ABSTRACT

Brodie's abscess of the calcaneus is an uncommon benign lesion that has rarely been reported in the literature. This study presents a rare case of a Brodie's abscess of the calcaneus caused by *Staphylococcus aureus* in an adult patient. A 46-year-old immunocompetent man had undergone nonsurgical treatment since childhood owing to the diagnosis of a heel spur. Radiological evaluation revealed a benign radiolucent cystic lesion of the calcaneus surrounded by a sclerotic rim. This condition was accompanied by perilesional bone marrow edema. Thereafter, surgical treatment was planned. During surgery, the content of the lesion was observed to be purulent. Meticulous intralesional debridement was performed, and antibiotic-loaded bone cement beads were placed. Subsequent to microbiological and pathological examinations, the cystic lesion was confirmed to be a Brodie abscess; however, direct clinical evidence of an intraosseous infection was lacking. The patient was followed up for 14 months with no complications until recovery. A Brodie abscess may mimic bone tumors. The onset of a Brodie abscess is insidious, and the clinical findings of such lesions may be obscure. A Brodie abscess of the calcaneus should be considered in the differential diagnosis of patients with chronic heel pain when suspicious radiological findings are evident.

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Case Report

Brodie’s abscess of the calcaneus in an adult patient

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A Brodie abscess is defined as a chronic pyogenic inflammation of the skeletal system without any obvious symptoms. It causes a diagnostic dilemma for orthopedic surgeons (1, 2). A Brodie abscess is generally located in the metaphyseal and epiphyseal regions of long bones; however, it can also be located in small bones (2, 3). In our literature review, we have observed case reports of Brodie abscesses in the tarsal bones but not of those in the calcaneus (2, 3).

This study presents a case of a Brodie’s abscess of the calcaneus caused by *Staphylococcus aureus* (*S. aureus*) in an adult patient who was followed up for 14 months.

Case Presentation

A 46-year-old immunocompetent male presented with pain in the left heel and had no concurrent systemic disease. The patient had increasing pain for the past six months and encountered this condition since his childhood, with sporadically increasingly and decreasingly painful periods. Based on the X-ray findings, he was diagnosed with a heel spur; accordingly, the patient was treated for six months with conservative treatment methods and analgesics at irregular intervals. After quitting his treatment, the patient presented to our clinic due to increased pain and the onset of nocturnal pain. No penetrating injury, open wound, erythema, swelling, redness, or drainage were observed on his foot. However, pain was felt not only over the heel spur but also in the medial and lateral aspect of the heel along with palpation. A localized radiolucent lesion without any endosteal scalling was observed in the calcaneal body on the X-ray images (Figure 1). The lesion had a narrow zone of transition. There was no evidence of any periosteal reaction. Magnetic resonance imaging (MRI) with gadolinium-based contrast agents was performed: a unicameral cystic lesion without any fluid–fluid level (diameter at the widest section: 2.5 cm) was detected, with hypointense signals on the T1-weighted and hyperintense signals on the T2-weighted images (Figure 2). The MRI data revealed a sclerotic rim around the lesion accompanied by bone marrow edema. Based on these radiological findings, the lesion was considered to have a benign character: simple bone cyst (SBC), intraosseous lipoma, intraosseous ganglion, cyst-
tic fibrous dysplasia, eosinophilic granuloma, and Brodie's abscess were considered in the radiological differential diagnosis. Nevertheless, because the borders of the cyst were 10 mm off the nearest bone cortex, the pain was considered to occur due to a heel spur rather than a cystic lesion. Further, conservative and analgesic treatments for the heel spur were restarted for 10 days. However, the patient complained of increased pain during this time period; as the lesion had benign radiological characteristics, curettage and grafting without a preceding biopsy were planned. Informed consent of the patient was obtained before the surgical intervention.

