



Case report

An unusual case of Brodie's abscess in the humerus of an adult female

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ABSTRACT

Brodie's abscess is a manifestation of subacute to chronic osteomyelitis, characterized as intraosseous abscess formation, usually on the metaphysis of the long tubular bones in the lower extremities of male pediatric patients. Clinically, Brodie's abscess presents with atraumatic bone pain of an insidious onset, with absence of systemic findings. Delay in diagnosis is common, as diagnostic imaging, followed by biopsy for culture and histologic examination are generally required to secure a diagnosis of Brodie's abscess. Treatment of Brodie's abscess is non-standardized, and usually consists of surgical debridement and antibacterial therapy. Despite the variability in therapeutic approaches, outcomes of Brodie's abscess treated with surgery and antibiotics are favourable. Herein we report a case of a delayed diagnosis of Brodie's abscess in the upper extremity of an adult female. While she improved with treatment of Brodie's abscess, the case serves to remind clinicians to consider this entity in adult individuals who present with atraumatic bone pain.

Case

A 38-year-old female with Type 2 diabetes mellitus (hemoglobin A_{1c} 9.0%), presented to the emergency department multiple times over a three-month period with progressive atraumatic deep-seated left upper extremity discomfort in the distal humerus without overlying soft tissue infection. She did not have a history of constitutional symptoms. As there were serial intact neurological examinations, reassuring biochemical investigations and unremarkable plain radiographs, she was discharged home with analgesia.

She returned to the emergency department following a minor trauma to her left arm when she sustained a minor blunt shearing force against her distal left humerus. On examination, her arm was neurovascularly intact with normal strength, reflexes, bulk, and tone. There were no features of overlying skin and soft tissue infection. Musculoskeletal examination was otherwise non-contributory. Her complete blood count continued to be within normal limits and her C-reactive protein was elevated in the context of her acute trauma. Plain radiographs demonstrated cortical thickening and sclerosis of the distal humerus upwards of 12 mm (Fig. 1). Due to the acute pain and swelling superimposed upon her unrelenting deep-seated subacute pain, she underwent magnetic resonance imaging (MRI).

On MRI of the left humerus, an eccentric non-enhancing

6 mm × 6 mm × 10 mm bone lesion in the lateral aspect of the distal humeral metaphysis abutted the cortex, with surrounding enhancing edema and enhancing periostitis within the medullary cavity (Fig. 2). No pathological fracture or subperiosteal fluid collection was noted. Given her subacute refractory pain syndrome, lack of constitutional symptoms and relatively preserved biochemical markers, the abnormality on the MRI was thought to represent osteomyelitis with a Brodie's abscess.

She underwent irrigation and debridement of the left distal humerus lesion. Microbiological cultures from deep tissue and bone identified methicillin-sensitive *Staphylococcus aureus*. Pathology from the bone biopsy did not suggest neoplasm but demonstrated viable cortical and trabecular bone with reactive fibrosis and extensive lymphoplasmacytic infiltrates, consistent with subacute osteomyelitis (Fig. 3). Post-operatively, the patient completed a six-week course of cefazolin 2 g intravenously every 8 h. On follow-up she had complete resolution of her longstanding deep-seated left-sided upper extremity pain.

Discussion

Brodie's abscess is a form of subacute hematogenous osteomyelitis distinguished by a collection of pus within the metaphysis of long bones [1]. As the infection involves the growth plate between the bone metaphysis and epiphysis, the incidence of Brodie's abscess is higher in the

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Fig. 1. Left humeral radiograph demonstrating central lucent lesion within the distal left humeral metaphysis measures 12 mm with surrounding ill-defined sclerosis and cortical thickening without fracture, periosteal reaction, or soft tissue component.

pediatric population and predominately reported in males [2]. A history of recent infection or minor trauma without fracture usually precedes onset of symptoms. Long bones of the lower extremity such as the tibia and femur account for nearly 80% of cases, while less than 5% of Brodie’s abscesses involve the humerus [3].

The difficulty in diagnosing Brodie’s abscess is owing to the insidious

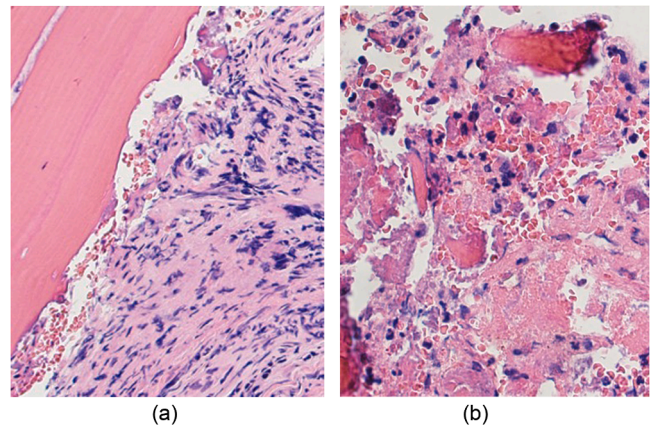


Fig. 3. Biopsy of the left humeral lesion demonstrating A) lymphoplasmacytic (i.e. chronic) inflammatory infiltrate with deposition of reactive fibrous tissue in the marrow space, and B) fragments of lamellar bone with fibrin and mixed (i.e. acute and chronic) inflammatory cells including neutrophils, lymphocytes and plasma cells, suggestive of subacute osteomyelitis, both at 400 x magnification.

onset of symptoms, non-specific pain syndrome and absence of systemic biochemical inflammation. Furthermore, radiographic findings may not be apparent as it can take two to four weeks for changes in the bone to be reflected radiographically [3]. As such, the median time to diagnosis of a Brodie’s abscess is 12 weeks, with upwards of half the cases being misdiagnosed as tumors [3,4].

