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**Access Microbiology**

**Multifocal tuberculosis revealed by a sternal swelling in an immunocompetent child**  
--Manuscript Draft--

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## Multifocal tuberculosis revealed by a sternal swelling in an immunocompetent child

Ghizlane Chehrastane<sup>1</sup>, Elmostafa Benaissa<sup>1</sup>, Abdelilah Radi<sup>2</sup>, Amal EL Hassani<sup>2</sup>, Rachid Abilkassem<sup>2</sup>,<sup>3</sup> Amar Agadr<sup>2</sup>, Mostafa Elouennass<sup>1</sup>

<sup>1</sup>Department of microbiology, Mohammed V Military Instruction Hospital, Rabat, Morocco.

<sup>2</sup>Department of Pediatrics and neonatology, Mohammed V Military Instruction Hospital, Rabat, Morocco.

**Corresponding author** : Ghizlane Chehrastane : [ghizlane.cheh@gmail.com](mailto:ghizlane.cheh@gmail.com)

**Data summary** : All data associated with this work is reported within the article

**Key words** : multifocal tuberculosis, sternal swelling, RT-PCR.

### Abstract :

Tuberculosis (TB) is one of the most common pathogens of bacterial lung infections specially in underdeveloped nations like Morocco where the incidence of TB was 97 cases per 100,000 person in 2019. Thanks to its national TB prevention and control plan, Morocco was able to achieve a remarkable progress in management of TB with 80% reduction in the total number patients diagnosed with TB between 1980 and 2018. The national plan also allowed to reach and maintain a therapeutic rate above 86% since 2002. extrapulmonary TB primarily affects the primary weight bearing joints and the spine. Sternal TB is a rare clinical condition accounting for 1% of all musculoskeletal TB cases. Due to its rarity and the lack of awareness of the clinical presentations, The diagnosis of sternal TB can be quite complex. we describe the case of a 14 year old Moroccan patient consulting in the military hospital Mohammed V, Rabat with central chest pain for four months. The pain was not associated to breathing, physical exercise or eating. with a history of asthenia, fever, and weight loss. A CT scan of the chest showed a destructive lesion of the sternum. thereafter, a surgical biopsy was performed and enabled to confirm the microbiological diagnosis of tuberculosis thanks to the realization of the RT-PCR. The anti-tuberculosis therapy was given to the patient who had complete resolution of symptoms. This condition should be included in the differential diagnosis of chronic chest pain that mimics costochondritis particularly in patients from endemic areas.

### Introduction :

29 Tuberculosis (TB) of the bone is the result of hematogenous dissemination of bacilli following  
30 primary infection. TB of the sternum is an exceedingly rare manifestation of extrapulmonary TB  
31 representing less than 2% of all osteomyelitis[1] and 2% to 3% of osteoarticular TB[2]. The  
32 diagnostic and medical management of patients with sternal TB is challenging because of its  
33 rarity and lack of awareness, as well as the clinical presentation of lesions with nonspecific signs  
34 and symptoms that may suggest chronic osteomyelitis, malignancy, and other similar disorders,  
35 hence the importance of microbiological diagnosis, which offers greater sensitivity than both  
36 medical imaging technology and the tuberculin skin test (TST).

37 **Objective :**

38 We report a case of multifocal TB in an immunocompetent child.

39 **Case presentation:**

40 The patient was 14 years old and had been vaccinated with BCG, with a previous episode of  
41 tuberculosis exposure. The history of the disease dates back to 4 months with the installation of  
42 a chest pain of burning sensation radiating towards the shoulders, then the appearance after one  
43 month of a palpable swelling of about 4 cm in size at the level of the upper part of the sternum  
44 evolving in a context of apyrexia, asthenia with night perspiration and a weight loss of 3 kg  
45 (figure 1).

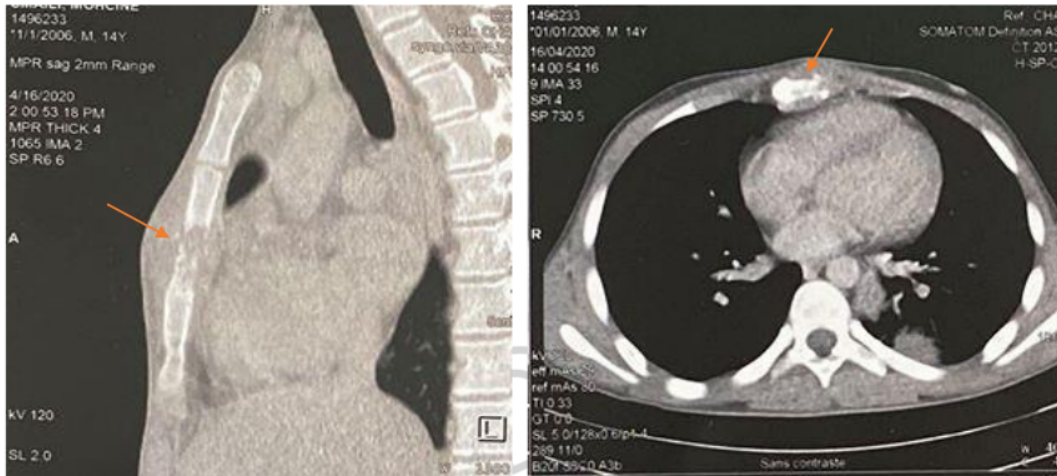


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**Figure 1 : Lateral view of the sternal swelling**