A standard lateral L-type approach for the calcaneus was intraoperatively employed: after the cutaneous–subcutaneous flap was elevated, the lateral cortex of the calcaneus was accessed. The boundaries of an oval-shaped corticocancellous window were drilled with multiple 1.2-mm K-wires. After lifting the bone window, a cavity filled with pus was observed in the calcaneus (Figure 3). Samples taken from this intracystic pus were sent for pathological and microbiological examinations. The walls of the cyst cavity were sclerotic. Meticulous debridement and irrigation were performed, antibiotic-loaded bone cement beads were placed, and the corticocancellous window was replaced (5). No implant was required for osteosynthesis, and the leg and foot were immobilized in a below-knee splint. As no clinical findings of an infection were observed, the C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) values were not preoperatively checked. At the first postoperative hour, the CRP value of the patient was 5 times higher than the normal range (5.6 mg/dL), whereas his ESR level was within the normal range. The samples were cultured for aerobic, anaerobic, and tuberculosis bacteria. *S. aureus* growth was observed within the first 24 h. No epithelial cells, which resemble SBC, were detected in a histological examination. However, fibrous regions-with a histological resemblance of a ganglion cyst-were detected in the histological examination. Moreover, neutrophils, lymphocytes, plasma cells, capillary proliferation, and fibrosis, commonly seen in subacute osteomyelitis (a Brodie abscess), were observed (Figure 4) (1, 6). These findings confirmed a Brodie abscess. The patient was hospitalized for 5 days and was administered 400 mg of teicoplanin daily. Moxifloxacin was administered (400 mg/day) orally after discharge. When the patient's CRP level returned to normal at the end of the sixth week, the treatment was terminated, the splint was removed, and the patient was allowed to bear weight. The CRP and ESR levels were normal on the postoperative 3rd, 6th, 12th, and 14th month follow-ups. After the 14th month, the patient had no complaints, his heel pain was completely dissolved, and the radiograph was normal (Figure 5).

**Discussion**

Brodie abscesses in the tarsal bones are rarely detected (4). However, no case of a Brodie's abscess of the calcaneus similar to the one in this study has been determined in the literature. Heel spur and plantar fasciitis are the first possibilities to be considered in the diagnosis of heel pain (7). However, the clinician should perform laboratory tests and other radiological evaluations such as MRI in the case of chronic heel pain that is not responding to conservative treatment (7). In our case, a localized radiolucent lesion without any endosteal scalloping was observed in the calcaneal body on X-ray images, and there was no evidence of any periosteal reaction. MRI with gadolinium-based contrast agents revealed a unicameral cystic lesion without a fluid–fluid level surrounded by a sclerotic rim, and the lesion was surrounded by bone marrow edema. Based on the radiological findings, the lesion was assumed to have a benign character; further, the SBC, intraosseous lipoma, intraosseous ganglion, cystic fibrous dysplasia, eosinophilic granuloma, and Brodie's abscess were determined in the radiological differential diagnosis. A literature review has indicated that SBC is the most commonly encountered calcaneal cyst, followed by aneurysmal bone cyst (ABC) and intraosseous ganglion (8). Because the cyst seemed to be unicameral and did not contain any fluid–fluid level in the MRI data, ABC was ruled out (9). No fat content was observed within the cystic

**HIGHLIGHTS**

- This study demonstrates significant role of orthopaedic surgeon keep in mind infection doubt of every orthopaedic tumor surgery.
- Our findings underline that patients’ symptoms are more important than patients’ X-Ray or MRI views.
- A Brodie abscess of the calcaneus should be considered in the differential diagnosis of patients with chronic heel pain when suspicious radiological findings are evident.
lesion; therefore, intraosseous lipoma was eliminated from the differential diagnosis. Finally, the absence of epithelial cells in the tissue samples taken intraoperatively and the findings of an acute inflammation of the dense fibrous tissue suggested the presence of a Brodie abscess (3, 6).

The diagnosis algorithm followed with this patient is the main limitation of this case report. This is because from an orthopedic oncology perspective, laboratory data, biopsy, and culture results should be obtained prior to any definitive surgical intervention for bone lesions. The lack of laboratory test (CRP and ESR) results of the preoperative acute infection in our case was a weakness of our study. Larsson et al. investigated the peak CRP levels after elective orthopedic surgeries: the authors concluded that the CRP levels peaked between 48 and 72 h after surgery (10). In our case, the ESR and CRP levels at the first hour postoperative were investigated. The ESR level was determined to be within the normal range, whereas the CRP level was found to be five times the normal level (5.6 mg/dL). Although these results do not exactly reflect the preoperative CRP results, it suggests that the CRP levels for a preoperative infection were high.

In case of a Brodie abscess, direct contact and hematogenic spread are the most well-known ways of bacterial spread; however, our case had no open wounds or penetrating injury history of the foot (11). A hypothesis about the formation of Brodie’s abscess suggests that the predisposition of bone to infection increases after minor traumas (without open wounds) (4).

Debridement, irrigation, and antibiotic-loaded cement spacers recommended for the treatment of adult osteomyelitis were performed to treat our patient (5). As the bone cortex achieved full union, the laboratory levels for infection were normal and the symptoms of pain completely disappeared; however, the antibiotic-loaded spacer was not removed.

**Conclusion**

Bone infections and Brodie’s abscess may mimic bone tumors. A Brodie abscess of the calcaneus is rare. The onset of a Brodie abscess is insidious, and the clinical findings of such lesions may be inadequate. A Brodie abscess of the calcaneus should be assessed in patients with chronic heel pain when suspicious radiological findings are evident.
Informed Consent: Written informed consent was obtained from patient who participated in this study.

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