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Acute Clavicular Osteomyelitis: A Rare Site of Bone Infection in Children

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Abstract **Case Report**

Acute osteomyelitis of the clavicle is often caused by Staphylococcus aureus, primarily in older children. It is a rare condition frequently confused with other diagnoses. We report a case of clavicular osteomyelitis in a 2-year-old infant. Clinical suspicion arose due to painful right shoulder syndrome with functional impairment of the upper limb, accompanied by fever. Standard radiography was normal, but ultrasound and shoulder computed tomography revealed a juxta-osseous collection extending along the internal two-thirds and lower aspects of the right clavicle. Urgent surgical drainage was performed with appropriate antibiotic therapy. Culture did not isolate a pathogen. The patient's condition improved significantly over a two-year follow-up period.

Keywords: Acute osteomyelitis; clavicle; Staphylococcus aureus; Child; Surgery.

INTRODUCTION

Osteomyelitis is a hematogenous infection of the bone that typically affects the metaphysis of long bones; its diagnosis in children is generally straightforward; clavicular involvement is rare, its frequency estimated at 1 to 3% of all cases of osteomyelitis in children; early diagnosis is challenging and is often delayed [1].

Here, we present a case study of clavicular osteomyelitis in a 2-year-old infant and we discuss its clinical, radiological, and evolutionary aspects.

OBSERVATION

This 2-year-old infant was referred to our department due to a painful syndrome in the right shoulder with functional impairment of the upper limb, evolving in a febrile context for 4 days. Upon admission, physical examination revealed a fever of 39°C, an anterior swelling over the clavicle, firm in consistency, measuring 5 cm/4 cm, fixed, tender to palpation, with local inflammatory signs. The rest of the orthopedic examination was unremarkable. Paraclinical examinations revealed a biological inflammatory syndrome with a CRP of 400 mg/L and a leukocyte count of 18,000 cells/mm3.

The shoulder X-ray initially appeared normal, except for soft tissue opacity in the area (Figure 1). On ultrasound, there was significant infiltration of the soft tissues in the supraclavicular region, associated with several small fluid collections at this level, the largest measuring 12 x 05 mm in diameter. No effusion was observed in the right glenohumeral joint. This appearance strongly suggested a subperiosteal clavicular abscess, with significant infiltration of the anterosuperior thoracic wall, right lateral cervical, and upper mediastinal areas on CT scan. A hypodense juxta-osseous collection was noted, extending along the inner two-thirds and lower surfaces of the right clavicle, with hypodense contents and a thin wall enhanced after contrast injection, spanning approximately 40 mm and reaching a maximum thickness of 05 mm posteriorly (Figure 2 and 3).

A direct surgical approach allowed for the evacuation of the purulent collection. Culture yielded negative results for bacterial growth. Intravenous antibiotic therapy was initiated, consisting of ceftriaxone and gentamicin for 10 days, followed by oral cefixime for three months. The patient's condition improved with regression of clinical symptoms, restoration of normal limb function, and normalization of C-reactive protein (CRP) levels within the first week.

Figure 1: Chest X-ray showing soft tissue opacity over the right clavicle

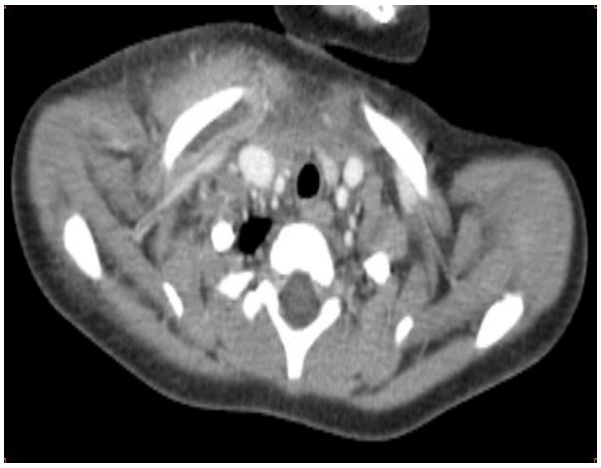

Figure 2: Thoracic CT scan in axial section demonstrating a hypodense juxta-osseous collection extending along the inner two-thirds and lower surfaces of the right clavicle, with hypodense contents, a thin wall enhanced after injection of contrast material, spanning approximately 40 mm, and reaching a maximum thickness of 05 mm posteriorly

