CLINICAL ARTICLE

Tuberculosis – the masquerader of bone lesions in children

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Abstract

Fifty-three children with histologically confirmed tuberculous osteomyelitis were treated between 1989 and 2007. The age ranged from 1–12 years. There were 65 osseous lesions (excluding spinal and synovial). Seven had multifocal bone involvement. Four basic types of lesions were seen: cystic (n=46), infiltrative (n=7), focal erosions (n=6) and spina ventosa (n=7). The majority of lesions were in the metaphyses (n=36); the remainder were in the diaphysis, epiphysis, short tubular bones, flat bones and small round bones. Bone lesions resembled chronic infections, simple and aneurysmal bone cysts, cartilaginous tumours, osteoid osteoma, haematological bone lesions and certain osteochondroses seen during the same period of study. Histological confirmation is mandatory to confirm the diagnosis of tuberculosis as several bone lesions can mimic tuberculous osteomyelitis.

Introduction

Tuberculous osteomyelitis is less common than skeletal tuberculosis involving the spine and joints. The destructive bone lesions of tuberculosis, the disseminated and the multifocal forms, are less common now than they were 50 years ago.[1-7] However, in recent series, solitary involvement appears to be the predominant skeletal manifestation of osseous tuberculosis and can pose difficultly in accurate diagnosis. Solitary bone lesions in children are not commonly reported. Martini[8] in a large series of 652 cases of osteoarticular tuberculosis, found bone involvement in only 11% of children.

Since 1985, there has been a resurgence in the incidence of skeletal tuberculosis in developing countries. This increase has been attributed to acquired immunodeficiency syndrome (Aids), immigration, homelessness, intravenous drug abuse, and a decline in health programmes.[9] Other countries have reported an increased incidence of osseous lesions secondary to Bacille Calmette-Guerin (BCG) immunisation.[10,11]

The variable radiological appearance of isolated bone lesions in children can resemble various bone lesions including subacute and chronic osteomyelitis, simple and aneurysmal bone cysts, cartilaginous tumours, osteoid osteoma, granulomatous lesions, haematological disease, and certain malignant tumours.[6,7,12]

The aim of this paper is to describe the variable radiological manifestations of tuberculous osteomyelitis in children in sites other than the spine and joint synovium, and show how these bone lesions can masquerade as various familiar orthopaedic conditions in children.

Materials and methods

The clinical and radiological records of 53 children with primary osseous lesions of tuberculosis, confirmed histologically and treated at King Edward VIII Hospital between 1989 and 2007, were reviewed retrospectively. Primary synovial and spinal lesions were excluded from this study. There were 40 boys and 13 girls with an age

range of 1 to 12 years (average 6 years). The duration of symptoms ranged from 3 weeks to 10 weeks. Pain, swelling and limitation of movement were the main complaints. With lower limb involvement, a limp was present. Minor trauma was reported as a primary complaint in 12 patients. A fluctuant abscess was seen in four children, and two children had discharging sinuses. A family history of tuberculosis was obtained in 10 children. Associated lymphadenopathy was seen in two children. There were a total of 65 lesions *(Table I)*. Seven children had multifocal lesions. The majority of lesions (36) were in the metaphyses of long bones; four occurred in the diaphyses; four in the epiphyses, and 10 in the short tubular bones of the hand and feet; eight in flat bones (pelvis, clavicle) and three in the small round bones (patella, talus, navicular). The various bone lesions resembled several common conditions *(Table II)*.

Four basic patterns of osseous lesions of tuberculosis were identified on radiographs, i.e. cystic type (n=46); infiltrative type (n=7); focal erosions (n=6); and spina ventosa type (n=7). Some radiographs had a combination of these lesions, but one type predominated.

The majority of bone lesions were of the cystic variety located typically in the metaphysis of the long bone. They were round to oval in shape, expanding, radiolucent lesions with a sclerotic margin, some loculated, others honeycombed in appearance.

