig 2 (Sag STIR MRI) : Hypertintensity noted in the vertebral bodies at D5, D12 and L1 (white arrows)

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case B Fig 3: Axial T1 W Post Gad MRI at L1 level: Enhancement of vertebral bodies adjacent to areas of destruction. Enhancement is seen to extend into the epidural space

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
**Fig. 0:** Case C Fig 1 (Sag T1W Post Gad image) : reveals enhancement of the posterior elements of D6 vertebra (white arrow). All the vertebral bodies in this patient reveal normal signal intensity.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
**Fig. 0:** Case C Fig 2 (Axial T1W Post Gad): Clearly reveals enhancement confined to posterior neural arch (white arrows) of D6 vertebra confirming the presence of isolated posterior element involvement. The patient responded to antitubercular treatment.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
**Fig. 0:** Case D Fig 1 (Plain AP radiograph of the foot) : Evidence of a lytic lesion noted in the 1st metatarsal with surrounding sclerosis

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
**Fig. 0:** Case D Fig 2 (Sag T1 W MR image): reveals decreased signal intensity consistent with edema in the 1st metatarsal.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
**Fig. 0:** Case D Fig 3 (Sag STIR (short tau inversion recovery) MR image): reveals heterogenous increased signal in the marrow of the 1st metatarsal. Para osseous collection noted in the dorsum (white arrow) seen as a high signal area on this fat suppressed image.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case D Fig 4 (Sag T1 W FS Post Gad image) reveals: evidence of enhancement within the metatarsal as well as the paraosseous collection (white arrow) on the dorsum of the foot.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case E Fig 1: 14 year old female patient presented with pain, swelling and stiffness. She had no constitutional symptoms. Plain X-ray of Lt thigh (Fig 1) revealed ominous looking expansile lytic lesion with round to oval lucencies with variable amount of sclerosis. No periosteal reaction and no soft tissue calcification. Patient tested positive to Mantoux test with elevation of ESR.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
**Fig. 0:** Case E Fig 2 (Sag T1 W image): reveals evidence of altered marrow signal in lower end of femur with adjacent marrow edema seen as hypointense signal.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case E Fig 3 (Sag T2 W MRI) reveals: evidence of altered marrow signal in lower end of femur with adjacent marrow edema seen as hyperintense signal.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
**Fig. 0:** Case E Fig 4 (Sag T1 W Fat suppressed Post Gad image) reveals: Enhancement of the inflammatory tissue with breach of the cortex posteriorly and spread of inflammation into the adjacent Vastus Medialis (white arrow).

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case E Fig 5 (Axial T1 W Fat suppressed Post Gad image) reveals : enhancing inflammatory tissue breaching the posterior cortex and spreading into the adjacent Vastus Medialis muscle (white arrow). The patient showed good response on institution of Anti Tubercular Treatment.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
**Fig. 0:** Case F Fig 1 (PA Radiograph of both hands in a 2 year old female patient with swelling of fingers and toes) showing presence of multiple spina ventosa seen as expansion of the short tubular bones of 1st and 3rd left metacarpal, 1st right metacarpal and proximal phalanx of left 2nd and fifth finger.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case F Fig 2 (AP Radiograph of both feet of the same patient as Case F (Fig1) shows evidence of spina ventosa of left 1st metatarsal and right 1st and 3rd metatarsal.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
**Fig. 0:** Case G Fig 1 (Axial NCCT): Shows destruction of anterior and posterior neural arches of C 1 (Thick white arrow) and left occipital condyle (thin white arrow).

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN

**Fig. 0:** Case G Fig 2 (Axial T2 W MRI): showing involvement of anterior and posterior neural arch of C1 with soft tissue abscess adjacent to left lateral mass of atlas and left occipital condyle

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case G Fig 3 (Sagittal post Gad T1 W MRI) : showing ring enhancing granulomas adjacent to the left occipital condyle

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case H Fig 1 (Oblique AP radiograph of the right foot): shows evidence of osteopenia affecting the phalanges of the great toe with adjacent soft tissue swelling without any calcification. There is an associated erosion with remodeling of the plantar aspect of the head of the proximal phalanx and the body of the distal phalanx.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
**Fig. 0:** Case H Fig 2 (Sag T1 W MRI of the right foot) shows sharply defined lobulated area of hypodensity along the plantar aspect of the great toe in the region of the Flexor Hallucis Longus

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case H Fig 3 (Sag T2W MRI of the right foot) shows bright homogenous signal of the distended tendon sheath consistent with fluid.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case H Fig 4 (Coronal T1 scan of the great toe) reveals the Flexor Hallucis Tendon seen as a hypointense focal area (white arrow) surrounded by the hypointense distended tendon sheath

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN

Fig. 0: Case I Fig 1 (Plain AP radiograph of the abdomen) : showing normal right psoas shadow (thin white arrow) and a bulging left psoas shadow (thick white arrow)

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
**Fig. 0:** Case I Fig 2 (Sag T1 W MRI) reveals: Normal lumbar spine

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
**Fig. 0:** Case 1 Fig 3 (Sag T2 W MRI) reveals: Normal lumbar spine with no abnormal signal noted in any of the vertebral bodies or the intervertebral discs. Note the hyperintense signal in the posterior paraspinal muscles (white arrow).

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case I Fig 4 (Axial T2 W MRI at L4-5 level) reveals: Patchy hyperintensity in the left posterior paraspinal muscles

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case I Fig 5 (Coronal T1 FS Post Gad MRI) reveals heterogeneous enhancement of the left psoas muscle with linear tracking non enhancing collection indicating presence of pyomyositis.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Fig. 0: Case I Fig 6 (Axial T1 FS Post Gad MRI at L4-5 and L5-S1 levels): Shows presence of heterogenous enhancement with non enhancing collections in the left posterior paraspinal muscles indicating presence of pyomyositis. The patient had no focus in the lung but her ESR was raised and PCR for Tuberculosis was positive. She was started on ATT and underwent a CT examination at our institution in Jan 2010 which revealed complete resolution of the inflammation of the psoas and paraspinal muscles.

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
Conclusion

- Extra pulmonary tuberculosis, a condition whose resurgence can be ascribed to multi drug resistant strains, increase in the number of immunocompromised individuals, as well as immigrants from the developing world, as such is a difficult diagnosis to make.
- Further musculoskeletal tuberculosis is renowned for an ability to present in various locations and guises.
- Thus the diagnosis of osteoarticular tuberculosis is extremely difficult owing to uncommonness of the entity and clinical inexperience especially in the developed nations.
- Hence it is very essential for the treating clinician to have a high index of suspicion and recognising patterns of usual and unusual presentation of this great mimic to achieve the eventual eradication of this disease.
Images for this section:

**Fig. 0:** Case B Fig 1: (NCCT Sag Reformated image) Evidence of destruction of D5, D12 and L1 vertebral bodies (white arrows).

© NMR Research Centre, Institute of Nuclear Medicine and Allied Sciences - Delhi/IN
References

REFERENCES