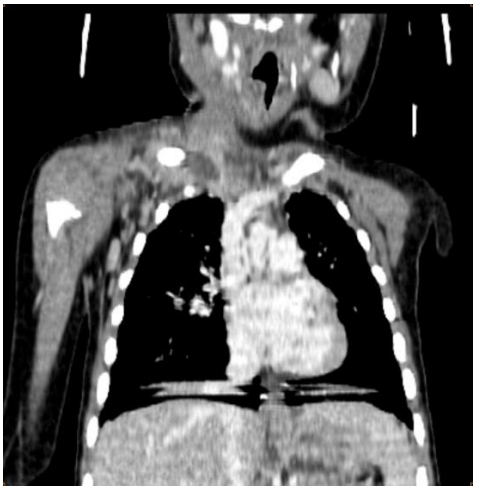

Figure 3: Thoracic CT scan in coronal section depicting a hypodense juxta-osseous collection extending along the inner two-thirds and lower surfaces of the right clavicle, with hypodense contents, a thin wall enhanced after injection of contrast material, spanning approximately 40 mm, and reaching a maximum thickness of 05 mm posteriorly

DISCUSSION

Non-traumatic lesions of the clavicle are uncommon, with infectious involvement accounting for 37.5% of these lesions [2]. Acute clavicular osteomyelitis is rare, with an incidence ranging from 0% in the general population [3] to 7% in the pediatric population [4]. It tends to affect older children, and its diagnosis is often misleading [1]. An adjacent joint, most commonly the sternoclavicular joint, is also frequently involved [5].

Its usual location is the middle third, in advanced forms during adolescence, the location tends to be more towards the inner third [6]; the infection is generally of hematogenous origin, less commonly by contiguity; clavicular osteomyelitis is often secondary to catheterization of the subclavian vein or surgical procedures in the head or neck region [7], particularly in the context of chronic multifocal osteomyelitis; an immunocompromised state may predispose to its occurrence.

Staphylococcus aureus is the predominant causative agent in clavicular infections, accounting for 60% of cases [8]. These infections can also be caused by hemolytic streptococci type 3, a mixed flora including Bacteroides fragilis and Pseudomonas aeruginosa, Propionibacterium acnes, Serratia marcescens, Treponema pallidum (syphilis), Mycobacterium tuberculosis, and fungi, as reported in the literature [5].

The rarity of clavicular localization and the rapid progression of this osteomyelitis (thinness of the clavicular periosteum) explain the difficulty in establishing an early diagnosis. The typical clinical

presentation includes swelling over the clavicle, pain, and redness [5, 9]. Initially, functional impairment of the upper limb may be the sole sign, which can lead to diagnostic confusion; this pain-avoiding posture has been well described by Andersen et al. [10] as the "Waiter's tip" posture.

Radiological signs typically appear with a delay, with bone destruction becoming evident only after 2 to 4 weeks of progression. This osteolysis is surrounded by a thin periosteal reaction [1]. Ultrasound is highly sensitive for diagnosing infectious fluid collections and joint effusions, offering the possibility of fine needle aspiration to confirm the infectious nature of a fluid collection without unnecessary contamination of adjacent anatomical compartments [8]. MRI remains the most appropriate method for evaluating bone marrow changes; it can detect osteomyelitis with a sensitivity of 82 to 100% and a specificity of 75 to 95% [8]. It is also useful for assessing complications such as abscesses, joint effusions, and extensions into soft tissues [8]. Computed tomography (CT) shows bone destruction and detects complications such as abscesses, fistulas, or sequestrum formation. When comparing the two methods, MRI has a significant advantage over CT in terms of soft tissue involvement [8].

