

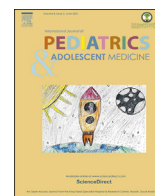
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Sternal and metacarpal masses as the initial presentation of tuberculosis in a child

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1. Images in pediatrics

A 5-year-old previously healthy boy was referred to the Pediatric Infectious Disease Clinic with a two-month history of progressive swelling on the upper chest and right 5th metacarpal bone. There was no reported weight loss, fever, cough, night sweats, or pain at the sites of swelling, although parents noted that the child was constantly tired and had reduced appetite. Prior treatment with amoxicillin-clavulanate by his pediatrician had not resulted in any improvement.

The child was born in the Phillipines and moved to Dubai, United Arab Emirates, at 1 year of age. He had received the Bacille Calmette-Guerin (BCG) vaccine at birth. On detailed questioning, the family recalled prolonged household contact with a relative who was subsequently diagnosed with active pulmonary tuberculosis (TB). This exposure occurred two years prior to the child's presentation.

On examination, the child was nontoxic, afebrile, and appeared pale, with large swellings over the manubrium and right metacarpal bone. These were not tender, indurated, or fluctuant. hepatosplenomegaly and systemic lymphadenopathy were absent.

Magnetic resonance imaging (MRI) of the chest demonstrated a

semi-ovoid mass arising from the manubriosternal area. It measured 2.8 cm × 3 cm × 1.8 cm and showed a low signal on T1-weighted images. A diffuse abnormal signal involving the 2nd thoracic (T2) vertebral body was also noted, which extended anteriorly deep into the anterior longitudinal ligament, measuring 1.8 cm in height. In addition, an abnormal signal was seen in the posterior aspect of the 4th thoracic vertebra, which extended to involve the adjacent right and left ribs (Fig. 1). After contrast administration, the sternal lesion showed heterogeneous enhancement. Mild to moderate post-contrast enhancement was also noticed in the T2 lesion, particularly involving the anterior subligamentous extension, which demonstrated a ring pattern of enhancement.

MRI of the right hand showed a large expansive lesion spanning the entire shaft of the 5th metacarpal bone resulting in a fusiform expansion of the diaphysis, measuring 2.5 cm in length and 1.3 cm in width (Fig. 2). Significant cortical thinning and cystic appearance of the metacarpal bone were noted. This lesion demonstrated an intermediate signal on T1 images and fluid-sensitive sequences. There was a cortical breakthrough involving the dorsal aspect of the metacarpal bone, through which the contents of the lesion were seen to be extending into the surrounding soft tissue (Fig. 3). The ring pattern of enhancement was noted after contrast administration.

Purified protein derivative demonstrated an induration of 35 mm after 72 h of placement. The TB interferon-gamma release assay was also positive. The sternal abscess underwent operative drainage and histopathology showed multiple caseating granulomas. Acid fast bacilli smear was negative; both, the polymerase

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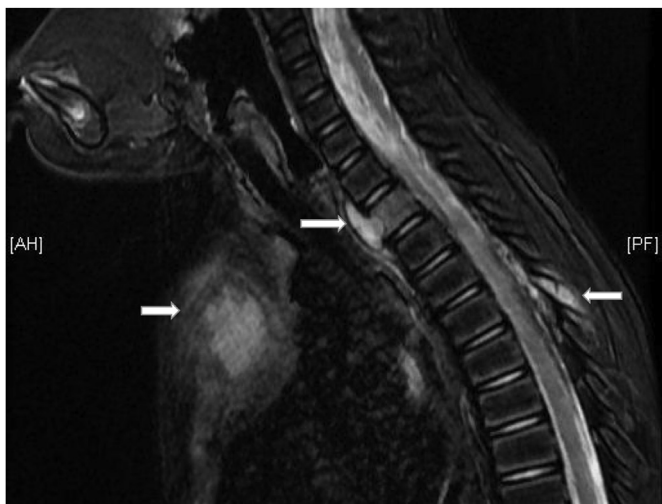


Fig. 1. Semi-ovoid mass arising from the manubriosternal area, measuring 2.8 cm × 3 cm × 1.8 cm (arrow). Diffuse abnormal signal involving the 2nd thoracic (T2) vertebral body, extending anteriorly deep into anterior longitudinal ligament, measuring 1.8 cm in height (arrow). Abnormal signal is seen involving the posterior aspect of the 4th thoracic vertebra, extending to involve the adjacent right and left ribs (arrow).



