Brodie abscess in the clavicle: an uncommon presentation

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ABSTRACT

Osteomyelitis is defined as an inflammation of the bone caused by infection. Acute osteomyelitis is common in pediatrics. A Brodie abscess is a type of subacute osteomyelitis, with a historically low incidence; however, its incidence is currently increasing.

Given its little clinical impact, with non-specific laboratory tests and radiological studies of difficult interpretation, diagnostic suspicion is crucial. It resembles neoplasms, either benign or malignant. An adequate diagnosis falls on the health care provider's experience.

Treatment consists of antibiotics, both parenteral and oral, with potential surgical drainage.

Here we describe the case of a healthy female patient with a tumor found in the topography of the left clavicle 3 months before. She was diagnosed with Brodie abscess; treatment was started with a good response.

A high index of suspicion of Brodie abscess is critical to avoid invasive tests and studies or inadequate treatments, and to prevent future sequelae.

Keywords: Brodie abscess; acute osteomyelitis; abscess; pediatrics.

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INTRODUCTION

Acute osteoarticular infections are uncommon in pediatrics, between 10 and 80 per 100 000 children. Osteomyelitis (OM) is a bone infection and is the most frequent form of osteoarticular infection in childhood. There are 3 subtypes of OM, depending on its duration: acute (less than 2 weeks), subacute (between 2 weeks and 3 months), and chronic (more than 3 months); according to its pathogenesis, OM may be disseminated by hematogenous route, by direct inoculation, or from a contiguous site. In the pediatric population, acute OM is the most common type observed and the hematogenous route is the main form of dissemination, which determines the type of causative agent involved.^{1–3}

The typical symptoms include pain, erythema and edema of the affected area, and undefined and non-specific signs, which may be caused by a wide variety of conditions.

Several microorganisms may be involved, but the most frequent causative agent, common in all age groups, is *Staphylococcus aureus* (SA).

Diagnosis and treatment are important to prevent complications and reduce the associated

morbidity.

Brodie abscess (BA) is a type of subacute, hematogenous, abscessed, localized OM, with suppurative necrosis and surrounded by granulation tissue. It was first described in 1832 by Benjamin Brodie. The onset of symptoms is insidious due to the low systemic inflammatory response it causes, as it is encapsulated.^{4,5}

CASE REPORT

A previously healthy 11-year-old adolescent girl consulted for a tumor in the left clavicle for the past 3 months, characterized by pain and an increase in size in the 72 hours prior to consultation. She had received antibiotics on 2 occasions, but did not respond adequately.

At the consultation, she provided a computed tomography (CT) without contrast, performed in another facility, which showed axillary lymphadenopathies of normal size without any other relevant data.

During history taking, it was observed that the patient did aerial silks as a sports activity and had experienced mild trauma prior to the onset of this lesion 4 months before.



FIGURE 1. Chest teleradiograph

Widening is observed at the level of the proximal third of the left clavicle with radiolucent images inside.

On physical examination, a fixed, tender, erythematous area of induration measuring 2 cm x 2 cm was observed on the proximal third of the left clavicle, with no other positive findings.

In this context, the chest X-ray showed a radiolucent image in the clavicle (*Figure 1*); the soft tissue chest ultrasound showed an abscessed collection in the left sternocleidomastoid muscle in close contact with the left clavicle, which measured approximately 2.7 cm x 1.9 cm x 1.6 cm (L x T x AP). Two blood cultures were negative. The laboratory tests showed increased acute phase reactants (erythrocyte sedimentation rate and C-reactive protein).

Due to epidemiology and given the characteristics of the lesion with little systemic impact and a prolonged course, the patient was tested for tuberculosis, which was negative.

The magnetic resonance imaging (MRI) of the neck showed the characteristic findings of osteomyelitis associated with soft tissue purulent collection. A possible bacterial or mycobacterial origin was suspected (*Figure 2*).