48 The chest X-ray showed a systematized heterogeneous opacity on the left medio-thoracic side,  
49 while the computer tomography (CT) scan showed a osseous lysis of the sternal body with  
50 infiltration of the soft tissues, a systematized pulmonary condensation on the left side associated  
51 with medio-thoracic mediastinal adenopathies and a splenomegaly with a hypodense intra-  
52 splenic image (figure 2). Further clinical examination was unremarkable.

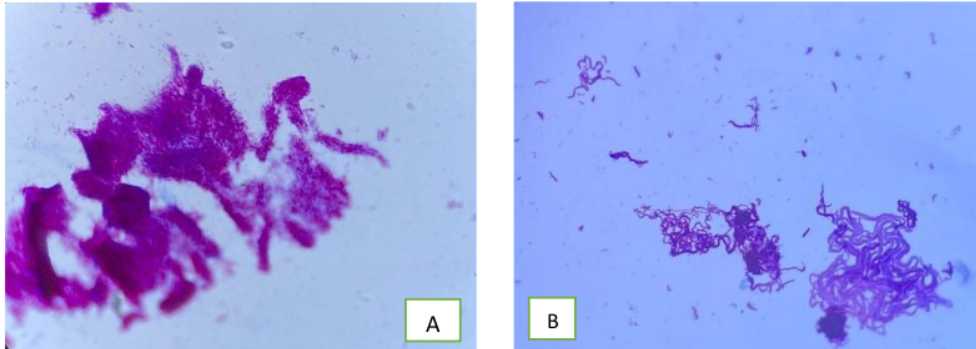


53  
54 **Figure 2 : Chest CT scan showing an osteolytic tissue mass centered on the sternum (left:**  
55 **axial section / right: sagittal section)**

56 The initial biological tests showed a hyperleukocytosis (17.6.103/mm<sup>3</sup>) with a predominance of  
57 neutrophils (7900), a microcytic hypochromic anemia (Hb=10.9) and thrombocytosis (PLQ=  
58 500000). The CRP was 85.1mg/l associated with a disturbance of the hepatic balance owing to  
59 hepatic cytolysis with ALAT=112 IU/L and ASAT = 120 IU/L.

60 Bacteriological examination of the surgical sternal biopsy and respiratory specimens did not  
61 show Acid-fast bacillus (AFB) on direct examination by auramine and Ziehl-Neelsen staining,  
62 whereas RT-PCR performed with the GeneXpert-Cepheid® automated system detected the  
63 presence of Mycobacterium tuberculosis complex at very low level without detection of  
64 rifampicin resistance genes. The culture of the biopsy was positive after 6 days on the liquid

65 medium MGIT (mycobacterial growth indicator tube) (figure 3-A) and 19 days on the solid  
66 medium LJ (Lowenstein-Jensen) (figure 3-B).



67 **Figure 3 : Appearance of bacilli after ziehl-neelsen staining from colonies of solid medium**  
68 **(A) and liquid medium (B)**



69 **Figure 4 : LJ medium showing colored colonies of 3-4 mm diameter with a cauliflower like**  
70 **appearance and adherent to the medium**

71 In the light of the bacteriological and radiological results, multifocal tuberculosis was retained  
72 as the diagnosis and an antitubercular medication was initiated as indicated by the national TB  
73 prevention and control program (PNLAT) with the use of rifampicin, isoniazid, pyrazinamide  
74 and ethambutol under the protocol 2(RHZE) /10 (RH).

75 During his hospitalization, the patient presented intermittent back pain of mechanical character  
76 without limitation of the vertebral joints nor impotence with a completely normal neurological  
77 examination. A CT scan of the cervical-dorsal-lumbar spine was performed and revealed



78 multifocal spinal bone affection involving the spinous process of C7, transverse process and  
79 posterior arch of D6 filling the right foramen and the left costo-vertebral joint of D11. The  
80 clinicobiological improvement was marked by a progressive resolution of the swelling, an  
81 apyretic state with weight gain and a decrease in hepatic cytolysis.

82 **Discussion :**

83 TB remains <sup>12</sup> an important global cause of morbidity and mortality, particularly in developing  
84 regions. In Morocco, 29,327 patients have been diagnosed with TB and putted on antitubercular  
85 drugs in 2021, within the framework of the PNLAT with an estimated 34% decrease in the  
86 incidence of the disease and a 68% decrease in mortality over the last 30 years, with therapeutic  
87 success rates maintained at over 85%. [3]

88 TB infection of flat bones remains rare even in endemic countries and sternal localization has an  
89 incidence of only about 2 to 3% of cases of osteoarticular tuberculosis [2] and remains  
90 exceptional in children [4][5]. It occurs most often after cardiac surgery, BCG vaccination, or in  
91 association with thalassemia, miliary tuberculosis and immunosuppression [6]. It can also result  
92 from direct extension from mediastinal adenopathies [7] that are supposed to be the consequence  
93 of bacillary spread by contiguity from intrathoracic lymphatics during a primary tuberculosis  
94 infection with a pulmonary origin, which seems to be the case of our patient.

