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Osteomyelitis of the Rib in a Child With Indolent Symptoms

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Abstract

We describe a case of osteomyelitis of the rib caused by methicillin-susceptible *Staphylococcus aureus*. The patient presented with a subtle, indolent course leading to a suspected 2-year delay in diagnosis. This case highlights that the diagnosis of rib osteomyelitis, which can readily mimic other diagnoses, such as costochondritis, intraabdominal infections, pneumonia, or malignancies warrants a high index of suspicion. Albeit rare, pediatricians should be aware of the possibility of rib osteomyelitis in healthy children to help ensure a prompt diagnosis and appropriate, timely management.

Keywords

Staphylococcus aureus, MSSA, osteomyelitis, rib

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Osteomyelitis is a common invasive infection in the pediatric population, occurring in approximately 8 of 100 000 children per year.[1] In children, most cases of acute osteomyelitis are hematogenous in origin,[2] with a predilection of the long bones of the extremities. Osteomyelitis of the rib is extremely rare, making up less than 1% of all cases of acute osteomyelitis in children.[2] Early signs of osteomyelitis of the rib are often subtle and indolent.[3] This, paired with the rarity of the condition, often lead to a delay in diagnosis and management. Consistent with other foci of pediatric acute hematogenous osteomyelitis, Staphylococcus aureus is the most pathogen responsible for rib osteomyelitis,[2,3] although atypical pathogens may also be implicated.[3] *Staphylococcus aureus* We report the case of a 9-year-old male with several months of intermittent symptoms who was ultimately diagnosed with methicillin-susceptible (MSSA) osteomyelitis of the rib, by microbiologic growth and histopathology of the hemiresected rib. Written informed consent was obtained from the parent of the patient.

Patient Presentation

A 9-year-old Caucasian male with a history of allergic rhinitis and reactive airway disease presented to a local emergency department with a 1-day history of fever (38.3°C) and right upper quadrant abdominal pain. He did not have cough, nausea, vomiting, or diarrhea. On arrival to the emergency department, he was febrile to 38.1°C with a heart rate of 113 beats per minute, respiratory rate of 20 breaths per minute, blood pressure of 110/62, and oxygen saturation of 98% on room air. On physical examination, he was well appearing. His examination was significant for a soft abdomen with right upper quadrant tenderness to palpation and normal bowel sounds. The rest of his evaluation was unremarkable. Laboratory workup revealed a complete blood cell count with white blood cell (WBC) count of 16 200/mm^3 with 80% neutrophil predominance, a platelet count of 256 000/mm^3. A chest radiograph was read as slightly prominent perihilar linear markings and mild peribronchial cuffing. A computed topography (CT) abdomen was read as no acute abdominopelvic abnormality and no aggressive osseous lesions were noted. He was discharged with supportive care recommendations. He continued to have fever overnight (38.9°C) and experienced non-localized abdominal pain that woke him from sleep.

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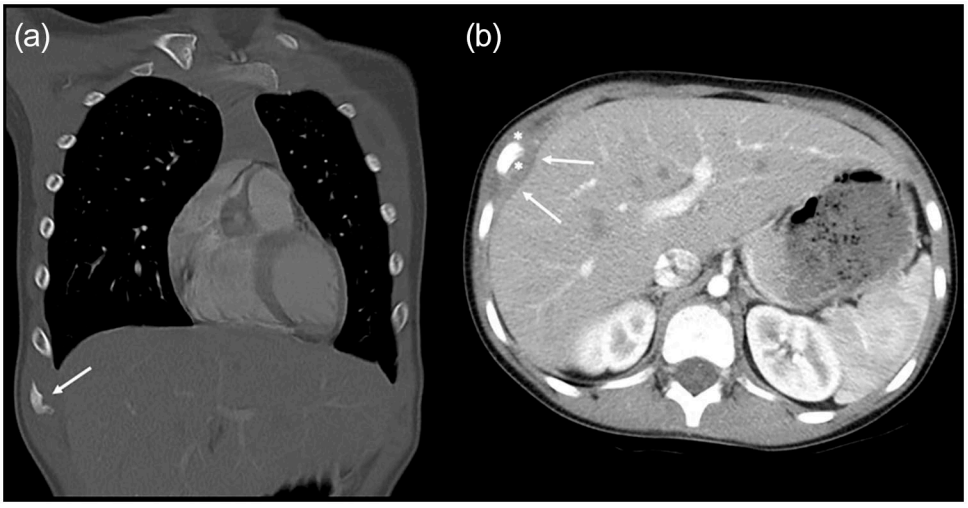

