

Brodie's abscess in children: a challenging diagnostic

Mirta Mesquita*¹, Nancy Mitsui², Gloria Martínez³
^{1,2,3}Hospital Pediátrico Niños de Acosta Ñu, San Lorenzo

*Corresponding author

Mirta Mesquita

Email: mirtanmr@gmail.com

Abstract: Brodie's abscess is a localized form of sub acute osteomyelitis affecting children and young people. Most often it is found in the metaphysis of the long bones of the lower limbs. We report two cases of Brodie's abscess in school children. They are females with chronic lower limbs pain and CT images showing cystic and lytic lesions with sclerotic borders in the metaphysis of the tibia. Both patients received antibiotics and underwent surgery treatment. Curettage was done and thick purulent discharge was drained and cultured. The germs isolated were *Pseudomonas aeruginosa* in the first patient, who had favorable post discharge progression, and *Staphylococcus aureus* in the second case reported. This patient developed a chronic osteomyelitis. The Brodie's abscess diagnostic is very challenging because of the pathologies considered in the differential diagnosis include benign and malignant bone diseases.

Keywords: Brodie's abscess, subacute osteomyelitis, children.

INTRODUCTION

The classification between acute and chronic osteomyelitis is a temporary matter. Often the classification between subacute and chronic is a bit confusing. However most authors consider Brodie's abscess as a localized subacute osteomyelitis. Frequently it is found in the metaphysis of the long bones of the lower limbs, but flat and short bones, the diaphysis and the epiphysis also can be affected [1]. Its pathogenesis is attributed to an alteration in the host microorganism interaction. It appears as an increase of host resistance and a decrease in the virulence of bacteria that prevents the spread of the infection, which is limited to the bone [2]. Bone subacute bacterial involvement with torpid evolution as Brodie's abscess, may histopathology have a form of chronic osteomyelitis [3]. The multifocal involvement is rare and is usually associated with a deficiency of the immune system [4]. There is clinically bone pain in most cases with inflammatory characteristics and in some cases, functional impotence [2]. We present two cases of Brodie's abscess in girls which diagnosis was a challenge.

CASE PRESENTATION

Case 1

A 9 years old, female, presented to the pediatric emergency department, with a 28 days history

of joint pain in left knee. There was associated 18 days of fever and swelling in her left knee accompanied by inflammatory signs. She denies previous trauma.

On examination the left knee, swelling is observed, with tenderness, increase temperature of the area and limited movement. The erythrocyte sedimentation rate (ESR), leukocyte count and C-reactive protein were within normal limits. Plain radiograph, revealed a cystic image in the metaphysis of the tibia (Fig.1A). The knee computed tomography (CT) showed in the left tibial plate, a lytic lesion with sclerotic borders (Fig1B and 1C). The diagnosis proposed was osteoid osteoma vs subacute osteomyelitis. The patient was admitted to surgery, where curettage was done, purulent discharge was drained, and culture and biopsy was taken of the affected area. *Pseudomonas aeruginosa* was isolated from the purulent discharge. The biopsy report ruled out neoplastic process and supported Brodie's abscess diagnosis. The blood cultures returns sterile. The patient received antibiotic therapy with Ciprofloxacin and Amikacin according to the bacterial susceptibility. On the 12th days of hospitalization she was able to walk and on day 16th was discharged with a good post hospital release progression.

