IMAGING OF EXTRASPINAL TUBERCULOUS OSTEOMYELITIS

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Purpose: To describe the radiographic patterns of tuberculous osteomyelitis whereas extraspinal location was uncommon.

Materials and methods: Five of twenty-two patients with pathological diagnosis of skeletal tuberculosis who had extraspinal lesions were retrospectively reviewed. All imaging techniques including routine plain radiographs, CT scan or MR imaging were evaluated.

Results: Four patients had solitary lesion with different sites in phalanx, metacarpal bone, capitulum and ilium respectively. The other one had two lesions in bony pelvis. All had similar patterns of osteolysis with irregular borders and cortical violations. None had sclerosis or periosteal reaction. CT and MRI exhibited one sequestrum and one abscess extension into soft tissue.

Conclusion: On the basis of radiologic appearance, the extraspinal tuberculous osteomyelitis is difficult to be differentiated from tumor and tumor-like conditions. CT or MRI can provide more information of sequestrum and abscess that is helpful for diagnosis and evaluation of extent of the lesion.

Tuberculous infection of musculoskeletal system is the least common manifestation of TB infection with reported frequency about 1-2%.[1] The patient of all ages can be affected without predilection for either sex. Musculoskeletal tuberculosis (TB) may be divided into tuberculous infection of bone, joints, or soft tissue.[2] The osseous TB can be further subdivided into more common spinal tuberculosis and uncommon extraspinal tuberculous osteomyelitis.

There have been many reports of the imaging patterns of spinal tuberculosis with its classical or atypical features,[2-6] but only few that mentioned to those in appendicular skeleton and flat bone. So we reviewed the imaging appearances of these unusual site to assess whether they had any characteristics.

MATERIAL AND METHODS

In this retrospective study, the cases of tuberculous osteomyelitis were identified from revision of pathological reports in Siriraj Hospital over a two years period (January 1998 to December 1999). The positive diagnosis of tuberculous osteomyelitis was based on a presence of caseous granuloma with or without positive AFB from surgical biopsy or removal specimens.

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Table 1. Skeletal TB in Siriraj hospital

Site	No. of lesions
Spinal TB	17 (77%)
Extraspinal TB	5 (23%)
Total	22 (100%)

A total of 22 patients (11 women, 11 men) were identified (Table 1). Seventeen patients (77%) with spinal tuberculosis were excluded from the study. So five patients with extraspinal involvement of bone were analyzed. Of these, positive AFB was established for the diagnosis in 2 cases. All patients had available imaging studies of involved bone as followings: plain radiographs in all cases, CT scan in 2 cases and MR imaging in 2 cases. The chest film was taken in all patients.

RESULTS

The 5 patients with extraspinal tuberculous osteomyelitis were encountered in 23% of skeletal TB cases, which were 1 man and 4 women (Table 2).

Table 2. Patients with extraspinal tuberculous osteomyelitis

Case	Sex	Age (years)	Site of lesions	No. of Lesions	Pulmonary TB
1	M	10	Prox. phalanx	1	-
2	F	46	Capitulum	1	-
3	F	20	Metacarpal	1	-
4	F	23	Iliac bone	1	-
5	F	51	pelvis	2	+

The patients' ages were range from 10-51 years with an average of 28 years. Four of the five patients had solitary lesion with different sites in the phalanx, metacarpal bone, capitulum and iliac bone, respectively. The other patient had two lesions in the bony pelvis. The chest film revealed pulmonary TB only in this case, which was occurred for 20%.

In the first case with the lesion at proximal phalanx of 5th finger, it was not difficult to diagnose because of the classic spina ventosa in appearance including expansion and thinning of cortex with surrounding soft tissue swelling.[2-7]

In the case of capitulum lesion, a 47-year-old patient had 9 months of a tender swelling at the right elbow. The well-defined border geographic bony destruction was seen radiographically at the medial epicondyle of right humerus without joint involvement (Fig. 1). Neither sclerosis nor periosteal reaction was evidenced. The diagnosis of bone tumor was the first impression. Subsequent CT scan showed sequestrum that was not seen on plain film. So the infective process was included in differential diagnosis and finally proved pathologically.