95 A meta-analysis conducted by Shi-Min Yuan of articles published between 2000 and 2013  
96 showed isolated TB of the sternum was observed in 96 patients (60.4%), association of sternal  
97 TB with the invasion of peritonsillar tissue (joints, cartilage, and muscles) in 32 patients  
98 (20.1%), and a multifocal TB 31 patients (19.5%) [8].

99 The occurrence of radiological signs happens after a considerable delay compared to the clinical  
100 manifestations like <sup>6</sup> abscesses or sinuses that appear much before the focus is found [9]., the  
101 symptoms vary according to the progression of the osteomyelitis, however, tuberculous sternal

102 osteitis presents as a painful swelling of the anterior chest wall overlying the sternum with  
103 general signs such as fever, weight loss and anorexia.  
104 The discovery of the disease is often made at a later stage of complications such as a sternal  
105 fracture, which was not the case in our patient who only presented osseous lysis of the sternal  
106 body with minimal symptoms evolving for 4 months before hospitalization.  
107 An increase of total white blood cells or other inflammatory markers including erythrocyte  
108 sedimentation rate and CRP are neither specific nor completely accurate, whereas chest film  
109 didn't reveal any abnormalities in about 70% of patients[10].  
110 The diagnosis of sternal tuberculosis relies in part on imaging, especially thoracic CT, which  
111 often shows a lytic lesion of the sternal body, surrounded by a tissue mass that invades the soft  
112 tissue externally and/or mediastinal structures internally[11]. In the case we report, the thoracic  
113 CT scan clearly characterized the extension of the bone destruction and the involvement of the  
114 soft tissues located opposite, which manifested as a hypodense lytic process, however , the  
115 diagnosis remains challenging due to the absence of other pulmonary or extra-pulmonary  
116 injuries evocative of TB, besides the fact that other diseases may have the same radiological and  
117 clinical features like chronic pyogenic osteomyelitis, tumors, or blood disorders[12].  
118 Therefore, a surgical or an ultrasound-guided biopsy is required in most cases to provide a  
119 diagnosis using microbiological and histological methods when radiological findings dont allow  
120 to determine <sup>2</sup>the cause of osteomyelitis specially when the lesions grossly emulate pyogenic  
121 abscess or neoplasm[13] [14].  
122 In our case the PCR performed on surgical sternal biopsy and respiratory specimens, which has  
123 been reported to be used for the diagnosis of bone tuberculosis with a sensitivity of 85% and a  
124 specificity of 80%[15], was the fastest and most sensitive examination to confirm the diagnosis  
125 of sternal tuberculosis from surgical sternal biopsy and respiratory specimens.

126 **Conclusion :**

127 TB does not always appear with typical pulmonary manifestations in children. The possibility of  
128 sternal tuberculosis, which is extremely rare, must be considered in any patient presenting a  
129 sternal swelling or abscess and the awareness of clinicians, specially in underdeveloped countries  
130 where the TB is endemic, of atypical clinical presentations of this deadly infection can help  
131 improve the medical management of the patients.

132 **Conflicts of interest :**

133 The authors declare that there are no conflicts of interest.

134 **Author contributions :**

135 **Elmostafa Benaissa:**

136 **Methodology-ID :** f21e2be9-4e38-4ab7-8691-d6f72d5d5843

137 **Supervision-ID :** 0c8ca7d4-06ad-4527-9cea-a8801fcb8746

138 **Abdelilah Radi:**

139 **Investigation-ID:** 2451924d-425e-4778-9f4c-36c848ca70c2

140 **Amal EL Hassani:**

141 **Investigation-ID:** 2451924d-425e-4778-9f4c-36c848ca70c2

142 **Rachid Abilkassem:**

143 **Investigation-ID:** 2451924d-425e-4778-9f4c-36c848ca70c2

144 **Aomar Agad:**

145 **Investigation-ID:** 2451924d-425e-4778-9f4c-36c848ca70c2

146 **Elmostafa Elouennass:**

147 **Conceptualization-ID :** 8b73531f-db56-4914-9502-4cc4d4d8ed73

148 **Supervision-ID :** 0c8ca7d4-06ad-4527-9cea-a8801fcb8746

149 **Validation-ID :** 4b1bf348-faf2-4fc4-bd66-4cd3a84b9d44

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Figure 2 : Chest CT scan showing an osteolytic tissue mass centered on the sternum (axial section)

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Figure 4 : LJ medium showing colored colonies of 3-4 mm diameter with a cauliflower like appearance and adherent to the

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