Figure 1. Coronal reformatted image of the chest in bone window (Figure 1a) demonstrates sclerosis and irregularity of the anterior aspect of the right eighth rib (arrow). Axial image of the upper abdomen in soft tissue window (Figure 1b) demonstrates ill-defined soft tissue fullness surrounding the tip of the eighth rib (asterisks) and mild mass effect on the adjacent right hepatic lobe (arrows).

He was evaluated by his primary care physician the following day, where he was afebrile. He had an unremarkable physical examination. Repeat bloodwork was obtained, revealing a WBC of 10 300/mm^3 and a platelet count of 160 000/mm^3. His fever resolved that day. However, over the course of the following 2 years, the child complained of intermittent pain along his right rib cage. This pain occurred 2 to 3 times a week, the duration of which was minutes and was generally self-limited, though he occasionally required analgesic medication. The frequency of his pain was 2 to 3 times a week. Although he played competitive football, he did not note any relation of his pain to activity or exertion. He did not have any history of penetrating trauma. He did not have an associated cough. Throughout this 2-year course, he received antibiotics for various reasons: 2 months after his initial presentation, he completed a 10-day course of amoxicillin for acute otitis media; 9 months after his initial presentation, he completed a 10-day course of cefdinir for acute otitis media and 11 months after his initial presentation, he completed a 5-day course of azithromycin for Streptococcal pharyngitis. It was greater than 2 years after his initial presentation with right upper abdominal pain that the frequency and intensity of his pain increased, and the child was noted to have a mass on the right side of his chest. Laboratory evaluation revealed WBC of 9300/mm^3 and a platelet count of 160 000/mm^3. A CT with contrast of the chest was noted to have irregularity and sclerosis in the distal anterior aspect of the right 8 rib with a surrounding ill-defined soft tissue fullness and mild mass effect on the adjacent right hepatic lobe, without evidence of pulmonary infiltrate, pleural effusion, or empyema (Figure 1).

Diagnosis and Outcome

The child underwent an interventional radiology-guided biopsy of the right chest wall mass, the results of which were inconclusive. Histopathology findings were benign, but non-specific, revealing fibrotic/sclerotic tissue with foci of mixed acute, chronic, and eosinophilic inflammation and associated injured-appearing myofibers with interstitial fibrosis. A decision was made to excise the mass. Intraoperative findings were significant for an inflammatory reaction around the rib in question with necrotic tissue deep to the rib that did not extend to the peritoneal or thoracic cavities. A specimen from this necrotic tissue was sent for aerobic, anaerobic, fungal, and acid-fast bacilli (AFB) cultures. The resected rib was sent for histological examination. Aerobic wound culture grew few methicillin-sensitive *Staphylococcus aureus*. Anaerobic, fungal and AFB cultures remained negative. He was started on cephalexin 50 mg/kg/dose by mouth every 8 hours. At that time his C-reactive protein (CRP) was normal (<4 mg/l) and erythrocyte sedimentation rate (ESR) was mildly elevated at 13 mm/hour (0-10 mm/hour). His biopsy returned soon thereafter, confirming the diagnosis of acute and chronic

osteomyelitis of the rib with periosteal abscess. He recovered well and competed a 3-month course of cephalexin.