About metacarpal lesion, the third patient

presented with painful swelling at the dorsum of right hand for I week. The plain radiograph demonstrated poorly marginated non-sclerotic, expansile geographic destruction at base of right 2nd metacarpal bone with adjacent soft tissue swelling (Fig. 2). No sclerosis or periosteal reaction was seen. The adjacent MCP joint was not involved. Due to failure of medical treatment as inflammatory condition, CT scan was requested showing irregular border of osteolysis that was expansile causing very thinning and disruption of cortex. No periosteal reaction was revealed. After that, the open curettage was done and pathologically proved to be positive for AFB.

The forth case was a 23-year-old man with right groin pain on movement for 6 months and palpable groin mass for 2 months. The plain radiograph revealed a well-defined large geographic bony destruction at right iliac bone with irregular border and without sclerosis (Fig. 3). There was soft tissue mass at RLQ causing medial displacement of bowel gas. The malignant bone tumor was most likely provisional diagnosis, so the MRI was obtained later for surgical planning. The study showed huge multiloculated soft tissue mass originated from right iliac bone with enhancing of its thicken wall and solid portion. The mass extended superiorly into the pelvic cavity displacing pelvic organs and psoas muscle, and inferiorly into groin region. The diagnosis of malignant bone tumor was now changed because of the appearance of that mass which was most likely to be an abscess. So an infective process was become the first in the differential diagnosis. Finally, the incisional biopsy was performed and obtained a large amount of draining pus. The pieces of bone and soft tissue were sent for cytology and the tuberculous bacilli were discovered.

The last case was a 51-year-old female, who had 2 months of tenderness on movement of right hip. Plain film of pelvis exhibited geographic bony destruction at the right superior pubic ramus with ill-defined border, expanding and breaking cortex without sclerosis or periosteal reaction. Another suspected lesion was at the inferior right acetabulum appearing ill-defined osteolysis. The MRI was requested to define their extension and number of lesions, which showed 2 lesions with broken cortex and no associated soft tissue mass. Due to patient's history of pulmonary TB with positive sputum and chest film, so the diagnosis was most likely to be osseous TB.

In all cases, the plain radiographs showed that the lesions were geographic lytic destruction with irregular border and no sclerosis or periosteal reaction (Table 3). Three of the five lesions were expanding and breaking cortex resulting to pathological fracture. All solitary lesions had associated soft tissue swelling.

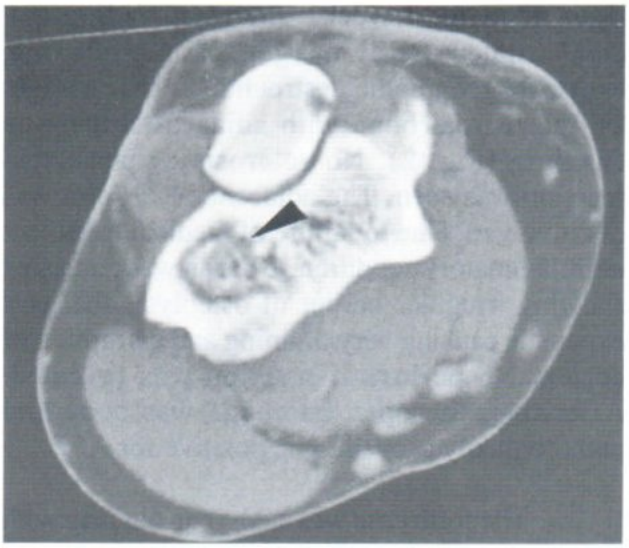
CT scan or MRI was performed in 4 patients. Sequestrum was demonstrated from CT scan of the capitulum lesion, and large abscess was identified from MR imaging of the iliac wing lesion.

Table 3. Imaging findings

Case	Type of destruction in plain film	Marginal sclerosis	Periosteal reaction	Cortical violation	Soft tissue swelling	CT/ MRI	Additional findings
1	geographic	-	-	-	+	-	-
2	geographic	-	-	-	+	CT	Sequestrum
3	geographic	-	-	+	+	CT	-
4	geographic	-	-	+	+	MRI	Abscess
5	geographic	-	-	+	-	MRI	-

1A

Fig. 1A. Plain film of right elbow shows geographic bony destruction at medial epicondyle of right humerus. (Black arrow heads)

