Brodie's Abscess of the Proximal Humerus Metaphysis: A Case Report

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Learning Point of the Article:
Brodie's abscess of an atypical site like proximal humerus metaphysis is difficult to diagnose and the differentials must be promptly ruled out prior to surgical management, and the functional outcome is favourable after debridement and thorough antibiotic treatment.

Introduction: Primary subacute pyogenic osteomyelitis, or Brodie's abscess was initially documented by Sir Benjamin Brodie in 1832. We present a case report with a 6-months follow-up period, demonstrating the successful diagnosis and surgical treatment of a focal lesion of the proximal metaphysis of the right humerus in a 21-years-old female. The pathology of hematologic osteomyelitis and its role in the development of a subacute abscess along with a review of literature and an in detail description of the pathogenesis of Brodie's abscess is discussed and submitted.

Case Presentation: A 21-years -old healthy female with a history of fall sustaining injury to the right shoulder one year back followed by which she presented to the outpatient clinic with a swelling over her right shoulder. The patient was managed conservatively with analgesics and was relieved of pain over a course of one 1 week of medications, the patient now presents with pain and swelling in the right shoulder joint on and off since the episode of fall one year back, which had increased over a period of past one 1 week. A week before the most recent presentation she started experiencing some discomfort and pain in her right shoulder. No recent trauma was reported. A mild swelling appeared over the proximal part of the humerus. There were no constitutional symptoms of fever or any illness reported. On examination, there was noted a painful restriction of ROM at the right shoulder joint with no rotator cuff injury. Laboratory investigations were suggestive of raised inflammatory markers. Radiograph of the right shoulder taken in the true antero-posterior view with the shoulder in the neutral rotation was suggestive of an oval lucency with surrounding sclerosis in the proximal metaphyseal region of the humerus. Magnetic resonance imaging MRI of the right shoulder joint showed features consistent with Brodie's abscess in the proximal metaphyseal region of the humerus. Surgical debridement of the abscess was planned. The right shoulder of the patient was immobilized by a universal shoulder immobilizer for 3 days post-operatively and then Physiotherapy for shoulder range of movements was started. Infectious parameters decreased and there were no complications in the postoperative period. Regular follow follow-up for two 2 weeks showed clinical improvement. At 6 months follow-up, the patient had made full recovery with radiographic improvement.

Conclusion: Brodie's abscess was first described by Sir Benjamin Brodie in 1832. Primary hematogenous subacute osteomyelitis is rarely seen in the proximal metaphysis of the humerus. With appropriate surgical debridement and aggressive antibiotic cover, a near 100% success rate is observed in the treatment of Brodie's abscess with no residual deformities in the affected bones or restrictions in the range of movements in the neighboring joints.

Keywords: Brodie's abscess, Subacute osteomyelitis, Proximal humerus metaphysis.

Abstract

Primary subacute pyogenic osteomyelitis or Brodie's abscess was initially documented by Sir Benjamin Brodie in 1832. Hematogenous osteomyelitis is an inflammation of the bone caused by infectious bacteria that reach the bone through the patient’s bloodstream. The aim of this case report is to showcase...
the rare presentation of Brodie’s abscess in the proximal humerus metaphysis, its clinical, radiological, and laboratory findings, its management and outcome.

**Review of Literature**

The most common offending organism in cases of primary subacute osteomyelitis is Staphylococcus aureus, followed by Streptococcus species [1, 2]. The organism reached the bone from a site elsewhere in the body via the bloodstream. It may pose very little or no threat at the site of primary infection, for example, skin pustule, furuncles, impetigo, and infected blisters and burns [3]. However, no pathogen is found in 20–50% of the cases [3, 4, 5]. Brodie’s abscess is one of the many clinical presentations of hematogenous osteomyelitis [3]. The sites most commonly affected by hematogenous osteomyelitis are the metaphyseal regions of growing ends of long bones of the lower extremities such as the distal femur, distal tibia, proximal tibia, and proximal or distal fibula [1, 2, 3, 4, 6]. Primary Brodie’s abscess of the metaphysis of the proximal humerus is rare. Multiple theories suggest that the reason for the predisposition of the metaphyseal region of the bone is due to its unique vascularization. Fraser suggested that the abundance of reticuloendothelial tissue in the metaphyseal area of growing bone contributes to the frequent localization of the infection in the area [5]. The initial theory of Hobo, in 1921, proposed that the vascular structures in the metaphysis make an abrupt loop just as the approach the epiphyseal plate. He concluded that the diminished flow rate because of this loop contributed to the high frequency of localization of the lesion in the metaphysis [7]. A typical Brodie’s abscess is, according to Robert’s classification, is a type Ib subacute osteomyelitis that presents as a cavity in the metaphyseal bone filled with pus and/or granulation tissue, surrounded by a layer of dense fibrous tissue and a zone of sclerosis. The location, symptoms, and radiological presentation of Brodie’s abscess mimics various benign and malignant tumors and often leads to initial misdiagnosis [4, 8, 9, 10].