Table I:
Anatomical sites of involvement of osseous lesions of tuberculosis

Site	Number
Epiphysis – long bone	4
Diaphysis – long bone	4
Metaphysis – long bone	36
Tubular short bones (hands and feet)	10
Flat bones (pelvis, clavicle)	8
Small bones (talus, navicular, patella)	3

Table II:
Differential diagnosis of tuberculosis – radiological resemblance

Bone lesions resembled	Number
Subacute/chronic osteomyelitis	11
Cartilaginous tumours	2
Simple/aneurysmal bone cysts	10
Osteoid osteoma	2
Round cell tumours, leukaemia/lymphoma/ eosinophilic granuloma	2
Osteochondroses (Perthes', Kohler's)	2
Monostotic fibrous dysplasia	1

A large number resembled simple bone cysts and aneurysmal bone cysts *(Figure 1)*. Periosteal reaction was seen in three cases, and sequestra in the cysts were seen in four. Four lesions crossed the growth plate. Two of these lesions resembled chondroblastoma *(Figure 2)*.

Infiltrative lesions with permeation, bone destruction and varying periosteal reaction resembled chronic osteomyelitis. A pathological fracture was seen in three patients *(Figure 3)*. Focal erosions were localised areas of destruction with cortical breaching or punched out defects on radiographs. There was slight marginal sclerosis resembling subacute pyogenic osteomyelitis. Spina ventosa lesions were expanding fusiform lesions with dense periosteal reaction mainly occurring in the metacarpals and phalanges *(Figure 4)*, and rarely occurring in the radius or ulna.

Plain radiographs of the affected areas and chest were obtained in all patients. Eight children had associated chest involvement. Of the 65 bone lesions in the 53 children, 46 had solitary bone lesions and seven children multifocal bone lesions (n=19); one child had four sites of involvement, three had three sites, and three had two sites.

Computerised tomography was done in six cases to define lesions in the talus, femoral head and pelvis (n=4), to plan biopsy.

All but seven of the patients had a raised erythrocyte sedimentation rate (ESR) (range 33–108, average 61). A negative tuberculin test (Mantoux) was recorded in 11 cases. Routine HIV testing was not done, except in multifocal involvement, and was positive in five cases.

Biopsy of bone lesions was taken from an osteolytic lesion, and not from the synovium alone. All bone defects were curetted. Bone grafts were not used to fill larger defects.

The limb was immobilised in an appropriate splint or traction for about 4 weeks. Thereafter, physiotherapy was commenced and continued on an outpatient basis. Oral antituberculous therapy consisted of rifampicin, isoniazid and pyrazinamide for 12 months.

Figure 1:
Expansile lesion in distal humerus with trabeculae and locules resembling an aneurysmal bone cyst. The lesion healed and remodelled following curettage and anti-tuberculous therapy

Figure 2:
Cystic lesion in tibial epiphysis crossing the growth plate into the metaphysis resembles chondroblastoma

Figure 3:
Infiltrative lesion in distal femur with pathological fracture and periosteal reaction resembling pyogenic osteomyelitis. Healing occurred with anti-tuberculous treatment

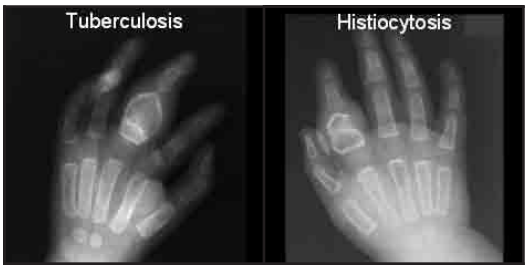

Figure 4:
Spina ventosa lesion in the hand (spina = short bone, ventosa = filled with air) resembling histiocytosis X (R)

Results

The average follow-up was about 2.5 years (range 12 months–15 years). All lesions showed good healing by 4–6 months. Slight sclerosis was seen on most radiographs at the site of the initial lesion after healing. Expanded cystic cavities and spina ventosa lesions showed good healing and remodelling. Lesions crossing the growth plate healed. Growth disturbance occurred at six sites, viz. hip, resulting in shortening and coxa vara (n=4), short thumb (n=1), and hypoplastic distal humerus (n=1). Avascular necrosis was seen in the femoral head (n=2), and navicular (n=1). There was no recurrence of bone lesions or resistance to medical treatment. Joint contracture of ± 10º–30º involving the hip joint in four, knee in two and elbow in two patients was seen at follow-up.