While plain radiographs have a high positive predictive value in diagnosing subacute osteomyelitis and are favored due to accessibility and safety, their sensitivity in diagnosing Brodie’s abscess is only 20%. In comparison, MRI has a sensitivity above 80% [5]. The penumbra sign is the classic feature on MRI, consisting of central necrosis with adjacent granulation tissue, surrounding fibrosis and an outermost layer of edema [6]. Modalities such as computed tomography or fluorodeoxyglucose-positron emission tomography allow for enhanced accuracy in diagnosing hematogenous osteomyelitis and fracture associated infections, but their role in diagnosing Brodie’s abscess is unclear [5,7].

While surgical intervention that removes necrotic, infected, and non-viable bone remains the mainstay of therapy of Brodie’s abscess, the optimal route and duration of post-operative antibacterials are less

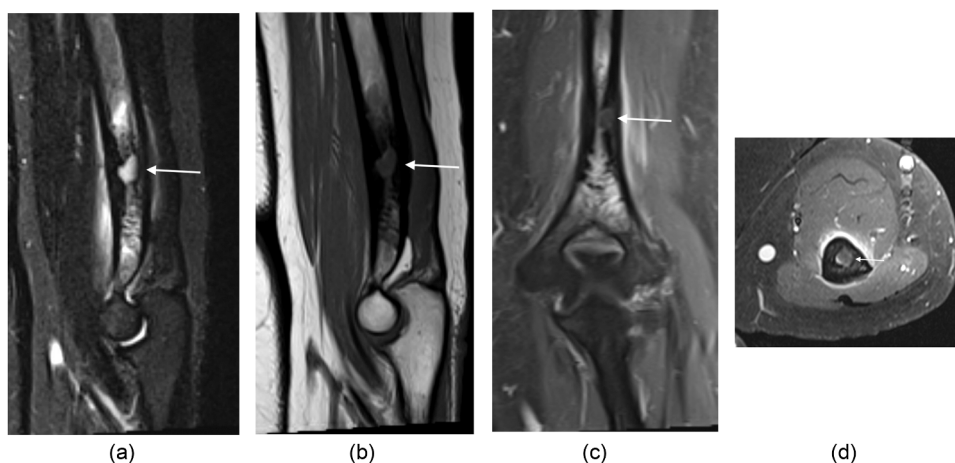


Fig. 2. Magnetic resonance imaging of A) Sagittal STIR, B) Sagittal T1-weighted, C) Coronal T-1 weighted post-gadolinium, and D) Axial T-1 weighted post-gadolinium demonstrating an eccentric distal left humeral metaphyseal lesion abutting the cortex with associated thickening, with T1 hypointense, T2 hyperintense signal with a thin T1 hyperintense rim suggestive of granulation tissue without intrinsic enhancement following administration of intravenous gadolinium. Abnormal edema and enhancement surround the lesion that extends into the periosteum and musculature without subperiosteal fluid collection, pathologic fracture, or soft tissue lesion.

defined [8,9]. As with most cases of osteomyelitis, *Staphylococcus aureus* remains the predominant organism identified in Brodie's abscess, although upwards of one quarter of cases are culture-negative [3]. The most common treatment consists of surgical debridement followed by a course of antibiotic, ranging from ten days to three months. Despite lack of uniformity in treatment protocols, > 95% of cases of Brodie's abscess with outcome data report favorable outcomes without long-term deficits when both surgery and antibacterial therapy are employed [3].

Conclusion

The case described herein is unique for multiple reasons. While Brodie's abscess usually occurs in pediatric male patients, an atypical case of Brodie's abscess occurring in a female patient during her fourth decade of life is described. Secondly, involvement of the humerus, rather than the long bones of the lower extremity, is not often reported. Given the non-traditional baseline characteristics of this case, the patient's diagnosis and treatment for subacute osteomyelitis were delayed. In patients who present with atraumatic, insidious-onset bone pain, reassuring biochemistry, and absence of constitutional symptoms, we advocate maintaining a low threshold for MRI imaging given the possibility of Brodie's abscess in the differential diagnosis.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Authorship

All authors had access to the data and a role in writing this manuscript.

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Priya Samuel: Writing – review & editing, Writing – original draft. **Andrew Brack:** Writing – review & editing. **John C. Lam:** Writing – review & editing, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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