**Case Presentation**

A 21-years-old healthy female with a history of fall sustaining injury to the right shoulder 1 year back followed by which she presented to the outpatient clinic with a swelling over her right shoulder. The patient was managed conservatively with analgesics and was relieved of pain over a course of 1 week of...
medications, the patient now presents with pain and swelling in the right shoulder joint on and off since the episode of fall 1 year back, which had increased over a period of past 1 week.

A week before the most recent presentation she started experiencing some discomfort and pain in her right shoulder. No recent trauma was reported. A mild swelling appeared over the proximal part of the humerus. There were no constitutional symptoms of fever or any illness reported. On examination, there was no visible wound, hematoma, scars, or sinuses over the right shoulder. The swelling was slightly painful and fluctuant on palpation with no local rise of temperature. The range of movements over the right shoulder joint was as follows: Abduction: 0-90 degrees, forward flexion: 0-120 degrees, extension: 0-30 degrees, internal rotation: 0-60 degrees, and external rotation: 0-80 degrees; indicating painful restriction of movements as compared to the normal opposite, i.e., left shoulder joint. The examination of the right shoulder joint was suggestive of no rotator cuff injury. Laboratory testing revealed increased C reactive protein (CRP) levels of 26.1 mmol/L and Erythrocyte sedimentation rate (ESR) was reported to be 33 mm/h, while leucocyte count: 6870 × 106/L was within normal range. Radiograph of the right shoulder taken in the true anteroposterior view with the shoulder in the neutral rotation was suggestive of an oval lucency with surrounding sclerosis in the proximal metaphyseal region of the humerus (Fig. 1).

Magnetic resonance imaging (MRI) of the right shoulder joint showed features consistent with Brodie’s abscess in the proximal metaphyseal region of the humerus. Differential diagnosis of the radiographic features of a lytic lesion includes osteoid osteoma, non-ossifying fibroma, giant cell tumor, eosiinophilic granuloma, chondroblastoma, and fibrous dysplasia [10]. On plain radiographs, this lesion fitted the description of a typical Brodie’s abscess, i.e., a lytic lesion with geographical destruction with well-defined edges and marginal sclerosis. MRI showing four zones or rims, the first zone shows as a low-intensity signal on T1 weighted images and high intensity oh T2-weighted images, the second zone consisting of highly vascularized granulation tissue around the abscess cavity is relatively a higher intensity on T1-weighted images as well as T2-weighted images, third zone containing sclerous bone marrow and fibrotic tissue shows low-intensity signal on T1 and T2 weighted images, and the fourth zone consisting of bone marrow edema showing low-intensity halo on T1-weighted and low-intermediate or high intensity on T2-weighted images are suggestive of subacute osteomyelitis (Fig. 2). The presence of the second zone that is the “Penumbra Sign” has 99% specificity and 73–75% sensitivity for subacute osteomyelitis [5, 11, 12, 13].

Surgical debridement of the abscess was planned. An incision over the anterolateral aspect of the proximal humerus was taken and the proximal humerus was reached after resection of the deltoid muscle. A sinus tract draining anteriorly into the bicipital canal was noted and was enlarged with the help of a drill. The abscess cavity was cleared and the purulent collection from the cavity was sent for culture (Fig. 3). A vancomycin wash was administered and STIMULAN an absorbable calcium sulfate antibiotic carrier mixed with vancomycin was administered in the abscess cavity and the wound was closed, and an immediate post-operative anteroposterior view X-ray of the right shoulder was taken (Fig. 4). The culture was sterile after 48 h. The patient was kept under the cover of broad-spectrum antibiotics administered intravenously for 5 days followed by oral Clindamycin 2 × 600 mg for 1 week. The right shoulder of the patient was immobilized by a universal shoulder immobilizer for 3 days post-operatively and then physiotherapy for shoulder range of movements was started. Infectious parameters decreased and there were no complications in the postoperative period. Regular follow-up for 2 weeks showed clinical improvement. At 6 months follow-up, the patient had made full recovery with radiographic improvement (Fig. 5).