Discussion

Lack of familiarity with bone lesions of tuberculosis can lead to a delay in diagnosis. The clinical and radiological presentation of osseous tuberculosis appears to be changing.

Osteoarticular tuberculosis was regarded as destructive, disseminated and multifocal lesions seen < 50 years ago, and was confused with sarcoidosis (Jungling's disease) occurring secondary to a primary focus in the lungs.[2]

However, in recent reports, solitary isolated bone lesions appear to be the predominant radiological type seen in children.[7,13-19]

Accurate diagnosis has been reported to be delayed or overlooked, and patients have been treated for other commonly encountered lesions such as pyogenic osteomyelitis, osteoid osteoma, and benign and malignant tumours.[1,7,12,13,14,20]

Due to the subtle nature of the symptoms, the diagnosis is not made until the process is well advanced. A large number of patients in one series was treated initially with non-steroidal anti-inflammatories, which falsely improved symptoms, leading to delayed diagnosis.[21]

Children with bone lesions usually present with local pain, swelling, slight tenderness, muscle wasting and some decrease in movement. Discharging sinuses, fluctuant swellings and local lymphadenopathy, although regarded as important clinical findings in several reports,[21-24] were, in this study, rarely seen.

Minor trauma can mask the underlying pathology and also cause delay in diagnosis,[11] or trauma may flare up a dormant or asymptomatic lesion.[25,26] Impaired host resistance may also reactivate dormant lesions.[25]

The commonest site of involvement in children is the metaphysis of long bones, especially the lower limb, compared to adults where the axial skeleton and pelvis appear to be the common sites.[9]

The bone lesions are usually of four basic types: (a) cystic, (b) infiltrative, (c) focal erosions and (d) spina ventosa.[18]

The cystic bone lesions are well described in the literature.[1,5,8,18,22,23,27] They usually localise in the metaphyses of long bones or flat bones as single or, less commonly, multiple foci. The lesions are radiolucent, round to oval with slight marginal sclerosis. These 'cysts' can mimic lesions such as simple bone cysts and aneurysmal bone cysts, tumours and granulomatous bone lesions.[6,7,12,13,14,18]

Infiltrative lesions are diffuse areas of permeation with little or no periosteal reaction, resembling chronic osteomyelitis, benign and malignant tumours such as leukaemias, round cell tumours and Ewing's sarcoma. Pathological fractures usually occur with this radiological type.

One form of lesion usually predominates

Focal erosions are localised areas of osteolysis with or without destruction of the cortex; they may be punched out defects with marginal sclerosis. These lesions can resemble subacute pyogenic osteomyelitis, eosinophilic granuloma and round cell tumours.

Spina ventosa lesions are expansile lesions resulting from underlying bone destruction with periosteal thickening. A cystic cavity may form and the shape of the bone balloons out in a fusiform pattern. Sequestra may appear in these lesions. Spina ventosa lesions are commonly seen in short tubular bones of the hands and feet, but can also occur in the forearm bones and clavicle. Bone lesions can resemble haematopoetic conditions *(Figure 4)*.

Although four basic types of lesions are seen in osseous tuberculosis, a combination of two or more types may occur simultaneously. One form usually predominates, however: BCG osteomyelitis can manifest with radiological features similar to those of tuberculous osteomyelitis.[10,11] The lesions are usually localised to the epiphysis and metaphysis of long bones, occasionally extending across the growth plate. Accurate diagnosis requires the growth of the BCG strain in culture.

By far the commonest lesions seen in most studies are the cystic variety in the metaphyses. These lesions can cause problems with accurate diagnosis.