Fig. 2. Large expansive lesion spanning the entire shaft of the 5th metacarpal bone resulting in a fusiform expansion of the diaphysis, measuring 2.5 cm in length and 1.3 cm in width. There is significant cortical thinning and cystic appearance of the metacarpal bone (arrow).

chain reaction for *Mycobacterium tuberculosis* complex and culture were positive on the abscess material. This isolate was pan-sensitive to isoniazid, ethambutol, pyrazinamide, rifampicin, and

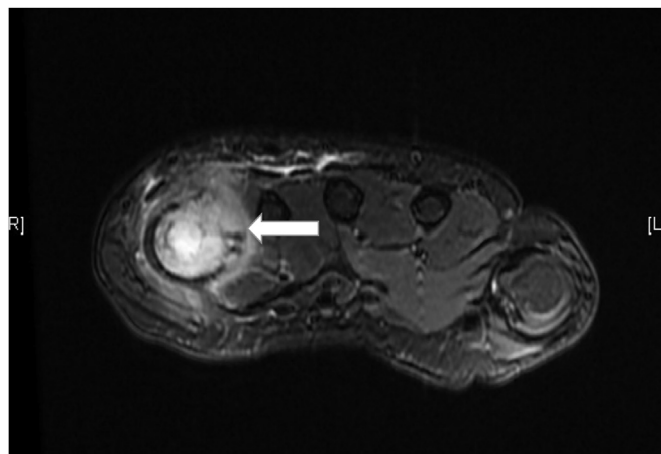


Fig. 3. Cortical thinning and breakthrough involving the dorsal aspect of the metacarpal bone, through which contents of the lesion are seen extending into the surrounding soft tissue (arrow).

streptomycin.

Intensive phase oral anti-TB therapy with four drugs was promptly initiated and well-tolerated by the child. Within a week of starting treatment, his appetite and energy levels improved significantly. Both, sternal and metacarpal lesions resolved clinically within 5 weeks of starting treatment. After eight weeks of therapy, he was switched to the continuation regimen with isoniazid and rifampin. Repeat MRI after 6 months of treatment demonstrated residual enhancement at sternal, vertebral, and metacarpal sites; hence, anti-TB therapy was extended to 12 months. Treatment was discontinued when repeat MRI demonstrated the complete resolution of all radiological abnormalities.

In 2018, the World Health Organization (WHO) reported 1.1 million new cases of TB in children younger than 15 years of age [1]. Musculoskeletal infection accounts for up to 20% of all extrapulmonary cases of TB. Infection in young children can present in unusual locations, causing diagnostic dilemmas and often leading to delays in diagnosis and treatment [2]. MRI is the preferred diagnostic modality for musculoskeletal TB, because it can demonstrate early bone marrow involvement or soft tissue extension of infection. In children, the most common manifestations of musculoskeletal TB include osteomyelitis, arthritis, and spondylitis; in the latter, intervertebral disc involvement occurs late in the disease process [3]. Multiple levels of vertebral body involvement, either contiguous or skipped, result from the subligamentous spread of infection as seen in our patient. The MRI abnormalities noted in our patient's metacarpal bone are consistent with *spina ventosa* – a term used to describe TB osteomyelitis with underlying bone destruction, periosteal reaction, and fusiform expansion of the bone resulting in diaphyseal expansion and cyst-like cavities.

Sternal TB in children is a rare entity [4,5] and requires a high index of suspicion for diagnosis. Multifocal Osteoarticular TB involving the sternum and metacarpal bones has not been previously described in children, and prolonged treatment guided by the resolution of lesions on MRI is favored to reduce the risk of relapse of infection.

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Informed consent

Informed consent for the publication of the images obtained.

Author statement

All authors have updated the manuscript based on feedback from the editors and reviewers. The final manuscript has been approved by both authors and agreed on its submission.

Declaration of competing interest

All authors have no conflict of interest to disclose.

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