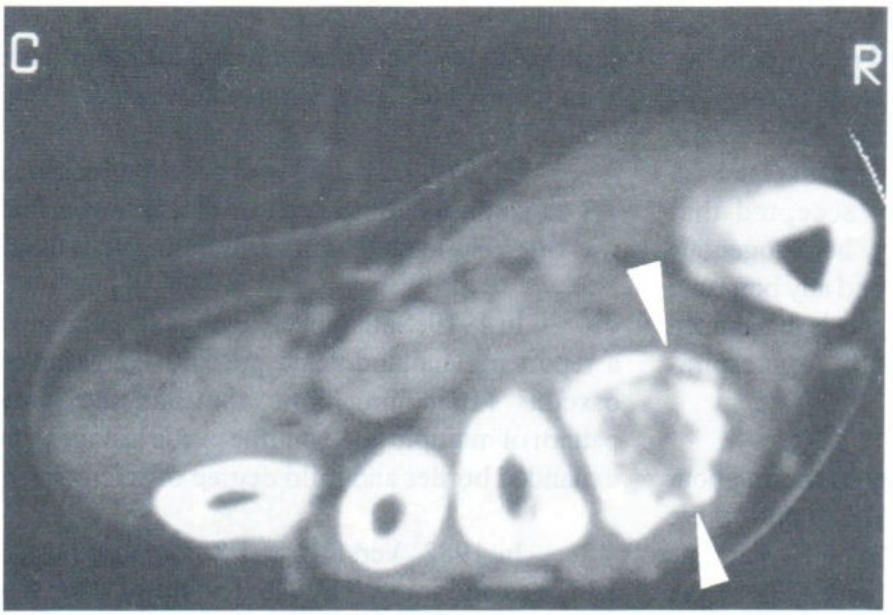


1B

Fig. 1B. Axial non-enhanced CT scan reveals sequestrum not seen on plain film. (Black arrow head)

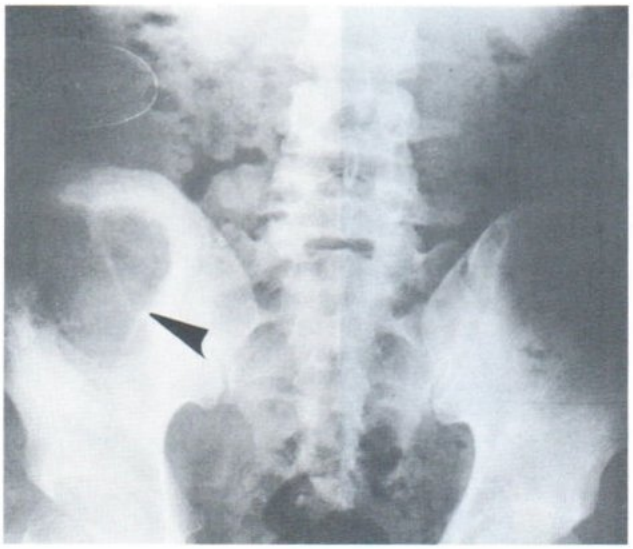
2A

Fig. 2A. Plain film of right hand shows poorly marginated non-sclerotic, expansile geographic destruction at base of right 2nd metacarpal bone. (Black arrow head)



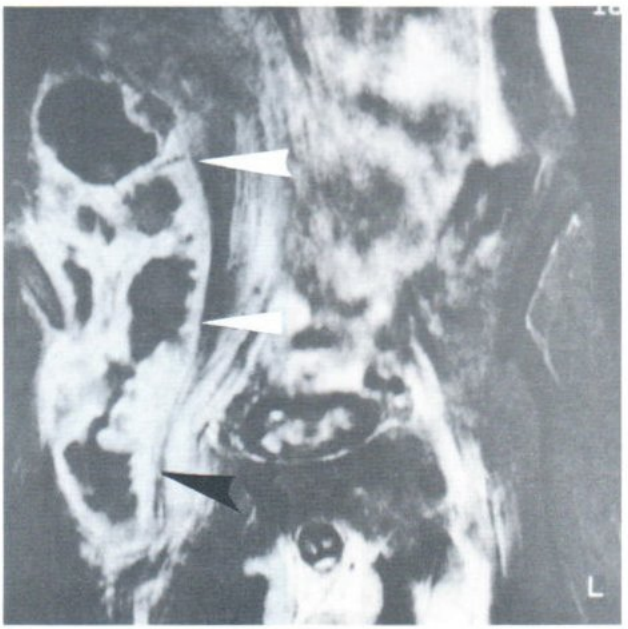
2B

Fig. 2B. Axial non-enhanced CT scan shows irregular border, expansile osteolytic lesion causing very thinning and disruption of the cortex. (White arrow heads)