Rarely, they may cross the growth plate and can resemble chondroblastoma *(Figure 2)*. Two cases were seen in this series. A large number of cyst-like lesions were seen in the femoral neck region. Here they can resemble fibrous dysplasia, chronic pyogenic osteomyelitis or eosinophilic granuloma *(Figure 5)*. The importance of accurate diagnosis has been emphasised.

The diagnosis of osteoarticular tuberculosis requires a high index of suspicion. Tuberculosis must be confirmed histologically. Versveld and Solomon[27] suggested that in osseous bone lesions near a joint, the biopsy specimen should be taken from the bone defect rather than the synovium alone. Synovial biopsy alone may show non-specific inflammatory reaction on histology.

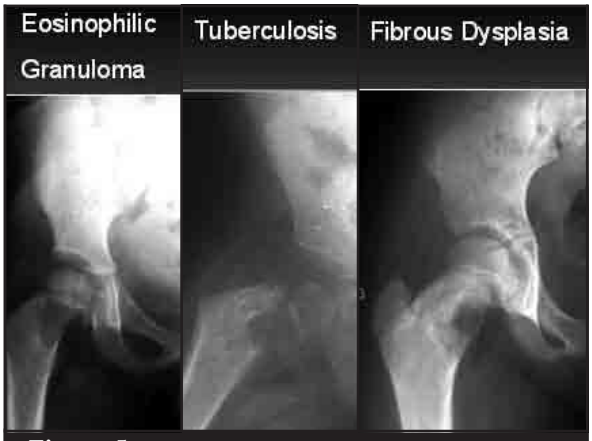

Figure 5:
Tuberculous lesion of the neck of femur with radiolucent cystic area with erosion of the medial cortex resembling monostotic fibrous dysplasia, on (R) and eosinophilic granuloma (L) resembling tuberculosis

Figure 6:
Lesion of cryptococcus with soft tissue swelling and destructive lesion in the proximal radius resembling tuberculous osteomyelitis in the same region

Curettage at the time of biopsy has been reported to yield favourable results.[5,11,24,26] Tubercle bacilli sequestrated in necrotic tissue found in cystic lesions and bone defects are inaccessible to chemotherapeutic agents. Curettage and debridement also excludes pyogenic and fungal osteomyelitis which occur in our environment *(Figure 6)*. Kumar[22] suggested bone grafting after curettage. However, Martini[8] in his large series found that it was not necessary to fill large defects. Good resolution of cystic and spina ventosa lesions was encountered in this study and by others.[8,15,27]

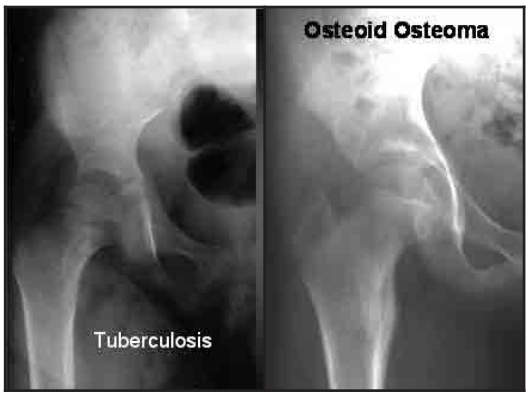

Figure 7:
A nidus in the medial cortex of the femoral neck with surrounding sclerosis (L) resembling osteoid osteoma (R)

Common radiological features of tuberculous osteomyelitis are osteopaenia, soft tissue swelling and minimal periosteal reaction. Extensive periosteal reaction, sequestrum formation and pathological fractures are rarely seen in tuberculosis in our series.

However, when they occur, the bone lesions can resemble pyogenic osteomyelitis and haematological conditions.

Small sequestra can mimic osteoid osteoma *(Figure 7).* The lack of familiarity with the spectrum of bone lesions may delay diagnosis. Advanced tuberculosis, either multifocal in type or disseminated lesions, are encountered less commonly nowadays. Solitary lesions can masquerade as benign or malignant bone lesions. The ESR and Mantoux tests are not always reliable in bone tuberculosis.

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