Discussion

This case report describes an extremely rare presentation of isolated Brodie’s abscess located in the proximal humerus metaphysis. The 21-year-old female patient in the case report presented with a chronic right shoulder pain aggravated over a period of 1 week with slightly limited shoulder range of movements. There was no fever or any visible swelling. The right proximal metaphyseal region of the humerus was tender on palpation. Radiograph showed a well-defined osteolysis with sclerosis at the periphery of the osteolytic lesion.

Our case featured most of the characteristic features of Brodie’s abscess. The patient was a young adult presenting with vague symptoms of pain and discomfort. The laboratory findings were within normal limits except for slightly raised ESR and CRP. The MRI findings supported the diagnosis of a Primary Brodie’s Abscess that had been latently present for some time, which may have become symptomatic after the trauma leading to the discomfort. The development of discomfort in the right shoulder could be well explained by an increased pressure in the abscess cavity that leads to the spurt of pus from the bone when the abscess wall was pierced during the surgery. These signs of high pressure in the abscess cavity have been described by Miller et al. [8].

There were no wounds or ports of entrance discovered for the abscess cavity which suggests that the abscess is most likely of a hematogenous spread. Rasool emphasized the importance of the difference between a true primary hematogenous form of subacute osteomyelitis which mainly occurs in children and the
types where previously inadequate antibiotic treatment played a role in the development of an equilibrium in between the host immune response and the pathogen virulence [14]. Here, when the patient presented at first 1 year back, her symptoms were undermined by the history of a recent blunt trauma which leads to a merely symptomatic treatment. While her recent presentation can be interpreted as a result of an inadequate treatment or a direct hematogenous Brodie’s abscess. However, both have the same clinical course. The near-normal laboratory findings are a reflection of the host immunity and the pathogen virology equilibrium.

The slow and relatively benign course of the disease has lead to difficulties in determining the appropriate treatment. Several studies have shown an excellent result with almost 100% success rate by surgical debridement of the abscess cavity [3, 5, 8, 15] and on the other side, conservative management by antibiotic administration alone achieves similar excellent results [15, 16, 17]. Many authors believe that surgical treatment is preferred for aggressive lesions and for lesions that cannot be differentiated from bone tumors with aggressive features and when it becomes necessary for carrying out a biopsy of the lesion to confirm the diagnosis [15, 16, 17]. In our case, the surgical line of treatment was chosen to drain the abscess cavity for further investigations and Vancomycin loaded calcium sulfate STIMULAN was used to fill the abscess cavity. Calcium sulfate is one kind of biodegradable delivery devices that can be loaded with antibiotics. The advantage of calcium sulfate is that it can offer the chance to delivery an effective concentration of local antibiotics with the biodegradation after implantation [18, 19, 20, 21]. The patient had an excellent outcome with no complaints on right shoulder movements and the radiographs showed significant improvement after 6 months of follow-up.

**Conclusion**

Brodie’s abscess was first described by Sir Benjamin Brodie in 1832. Primary hematogenous subacute osteomyelitis is rarely seen in the proximal metaphysis of the humerus. The authors believe that a surgical management is desired if the diagnosis is unclear and if biopsy is needed to differentiate the lesion from a malignant lesion. With appropriate surgical debridement and aggressive antibiotic cover, a near 100% success rate is observed in the treatment of Brodie’s abscess with no residual deformities in the affected bones or restrictions in the range of movements in the neighboring joints.

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**Clinical Message**

Diagnosing Brodie’s abscess at an unusual location such as the proximal humerus metaphysis can be challenging and an operative line of management must be undertaken only once the diagnosis is confirmed after a detailed clinical, laboratory, and radiological evaluation. The functional outcome after surgical debridement and intralesion antibiotics is considerably favorable and the patient is able to return to his/her activities of daily routine without any restrictions whatsoever.
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