3A

Fig. 3A. Plain film of the pelvis shows well -defined large geographic bony destruction at right lilac bonr with irregular border and no sclerosis. There is soft tissue mass at RLQ causing medial displacement of bowel gas. (Black arrow head)



3B

Fig. 3B. T1-weight MRI post gadolinium shows huge multilobulated mass originates from right iliac bone with enhancement of thicken wall and solid component. The mass is also extending superiorly into pelvic cavity and inferiorly into groin region. (Two white arrow heads, One black arrow head)

DISCUSSION

TB was often overlooked as a possibility in the differential diagnosis of skeletal lesions. An average delay of 16 to 19 months between the initial symptoms and the diagnosis of skeletal TB was reported.[3] It is generally accepted that skeletal involvement is caused by hematogenous dissemination of tubercle bacilli and any bone can be affected. The definitive diagnosis is made from a positive culture of tubercle bacilli from aspiration fluid or bone biopsy.

In TB patients, there were reports about 1-2% to be skeletal TB and 50-70% of these were spinal lesions.[1] In our study 11 of 22 patients (77%) are spinal TB and 5/22 patients (23%) have extraspinal lesions. These unusual locations have been reported as a part of rare skeletal TB.

In 1970, Davidson et al described osseous TB as small-localized area of osteoporosis that was often associated with surrounding sclerosis.[8]

In 1979, Sathaphatayavongs B. published a report in Thailand.[7] She presented 2 cases of osseous TB in long bone, that had the same pattern of multiple good outline cystic lesions with expanded border and mild degree of sclerosis.[7]

In 1982, Versfeld and Solomon reported 17 bones and joints TB. The feature of bony TB

included poorly defined round edge cyst-like lesion with minimal surrounding sclerosis.[9]

In 1990, Abdelwahab et al reported 3 osseous TB that showed tumor-like lesion with sclerotic changes, periosteal reaction and sequestrum.[10]

In 1995, Yao and Sartoris claimed that tuberculous osteomyelitis of the extremities typically affected the metaphyses with radiographic findings of osteopenia, osteolytic foci with poorly defined edges, and minimal surrounding sclerosis.[3]

The largest series had been of Hugosson et al in 1996 reported 10 patients with osseous TB.[1] All were irregular border lytic lesions with surrounding bone. Trabecular bone still present and no or little reactive bone formation. Minor periosteal reaction was present.

Recent publications were reviewed by Ridley et al in 1998. The lesion of appendicular skeleton was lytic with little or no sclerosis and no periosteal reaction.[2]

All reports since 1970 until recently had shown similar pattern of osteolytic destruction with minimal or no sclerosis. The border may be poorly defined or good outline. Sequestrum may be associated. The periosteal reaction is minimum or absent and pathological fracture is rare.

This is in agreement with our study, in which the appearances of extraspinal tuberculous osteomyelitis are osteolytic destruction causing bony expansion with or without cortical violation. Minimal or no sclerosis can be encountered but no periosteal reaction. These radiographic appearances are non-specific and cannot be distinguished from other conditions. So, when this lesion is evident on plain film, the differential diagnoses of tumor and tumor-like diseases, osteolytic metastasis, multiple myeloma, hyperparathyroidism and fungal infection should be included.

The supplemental diagnostic hallmarks are including the present of abscess, sequestrum or pulmonary TB. The first two findings are generally accepted that represent the infective processes which are clearly demonstrated from CT scan and MRI. The presence of pulmonary TB. has been reported to occur in approximately 12-50% of skeletal TB patients.[1] In this study we found that the frequency of pulmonary TB was 20%. However, a normal chest film does not exclude skeletal TB and a history of tuberculous infection or exposure may or may not be present.

CONCLUSION

The conventional radiography remains the best initial diagnostic test and the most useful and least expensive modality for imaging of skeletal lesion. However, on the basis of radiographic appearance alone, the extraspinal tuberculous osteomyelitis has its own characteristics but not specific and difficult to be differentiated from other conditions. We highlight that CT and MRI can provide more information of sequestrum and abscess that is helpful for diagnosis and evaluation of the extent of this unusual lesion and also facilitating guided biopsy.

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