

Brodie's abscess of the ulna caused by *Salmonella typhi*

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Osteomyelitis caused by *Salmonella typhi* is rare in patients with no haemoglobinopathies or other diseases causing immunosuppression. Brodie's abscess is a special variety of subacute or chronic osteomyelitis. An otherwise healthy woman who presented with forearm swelling for 6 months was diagnosed with a Brodie's abscess of the ulna caused by *Salmonella typhi*. Magnetic resonance imaging and a computed tomography-guided needle biopsy were performed. She was later found to be a *Salmonella* carrier. The Brodie's abscess was treated by surgical debridement and a course of antibiotics. The clinical, radiological, and management aspects of the disease are discussed.

Introduction

Osteomyelitis caused by *Salmonella typhi* is a rare event in patients with no haemoglobinopathies or diseases causing immunosuppression. We report a case of Brodie's abscess, a special form of osteomyelitis, caused by *S typhi* in an otherwise healthy woman who was later found to be a *Salmonella* carrier. The clinical and imaging features are discussed and the literature is reviewed.

Case report

A 43-year-old woman presented with a 6-month history of right forearm swelling and a 2-month history of mild pain. She had no history of trauma. Fever and other constitutional symptoms were absent and her medical history was non-contributory. A physical examination revealed swelling and mild tenderness over the ulnar aspect of the right forearm. The overlying skin was normal and the local temperature was not raised. The regional lymph nodes were not enlarged; there were no neurovascular abnormalities, and elbow and wrist movements were normal. Laboratory investigations revealed a leukocyte count of $6.8 \times 10^9/L$ (reference range, $3.7\text{--}9.2 \times 10^9/L$) and an erythrocyte sedimentation rate of 18 mm/hour (reference range, 3–28 mm/hour).

Radiographs demonstrated a well-defined lytic lesion in the diaphyseal region of the right ulna that was interpreted as either an intracortical lesion with destruction of the outer cortex or a subperiosteal lesion with cortical erosion (Fig 1). Cortical thickening was mild. There was no visible matrix or periosteal reaction. Magnetic resonance imaging (MRI) of the forearm using a 1.0-T magnet (Siemens Medical Solutions, Erlangen, Germany) showed an intracortical lesion and destruction of the thickened posteromedial cortex. It was of intermediate signal intensity on T1-weighted spin echo (SE) images (Figs 2a, 2b) and high signal intensity on short tau inversion recovery (STIR) and T2-weighted SE images (Figs 2c, 2d). There was a tiny low signal intensity focus at its centre (Figs 2a, 2e). The lesion showed contrast enhancement (Figs 2e, 2f). Hyperintense signals on STIR and T2-weighted SE images and contrast enhancement were present in the adjacent soft tissues (Figs 2c–f). Bone marrow oedema was absent. A differential diagnosis of Brodie's abscess and osteoid osteoma was considered. A percutaneous needle biopsy of the lesion was performed with computed tomography (CT) guidance and showed an intracortical lytic lesion with a tiny, hyperdense focus at its centre. A histological examination of the biopsy specimen revealed chronic inflammatory tissue. Cultures of the specimen grew *S typhi*. A stool culture was positive for group D *Salmonella* and the Widal test was negative. On further questioning, the patient recalled an episode of fever, chills, and occasional diarrhoea approximately 3 months prior to the onset of her presenting symptoms, for which she was given a 1-week course of antibiotics. There was no history of overseas travel during that period.

The patient underwent debridement of the Brodie's abscess. Intra-operatively, a 1.5-cm cortical defect filled with fleshy tissue and necrotic bone was found. Curettage and saucerisation were performed. A histological examination of the tissue removed at surgery found granulation tissue containing necrotic and reactive new bone fragments with abundant mixed inflammatory cell infiltrate. There was no evidence of malignancy.

Key words

Abscess; Osteomyelitis; *Salmonella typhi*

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FIG 1. Anteroposterior (a) and lateral (b) radiographs show a cortical lytic lesion in the diaphysis of the ulna destroying the outer cortex

She was given a 6-week course of ciprofloxacin, administered intravenously for 2 weeks and then orally for 4 weeks. At the 6-week follow-up, she had no complaints. Radiographs showed a cortical defect in the ulna. Repeat stool cultures did not grow any enteric pathogens of significance. Abdominal ultrasonography revealed gallstones and she was referred for an elective laparoscopic cholecystectomy but the cholecystectomy was refused because of the potential operative risks and because the gallstones were asymptomatic. At the 2-year follow-up, she was asymptomatic and her forearm had a full range of motion. Radiographs revealed no recurrence, only evidence of saucerisation.

Discussion

Osteomyelitis has become a rare complication of *Salmonella* infections since the advent of antibiotics. *Salmonella* osteomyelitis is usually associated with sickle cell anaemia and other haemoglobinopathies,

傷寒沙門氏菌引致的尺骨骨骺端膿腫

病人如果沒有血紅蛋白病或者其他引致免疫抑制的疾病，由傷寒沙門氏菌引致骨髓炎的情況會很罕有。骨骺端膿腫是一種亞急性或慢性骨髓炎的特別變種。一名沒有其他疾病的女性，前臂腫脹已達6個月，後診斷為由傷寒沙門氏菌引致的尺骨骨骺端膿腫。經磁共振成像和電腦斷層攝影穿刺活檢，發現病人是沙門氏菌帶菌者，並以外科擴瘡術和抗生素療程治理骨骺端膿腫。本文按臨床、放射性、和治療幾方面討論此病。

or other diseases causing general or local immunosuppression.¹⁻⁴ It has also been described in healthy, immunocompetent patients with no history of underlying disease.¹⁻⁶ It is usually caused by haematogenous spread following bacteraemia. Most cases are caused by the non-typhi serotypes, which are harboured in animals and transmitted through animal products.¹⁻³ *Salmonella typhi* is the only strain that is exclusively transmitted from human to human.¹ Our patient was an otherwise healthy person but she recalled one episode of fever and mild diarrhoea 3 months before her symptoms appeared. Although we have no proof that it was typhoid fever, the fact that she was excreting *Salmonella* in her stool was evidence of prior infection with, or exposure to, the bacterium.