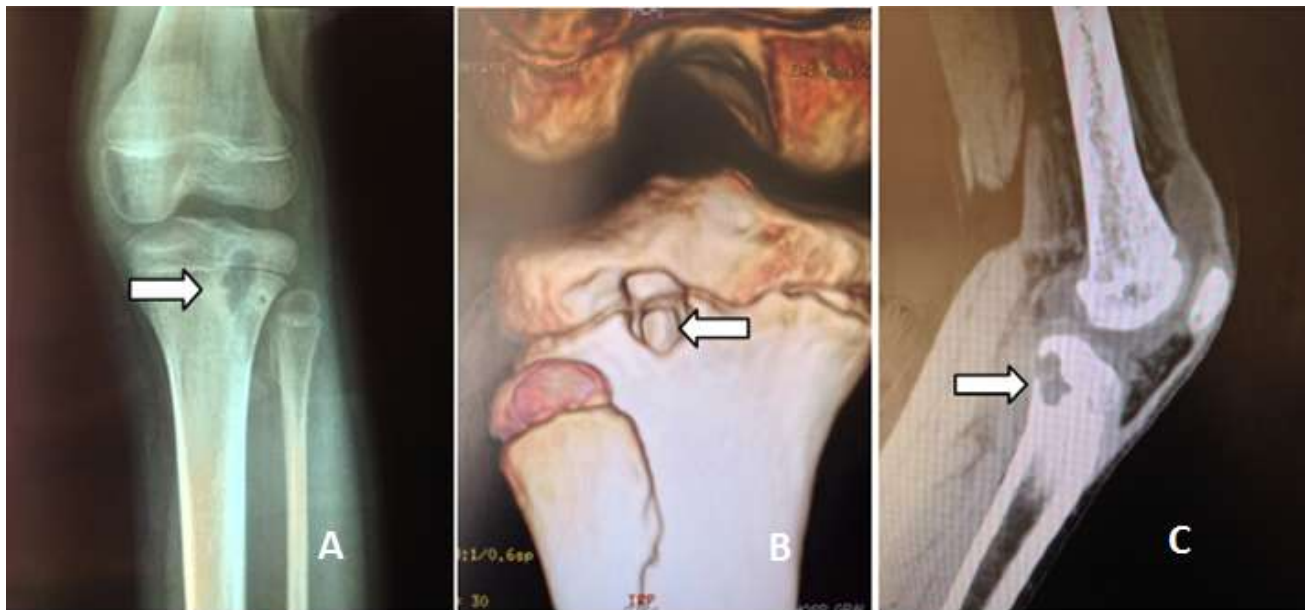


Fig.1A. The arrow indicates the lesion on plain radiograph of the left leg at the. **Fig. 1B.** and **Fig.1C.** show the CT image.

CASE2

An 11 year old, girl presented with a 4 week history of left leg pain, which is exacerbated by standing and walking. There was associated 7 kilograms of weight loss and fever 72 hours prior to hospital admission. She denied previous trauma.

Physical examination showed swelling in the upper third of the left leg, without inflammatory signs. It was painful on palpation. The leg x-ray image showed a cystic metaphysical tibia. (Fig-2A) .The CT of left leg showed lytic, delimited lesion with sclerotic borders. (Fig.i2 B) The blood count was normal. The CRP was positive and the ESR was 107 mm.

The differential diagnosis included sub acute osteomyelitis, osteoid osteoma and primary malignant tumor. The patient underwent surgery where purulent

discharge was drained, culture and biopsy of the lesion was taken. *Staphylococcus aureus* methicillin sensitive (SAMS) was isolated. The blood cultures returns sterile. Histological examination, ruled out neoplastic process and support Brodie’s abscess diagnosis.

The patient remained febrile in the first days of hospitalization. She received 4 weeks of antibiotic treatment with oxacillin and amikacin.

In tracking control within the month of discharge, the patient had a relapse with purulent discharge of surgical wound. She had a surgery procedure done. From the purulent discharge *Staphylococcus aureus* meticilin sensitive (SAMS) and *Streptococcus pyogenes* were isolated. This patient developed a chronic osteomyelitis therefore she received antibiotic treatment for 3 month.



Fig-2A:the arrow shows the lesion in the radiograph of the lower limb at knee level **Fig. 2B** the CT image.

DISCUSSION

The two patients reported are school children, according to the most common age of musculoskeletal disorders showing in children [5]. Both had a torpid overall picture of developments, and localized pain in lower limbs. The clinical case 1 shows as accompanying symptom, prolonged febrile syndrome and in case 2, general malaise with significant weight loss. In both cases cystic tumor, osteoid osteoma and eventually malignant diseases as differential diagnosis were proposed. This approach is not uncommon in subacute and chronic bone disease as fibrous dysplasia, bone infarction, Brown tumor and Brodie abscess among others, and requires knowledge in terms of the epidemiology, clinical presentation, anatomical distribution and mainly characteristics of the images to make a correct diagnosis [6, 7].

Brodie's abscess was first noted by Benjamin Brodie in 1832, when he documented three cases of an abscess within the tibia [8]. Its diagnosis is difficult because it mimics many benign and malignant pathologies. Initially it is misdiagnosed in up to 90% [9, 10]. One of the tumor diseases with which frequently the differential diagnosis is proposed is osteoid osteoma [11,12]. This tumor is 10% of all benign bone tumors and it mainly affects school children and young adults and has similar radiological images to Brodie's abscess [13].