Discussion

Osteomyelitis of the rib is extremely rare, making up less than 1% of all cases of pediatric acute osteomyelitis.[2,3] The primary pathogenesis in pediatric patients with acute osteomyelitis is hematogenous spread.[2] This is the likely mechanism of infection in our otherwise healthy patient. Although he is a football player, he did not have a history of penetrating trauma, nor of a known contiguous infection, such as pneumonia or empyema.

Osteomyelitis of the rib is similar in several ways, to the more frequently encountered sites of acute hematogenous osteomyelitis. Firstly, hematogenous osteomyelitis favors the region of the bone with the richest blood supply.[2] In the rib, this is the anterior aspect of the rib near the costochondral angle[3,4] and is the most commonly affected region in rib osteomyelitis. Secondly, as is the case with common sites of acute hematogenous osteomyelitis, osteomyelitis of the rib is most commonly due to *Staphylococcus aureus*.[3-10] Other reported causes of hematogenous-borne rib osteomyelitis have included *Streptococcus pneumoniae* and *Streptococcus pyogenes*. *Bartonella henselae*.[4,11-13] *Mycobacterium tuberculosis* and fungal etiologies have also been implicated in hematogenous rib osteomyelitis[14-17] and although rare, may be considered in the presence of the appropriate risk factors. Thirdly, the clinical presentation includes fever accompanied by pain at the site of infection; in the case of rib involvement, this may present as chest pain or back pain,[3] depending on the area of the rib that is the focus of infection. In the case of lower rib involvement, children may also present with abdominal pain,[3,10] as appears to have been the case with our patient.

Osteomyelitis of the rib is a challenging diagnosis due to its low incidence, indolent course, and challenge differentiating from other processes.[10] As was the case with our patient, a delayed diagnosis may lead to children presenting at a later stage of disease progression, often with complications such as an abscess and necrosis or sequelae of chronic osteomyelitis, such as a draining sinus.[3,10] In retrospect, it is suspected that our patient had symptoms lasting greater than 2 years. This is consistent with cases reported in the literature, with symptoms often exceeding 6 months duration, up to 3 years.[3]

Being a rare entity, appropriate imaging, in addition to a thorough history and physical examination, are vital in the timely diagnosis of rib osteomyelitis. As is the case for osteomyelitis in general, magnetic resonance imaging (MRI) is the imaging modality of choice.[2,3,10] In a case series where 8 children with rib osteomyelitis underwent either CT or MRI, MRI demonstrated rib abnormality in all studies, while rib abnormality was demonstrated in 50% of CT studies. Furthermore, a diagnosis of osteomyelitis was noted by the radiologist in all but one of the MRI studies.[10] The gold standard in diagnosis of rib osteomyelitis requires histopathology, bone culture, or blood culture.[3] Due to the differential diagnoses involving oncologic processes and due to the need for surgical debridement as a result of delayed onset and progression of infection, many reported cases undergo biopsy or resection. (reference) Empiric antimicrobial therapy should cover Staphylococcus aureus-MSSA or methicillin-resistant Staphylococcus aureus (MRSA), depending on local antibiogram patterns. Unlike other foci of acute hematogenous osteomyelitis, almost all reported cases of rib osteomyelitis have involved surgical management, for diagnostic and therapeutic purposes. In a case series of rib osteomyelitis, 85% (46 of 54) underwent surgical management, including drainage of subperiosteal abscess, with or without resection of the rib.[3] Surgical debridement may be required for optimal source control in cases of rib osteomyelitis that are associated with a contiguous infection, direct inoculation or has progressed to chronic osteomyelitis.[18]

In conclusion, albeit rare, pediatricians should be aware of the possibility of rib osteomyelitis in healthy children to help ensure a prompt diagnosis and timely management, leading to superior prognosis.

Author Contributions

Drs. Balamohan and Buchmann made substantial contribution to the concept of the work. Dr. Balamohan drafted and Dr. Buchmann reviewed and revised the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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