A Brodie's abscess is a form of osteomyelitis that is defined by a particular constellation of clinical, radiological, and pathological features.⁷⁻⁹ This form of osteomyelitis was first reported in 1836 by Sir Benjamin Brodie as a localised abscess in the tibia without acute symptoms. The onset is insidious. Pain is the most common symptom and has usually been present for several weeks or months before the initial evaluation.^{7,10} Swelling and tenderness over the area of involved bone may also be seen.⁷ Laboratory evaluation is unrevealing, with a normal leukocyte count and differential.⁷ The erythrocyte sedimentation rate may also be normal.^{7,10} The most common organism cultured is a *Staphylococcus* species.^{7,8,10} Approximately 25% of cultures are sterile.⁹ Few reports have specifically described a

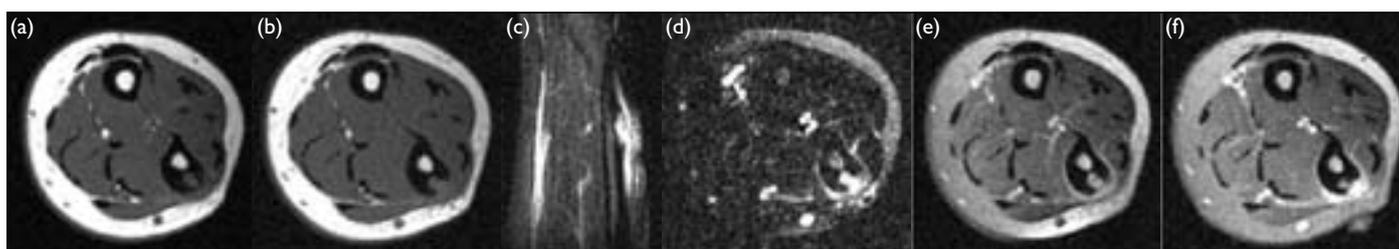


FIG 2. (a, b) Axial T1-weighted spin echo (SE) magnetic resonance images (TR/TE: 450/14) demonstrate a low signal intensity intracortical lesion in the ulna with destruction of the outer cortex. Note the low intensity focus in its centre in (a). (c) Coronal short tau inversion recovery image (TR/TE/TI: 3500/60/130) and (d) axial T2-weighted SE image (TR/TE: 4500/119) with fat suppression show a hyperintense intracortical lesion extending to the adjacent soft tissue. Marrow oedema is absent. (e, f) Axial T1-weighted SE fat-saturated images (TR/TE: 810/14) obtained after intravenous gadolinium administration show enhancement of the lesion and adjacent soft tissue

Brodie's abscess caused by *Salmonella* species. In a recent report of a case of *Salmonella* osteomyelitis in an otherwise healthy patient, the imaging features were those of a Brodie's abscess, although this term was not used.⁶ Our case is another example.

Brodie's abscesses are usually circumscribed radiolucent lesions with adjacent sclerosis showing predilection for the metaphysis of tubular bones, particularly the tibia. Less frequently, they occur in other tubular, flat, or irregular bones and are diaphyseal in origin.⁸ In one series, one third of the Brodie's abscesses were diaphyseal in location.¹¹ In the case of *Salmonella* osteomyelitis, frequent involvement of the diaphysis of long bones is a characteristic feature.¹² Brodie's abscesses usually involve the medulla. One series reported that 86% of Brodie's abscesses were based in the medullary canal and 14% were based cortically.⁹ The differential diagnosis for an intracortical lytic lesion consists primarily of osteoid osteoma and Brodie's abscess. Other lesions to consider include an intracortical haemangioma, cortical fibrous lesions such as ossifying fibroma and fibrous dysplasia, and intracortical metastasis, all of which were felt to be unlikely in our case, given the clinical and imaging features.¹² The imaging features were not specific enough to make a differentiation between osteoid osteoma and Brodie's abscess in our case. While the presence of a low signal intensity focus on MRI that appears hyperdense on CT might suggest a partially calcified nidus in an osteoid osteoma,¹³ it might also be a sequestrum, which has reportedly been present

in 20% of Brodie's abscesses.¹¹ The presence of soft tissue oedema was not a discriminating feature as it can be found in both conditions.¹³ The lack of marrow oedema seen on MRI (a common feature of osteoid osteoma),¹³ the cortical destruction, and the lack of significant sclerosis seen on the X-rays suggested that Brodie's abscess might be the more likely diagnosis. In any case, a biopsy was required to reach a definitive diagnosis; we have found CT-guided needle biopsy a useful way to obtain tissue for histological and bacterial analysis.

Treatment of *Salmonella* osteomyelitis¹⁴ and of Brodie's abscess^{7,10} involves a combination of surgical debridement and the administration of appropriate antibiotics. Successful treatment of *Salmonella* osteomyelitis with antibiotics alone has also been reported.^{5,6} A *S typhi* carrier should be screened for the presence of gallstones, as individuals with gallstones who are infected with *S typhi* are more likely to become carriers than individuals without gallbladder abnormalities.^{14,15} If gallstones are present, a cholecystectomy should be advised, as this is the best means of clearing a *S typhi* carrier state in an individual with gallstones.¹⁴

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