There are reports from developing countries, of bone tuberculosis at the proximal end of the tibia with metaphyseal lytic lesions and bacterial infection in children, which raises differential diagnosis in this age group [14]. In a study of 21 children with subacute osteomyelitis, the most frequently affected bone was the tibia, and the most frequent location was the diaphysis. However metaphysis is cited as a frequent site of involvement, because it has a rich blood supply and low phagocytic activity [15].

In the initial stages of Brodie's abscess the plain X-ray is normal, because the 30-50% reduction in bone mass occurs before radiological changes appear. The lesion, which main feature is a lytic image with sclerotic margin, can be observed after 10-21 days after the process has started [5]. With radiography Brodie's abscess appears as lucent lesion with marginal sclerosis and cortical thickening. With CT, lytic lesion, presence of sequestrum and periosteal reaction is visualized [16]. The nuclear magnetic resonance imaging (MRI) is the most sensitive technique for assessing Brodie's abscess. It has been showed that the "penumbra sign" on MRI is useful for discriminating subacute osteomyelitis from others bone lesions. The "penumbra sign" is a rim lining of an abscess cavity with increased signal intensity [2,17]. MRI was not done to the reported patients because it was not available.

The ultrasonography has its limitation in the Brodie's abscess diagnosis, because the ultrasound beam cannot penetrate bone [18]. Bone scintigraphy is rarely indicated unless the diagnosis is uncertain, but it may be useful for the evaluation of subacute multifocal osteomyelitis [5]. The PET/CT (positron emission tomography) technology using 18F-FDG (Fludeoxyglucose 18F) is a useful tool for the evaluation of chronic infection of the skeleton. PET/Ct has successfully defined the diseases extent in a Brodie's abscess reported where the MRI fails to characterise the features of the abscess [19].

During surgery in both patients, purulent discharge was cultivated and the organism was isolated. In subacute osteomyelitis surgical drainage may yield positive culture in 40% to 75% of the patients. When cultures are positive *Staphylococcus aureus* is the most common organism isolated, and less frequently, *Pseudomonas aeruginosa*, *Streptococcus group B*, *Salmonella* and *Klebsiella*. Fungal and mycobacterial infections are rare and occur mainly in immunosuppressed patients [2, 20].

Even though the patients here reported were treated with surgical debridement plus antibiotic, their evolution was different. The first patient had good progression while the second one evolved into a chronic osteomyelitis. Some authors cite Brodie's abscess as a sub acute and/or chronic osteomyelitis [21]. Others report it as a chronic osteomyelitis post traumatic [22]. Not one of our patients had a trauma history.

The treatment is controversial. In most reports it is suggested the surgical debridement plus antibiotic therapy. Some authors recommend a conservative treatment with oral antibiotics for 6 weeks and surgery is indicated if there is no response to conservative treatment with antibiotics [2]. Another report suggests surgical curettage when the size of the abscess is larger than 3 cm in diameter [23]. The CT-guided percutaneous drainage may be an alternative treatment for being a less invasive procedure and to avoid the risks involved in an open surgery. It also shortens the time of hospitalization [24].

CONCLUSION

Brodie's abscess is not a common children's disease. However, it is a bone pathology that should be considered in the evaluation of the chronic pain especially in developing countries.

It may be difficult to differentiate Brodie's abscess from others malignant and benign bone lesion, but with the help of imaging and histopathology it can be diagnosed. Even with appropriate treatment, the patient can develop a chronic osteomyelitis, such as one of the case we reported.

