Brodie's Abscess of the Distal Radius: An Unusual Complication after Percutaneous Pinning

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Received: 22 September 2007 / Accepted: 4 June 2008 / Published online: 5 September 2008
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Abstract We report a case of Brodie's abscess of the distal radius that presented 4 years after closed reduction and percutaneous pinning for a closed distal radius fracture. This condition has not been previously reported in the adult distal radius and we detail the clinical features and imaging findings. We also present a new way of management of Brodie's abscess using injectable bone substitute along with adjunctive parenteral antibiotic therapy.

Keywords Osteomyelitis · Subacute osteomyelitis · Brodie's abscess · Distal radius · Percutaneous · Pinning · Bone substitute

Introduction

We report a case of an isolated, well-circumscribed osteomyelitic lesion that developed in the distal radius of a 57-year-old Caucasian gentleman 4 years after percutaneous pinning of a distal radius fracture. To our knowledge, the occurrence of a Brodie's abscess in the distal radius of an adult has not been

previously reported in the literature. We also approached the treatment of this entity with a novel solution, not previously described for the treatment of Brodie's abscesses.

Case Report

A 57-year-old right hand dominant Caucasian gentleman presented with a history of a painful boil located on the dorsum of the left distal forearm that was discharging intermittently for over 6 months. The patient reported that the problem started with pain, redness, and swelling and progressed to form an abscess. He underwent multiple incision and drainage procedures under local anesthetic in the office of his primary care physician along with at least eight courses of oral antibiotics. After each treatment episode, the pain and swelling decreased temporarily only to return again a few weeks later with recurrent abscess formation. The patient was subsequently referred to a wound care center for further management. Routine radiography revealed a well-defined radiolucent defect of the left distal radial metaphysis that prompted referral to our center.

We asked the patient about prior trauma to the area and he reported a closed left distal radius fracture 4 years earlier after a fall of approximately 6 ft. He was treated with closed reduction, percutaneous pinning, and cast immobilization. The postoperative period was free of any complications, and the pins were removed and active range of motion was commenced under therapy supervision after 6 weeks. The patient went on to regain use of the left upper extremity with some limitation of wrist motion.

On physical examination, we noted a discharging sinus on the dorsum of the distal left forearm. There was an area of surrounding erythema with serous discharge noted from the sinus. The skin around the sinus was adherent to the un-

Level of Evidence: IV (Case Report)

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derlying tissues. There was mild restriction of wrist range of motion and there was no neurovascular deficit in the hand.

Plain radiographs of the left wrist revealed a radiolucent area in the distal radius metaphysis measuring 2.7 mm in diameter. The lesion was well-circumscribed with some surrounding sclerosis (Fig. 1). The distal radius demonstrated evidence of prior fracture that had healed with loss of height and radial tilt. There was also an ununited and hypertrophied ulnar styloid fracture. Routine laboratory investigations revealed an elevated white count of 12,100/ μ l and erythrocyte sedimentation rate of 30 mm/h. He was subsequently referred to our facility for definitive care. MR imaging revealed a well-contained abscess of the radial metaphysis without involvement of the adjacent metaphysis.

In view of the chronicity, presentation, and radiographic findings, we diagnosed chronic osteomyelitis of the distal radius that most likely occurred as a late complication of surgical treatment. The patient was offered debridement of the cavity and management with parenteral antibiotic therapy.

At surgery, we excised the sinus and surrounding skin (Fig. 2). The distal radius was exposed in the interval between the third and fourth extensor compartments. An ab-

Figure 1 Radiograph on presentation (December 9, 2005).

Figure 2 Preoperative appearance of the draining sinus.

cess cavity was found within the radius and material was obtained for culture. Granulation tissue lining the cavity was removed by curettage to leave behind a cavity lined by a sclerotic wall. The metaphyseal defect was injected with 2 cc of calcium sulfate bone substitute (MIIG STAT, Wright Medical, Memphis, TN, USA) mixed with 400 g of vancomycin (Fig. 3). The wound was closed with interrupted nonabsorbable sutures to the skin over a suction drain and the wrist was immobilized in a splint. Active range of motion was commenced 1 week postoperatively.

Histological evaluation of curetted specimens revealed evidence of chronic inflammatory infiltrate and necrotic material. The fluid cultures were positive for methicillin-sensitive *Staphylococcus aureus*. After consultation with infectious diseases specialists, we commenced the patient on intravenous nafcillin, 12 g daily for 6 weeks, administered via a peripherally inserted central catheter and continuous infusion pump.