Marked leukocyte scintigraphy can assist in early diagnosis, evaluation, and monitoring of treatment response; technetium scintigraphy is valuable for detecting multifocal osteomyelitis, with a sensitivity of 84 to 100% [1]. This examination becomes abnormal within hours or days after the onset of a bone infection, which is several days to weeks before radiological signs appear on standard radiographs [11, 12]. Combined scintigraphy using both technetium-99m phosphate and gallium-67 citrate in the same patient can provide more valuable information than using either tracer alone [11]. Active disease at a particular site, for example, is indicated when the activity observed on gallium scintigraphy exceeds that observed on technetium scintigraphy [13]. Even higher specificity for osteomyelitis can be achieved with scintigraphy using indium-I 11 labeled leukocytes [5]. As the success of this technique depends on the migration of a large number of leukocytes to the site of infection, positive indium scintigraphies are more likely in acute osteomyelitis than in chronic stages of the disease [5].

The rarity of acute clavicular osteomyelitis and its clinical similarity to trauma often lead to misdiagnosis. When a patient presents with acute focal pain and swelling in the clavicle, differential diagnoses to consider include fracture, cellulitis, soft tissue abscess, pyarthrosis, rheumatoid arthritis, and acute rheumatic fever [4]. In infants, Caffey's disease should be included in the differential diagnosis [14].

The differential diagnosis of chronic osteomyelitis should consider sternoclavicular arthritis, ischemic necrosis, brown tumor of hyperparathyroidism, developmental anomalies, condensing osteitis, and tumor-like conditions such as eosinophilic granuloma, aneurysmal bone cyst, hemangioma, and osteoid osteoma. Due to its prevalence in children, Ewing's sarcoma should always be considered when a child presents with local pain, swelling, fever, or leukocytosis [5].

Developmental abnormalities of the clavicle, such as pseudarthrosis and synovial cysts, may present clinically as a focal mass or deformity associated with focal destruction of the clavicle. However, pain is typically absent. These abnormalities are primarily discovered during childhood (average age of 2.4 years) [5].

In geographic regions where fungal diseases are endemic, symmetric lesions may suggest skeletal coccidioidomycosis, which is typically associated with cutaneous or pulmonary lesions [15]. Symmetric involvement is sometimes observed in cases of tuberculosis and congenital syphilis as well.

Clinical history and laboratory findings should help clarify the differential diagnosis of these conditions. Radiographic findings of clavicular osteomyelitis often do not suffice for diagnosis, and patients may require a biopsy [5] to rule out malignant tumor pathology [1].

The treatment relies on appropriate antibiotic therapy combined with drainage of the collection and curettage of the osteal lesions with biopsy to rule out malignant tumor pathology [1].

Isolating the etiological organism remains the gold standard for diagnosis and constitutes the only means of establishing a definitive microbiological diagnosis [16, 17]. When the causative agent is identified, empirical antimicrobial treatment should be adjusted. Antibiotics that have proven efficacy against S. aureus bone and joint infections include anti-staphylococcal penicillins, clindamycin, first-generation cephalosporins, and vancomycin [18, 17]. The standard treatment for acute hematogenous osteomyelitis varies from 4 to 6 weeks [19], with a median duration of 7.5 weeks. CRP levels typically normalize within the week following appropriate treatment and are often used as a marker for transitioning from parenteral to oral therapy [18]. The oral antibiotic should demonstrate adequate bone penetration and have a similar antibacterial spectrum and activity to the parenteral medication [20].

CONCLUSION

Acute clavicular osteomyelitis is often caused by Staphylococcus aureus, primarily in older children. It is a rare condition, and confusion with other diagnoses is common; however, the consequences of delayed diagnosis and treatment can be disastrous in many cases. MRI allows for rapid localization of the infection.

Treatment relies on appropriate antibiotic therapy combined with drainage of the collection and curettage of the osteal lesions with biopsy to rule out malignant tumor pathology, with favorable outcomes in many cases.

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