REFERENCES

1. Bohndorf K; Infection of the appendicular skeleton. *Eur Radiol*, 2004; 14(3):53-63.
2. Moranges Sbert G, Soletto Roncero MJ, Del Río Mangada A, Toribio Pons JA; *Acta Pediatr Esp*, 2006; 64: 443-445.
3. González-López JL, Soletto-Martín FJ, Cubillo-Martín A, López-Valverde S, Cervera-Bravo P, Navascués del Río JA; Subacute osteomyelitis in children. *J Pediatr Orthop*, 2001; 10:101–104.
4. Kornaat PR, Carmerlinck M, Vanhoenacker FM, Praeter G, Kroon HM; Brodie's abscess revisited. *JBR-BTR*, 2010; 93:81-86.
5. Macnicol MF; Patterns of musculoskeletal infection in childhood. *J Bone Joint Surg Br*, 2001; 83:1–2.
6. Gould CF, Ly JQ, Lattin GE, Beall DP, Sutcliffe JB; Bone tumor mimics: avoiding misdiagnosis. *Curr Probl Diagn Radiol*, 2007;36:124- 141.
7. Amnullah F, Ansari SAK; Brodie's abscess mimicking as of malignancy: case report with radiological features. *Journal of Musculoskeletal research*, 2013;9 (1):1372001- 6.
8. Abdulhadi MA, White AM, Pollock AN; Brodie abscess. *Pediatr Emerg Care*, 2012; 28:1249-51.
9. Chan RS, Abdullah BJJ, Aik S, Tok CH; Radiofrequency ablation of a misdiagnosed Brodie's abscess.
10. Knaap SF; Undiagnosed Brodie abscess in a gymnast after surgical fixation of a tibial fracture *J Chiropr Med*, 2007; 6: 159–162.
11. Schlur Ch, Bachy M, Waffisz A, Ducou H, Jossiet P, Vialle R; Osteoma osteoid mimicking Brodie's Abscess in a 13-year –old girl. *Pediatrics International*, 2013;55:29-31.
12. Gulati Yash, Maheshwari Adiya V; Indraprastha Apollo Hospital, New Delhi, India. Brodie's abscess of the femoral neck simulating osteoid osteoma. *Acta Orthop. Belg*, 2007; 73: 648-652.
13. Rajeev A, Ali M, Ralte A, Chakaravathy J; Osteoid osteoma as an unusual cause of wrist pain – A case report and review of literature. *Int J Surg Case Rep*, 2014; 5: 896–898.
14. Akgül T, Ozger H, Göksan BS, Eren I; Cystic transphyseal bone tuberculosis: a report o two cases. *Acta Orthop Traumatol Turc*, 2012;46:316-319.
15. Rasool MN; Primary subacute haematogenous osteomyelitis in children. *J Bone Joint Surg Br*, 2001; 83:93–98.
16. Pineda C, Espinosa R, Pena A; Radiographic imaging in osteomyelitis: the rol of plain radiography, computed tomography, Ultrasonography, Magnetic resonance imaging and scintigraphy. *Semin Plast Surg*, 2009;23(2):80-89.
17. Ahmadreza A, Afshim M; The “penumbra sign” on Magnetic Resonance Images of Brodie's Abscess: A case report. *Iran J Radiol*, 2011;8(4):245-248.
18. White M; Brodie's abscess : What's that? *The Canadian Journal of Medical Sonography*, 2014;5 (3):11-16.
19. Fathimul F, Nordin AJ; F FDG PET /CT as a potential valuable adjunct to MRI in characterizing Brodie's abscess. *Biome Imag Interv J*. Available www.bijj.org/20103/e26 DOI 10.2349/bijj.6.3.e26
20. Cerini D, Belaieff W, Cherkaoui A, Lascombes P, Schrenzel J, de Coulon G, et al.; Primary epiphyseal or apophyseal sub acute osteomyelitis in the pediatric population. A report of fourteen cases and systematic review of the literature. *J Bone Joint Surg Am*, 2014;96:1570
21. Strobel K, Hany TF, Exner GU; PET/CT of a brodie abscess. *Clin Nucl Med*, 2006; 31:210-212.
22. Guermazi A, Mohr A, Genat HK; Brodie Abscess: another type of chronic posttraumatic osteomyelitis *Eur Radiol*, 2003; 13:1750-1752.
23. Olasinde AA, Oluwadiya KS, Adegbehingbe OO; Treatment of Brodie's abscess: excellent result from curettage, bone grafting and antibiotics. *Singapore Med J*, 2011; 52(6):436.
24. Tan K, Yoong P, Marshall TJ, Martin C; Percutaneous drainage as a novel approach for the treatment of Brodie's abscess. Department of Radiology, Norfolk and Norwich University Hospital, UK. *Clin Radiol*, 2012; 67:1030-1033.
25. Knaap SF; Undiagnosed Brodie abscess in a gymnast after surgical fixation of a tibial fracture *J Chiropr Med*, 2007;6:159–162.