A surgical debridement was performed. The specimens were sent for culture and pathological examination. Treatment with vancomycin was started. At 24 hours, the development of methicillin-sensitive *S. aureus* (MSSA) was reported; antibiotics were changed to cephalothin 100 mg/kg/day.

During hospitalization, a new surgical debridement was necessary due to local worsening of clinical signs. The patient completed parenteral antibiotics for 14 days with improved clinical and laboratory parameters and she was discharged from the hospital with cephalexin 100 mg/kg/day for a prolonged period of time. After completing 6 months of oral treatment, her clinical course was good.

DISCUSSION

Although the acute forms of OM are the most common in the pediatric age group, subacute variants are currently increasing. It is believed that this may be due to a greater host resistance, a lower microorganism virulence, or previous exposure to antibiotics, which causes the infection to be limited to the bone.⁴

As the most frequent route of dissemination is hematogenous, the most affected part of the bone is the metaphysis, as it is more vascularized. This is where the inflammation occurs, which causes bone destruction and pus collection. With an insidious course, new bone is synthesized surrounding the infection (involucrum). If a fistula occurs in the affected bone, which may drain to underlying structures, vascularization is interrupted and necrosis develops, which leads to what is known as bone sequestration.

The increase in intraosseous pressure, secondary to this process, may cause disruption of the cortical bone, draining material and forming subperiosteal abscesses, more commonly in the pediatric population because the cortical bone breaks easily and the periosteum is deformable.

In relation to microorganisms involved, the most frequent causative agent, common in all age groups, is *Staphylococcus aureus* (SA). Other bacteria involved include group B *Streptococcus*, *Haemophilus influenzae*, *Kingella kingae* (in children aged 1 to 4 years), *Escherichia coli*, *Pseudomonas*, and other gram-negative bacteria. In adolescents, *Neisseria gonorrhoeae* should also be taken into account. Another causative agent to be considered in our setting is *Mycobacterium tuberculosis*.^{1,2,4,5}

A Brodie abscess is a form of subacute OM with little clinical systemic impact. It is difficult to diagnose and may be confused with other conditions. It affects the metaphyses of the long bones, mainly the tibia, and is extremely uncommon in the clavicle; only few cases have been published.^{6,7}

Its characteristic clinical manifestations include pain, usually during the night, with little local reaction (erythema, edema). Blood cultures are generally negative and an increase in acute phase reactants is observed in the laboratory tests.

The X-ray shows a lytic image at the metaphyseal level, with a sclerotic rim. The MRI shows a characteristic sign in T1 sequences, called the *penumbra sign* (an area of moderate intensity surrounding a hypointense area— abscess—) which, although it may be observed in other conditions, contributes to the suspicion of Brodie abscess.⁸

The diagnosis is made based on clinical and imaging findings, and the histopathological examination helps to confirm it.

Based on clinical findings, imaging studies, and location, various differential diagnoses may be considered, such as a tumor (benign or malignant) or a non-tumor pathology, e.g., fracture, osteoid osteoma, eosinophilic granuloma, bone cyst, neuropathic arthropathy. When considering a neoplastic disease, secondary conditions or Ewing's sarcoma should also be taken into account.

Figure 2. Magnetic resonance imaging of the neck



The proximal third of the left clavicle is affected, associated with regional soft tissue involvement. The diameter of the medial two-thirds of the left clavicle is increased, with bone marrow signal enhancement in fluid-sensitive sequences, cortical irregularity, laminar periostitis, and enhanced subperiosteal laminar collection.

The treatment of a Brodie abscess consists of the sequential administration of parenteral antibiotics, followed by oral antibiotics. Surgery is also common to ensure drainage of the collections and thus improve the local environment to achieve a greater antibiotic effect. Surgery also allows to obtain specimens for cultures that will make it possible to adjust the treatment depending on the isolated microorganism.

It is necessary to consider a Brodie abscess in the differential diagnosis of bone lesions, especially in the case of atypical locations, to spare the patient unnecessary or inadequate procedures or treatments, and thus reduce the potentially associated morbidity and complications.

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