The operative incision healed primarily without any recurrence of erythema or discharge. The patient reported complete resolution of symptoms. Some discomfort was noted on the ulnar border of the wrist, but was felt to be related to an ulnar styloid nonunion and ulnocarpal impaction.

Serial follow-up radiographs revealed gradual resorption of the calcium sulfate and replacement by bone from the periphery. Radiographs obtained at 13 months postoperatively revealed that the cavity was completely replaced with bone except for a residual 5-mm defect in the center (Fig. 4). At a final follow-up of 2 years, C-reactive protein had returned to normal levels, the patient was satisfied, remained symptom-free, and was released from care.

Discussion

The original description of a localized bone abscess is credited in 1832 to Sir Benjamin Collins Brodie who described the

Figure 3 Intraoperative photos: *top* the opened abscess cavity, *bottom* cavity after injection of calcium sulfate and vancomycin.

condition in the tibia of a man with intractable pain. This condition now bears his name [6]. Brodie's abscess is one of many subtypes of subacute osteomyelitis that characteristically lack a systemic response seen with acute osteomyelitis.

Figure 4 Radiograph after treatment (January 29, 2007).

These patients typically have local symptoms, few or no constitutional symptoms, and near normal laboratory values. Brodie's abscess is defined as a confined abscess within bone surrounded by a sclerotic rim of dense bone. This unique situation is felt to develop when the bacteria and the host defenses are equally matched, thus walling-off the abscess and minimizing the systemic response. This type of lesion is slightly more common in boys with a 3:2 ratio and usually occurs in young patients with an average age of 19.5 years [5]. The most common location is in the lower extremity, specifically the tibia, while the upper extremity accounts for roughly 9% of cases [5]. Most lesions are noted in the metaphyseal region [7].

Erythrocyte sedimentation rate and C-reactive protein levels are elevated in roughly 50% of cases and may indicate active infection [7]. Coagulase-positive *Staphylococcus* is the most common offending organism; however, other organisms have been reported [4]. Twenty-five percent of cases are sterile [5]. Microscopic evaluation of the abscess material usually reveals necrotic tissue with an acute or chronic inflammatory infiltrate [1].

The characteristic radiographic appearance of a Brodie's abscess has been described as a "geographic, lytic lesion with moderately well- or well-defined edges and without soft-tissue mass, matrix, cortical destruction, or bone enlargement occurring in the long bones." [5] MR imaging helps to delineate the extent of infection, usually indicating a well-circumscribed lesion without the more widespread involvement typical of diffuse osteomyelitis [3].

Treatment of subacute osteomyelitis includes surgical drainage and antibiotic therapy. Most authors recommend 6 weeks of antibiotics administered wholly or in part by an

intravenous route [2]. Surgical drainage is advocated to allow for accurate identification of the pathogen. Cured specimens are sent for both culture and pathologic examination. Lesions greater than 3 cm or those thought to be a risk for fracture should be considered for allograft or autograft bone grafting [7]. However, the timing for bone grafting is debatable as there is possibility of failure of incorporation in an infected bed.

The patient presented in this report had the classic clinical features and radiographic appearance of a Brodie's abscess. To our knowledge, a Brodie's abscess has not been described in the adult radial metaphysis and has also not been reported as a late complication of percutaneous wire fixation of distal radius fractures. Due to the possibility of resistant organisms secondary to multiple antibiotic courses, we were concerned about the fate of bone graft packed in the radius defect. We hence opted to fill the cavity with commercially available injectable calcium sulfate (MIIG STAT, Wright Medical, Memphis, TN, USA) to which we added vancomycin. Calcium sulfate hardens after injection and can elute antibiotics at supraphysiologic levels at the site of infection. Compressive strength of this material is approximately 50–70 MPa and is replaced by host bone over 8 to 10 weeks [8]. We were able to control the infection and almost completely eradicate the abscess cavity in the distal radius by this combination of local calcium sulfate injection and intravenous antibiotic therapy. We feel that this technique may be useful in the management of infective bone lesions in other long bones as an alternative to bone grafting.

Conflict of interest statement Randip R. Bindra, M.D. has received benefits from Wright Medical, Memphis, TN, USA. However, this study was not sponsored by Wright Medical nor do they have any rights to the information presented within this case study.

Ethical Board Review statement IRB approval waived.

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