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Case report

Bad to the bone. Not all bone tumors are cancer: Case of long bone osteomyelitis

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ABSTRACT

Long bone osteomyelitis could mimic bony tumor in clinical presentation and imaging studies. We present a case of a 47-year man who presented with leg pain, weight loss and night sweats that initially was thought to be related to osteosarcoma, later suffered a pathologic fracture from *Staphylococcus aureus* osteomyelitis. This case highlights the importance of source control of infection and careful clinical evaluation including radiographic and pathologic findings that can help physicians to differentiate between competing diagnoses.

Introduction

Osteomyelitis is an inflammation of bone, the most common etiology being infection [1,2]. In long bones, it could mimic bony tumor and sometimes be misdiagnosed as primary bone malignancy [3,4]. Without prompt diagnosis and management, osteomyelitis could be complicated by bacteremia and pathologic fracture [3].

Case

A 47-year man with a past medical history of tobacco use and anxiety, initially presented to primary care for 1 month of left thigh pain, weight loss and night sweats. Radiographs were suspicious of bony mass of left femur.

He was referred to orthopedic oncology in our facility. Imaging studies including magnetic resonance imaging (MRI) suggested possible osteosarcoma at left femur diaphysis (Fig. 1 A, B, C). He underwent tissue and bone biopsies.

Bone histopathology revealed inflammatory infiltrates with neutrophils and plasma cells consistent with osteomyelitis. Fine needle aspiration showed no malignant cells. However, tissue culture later grew methicillin sensitive *Staphylococcus aureus* (MSSA). Fungal and acid fast cultures were negative.

Unfortunately, prior to contacting the patient for treatment, he presented to an outside emergency department (ED) as he felt a snap in left thigh while he applied weight and turned. He was transferred to our facility's ED where on evaluation, his vital signs were stable. He had tenderness and decreased ranges of motion of his left leg. Xray showed pathological fracture of mid diaphysis of left femur (Fig. 2A).

He had elevated inflammatory markers. Erythrocyte sedimentation rate (ESR) was 34 (normal 0–15 mm/h) and C reactive protein (CRP) was 28 (normal less than 0.9 mg/dl). Both sets of blood cultures on admit were positive for Gram-positive cocci resembling *Staphylococcus* (Fig. 3) that was confirmed as MSSA. Transthoracic echocardiogram did

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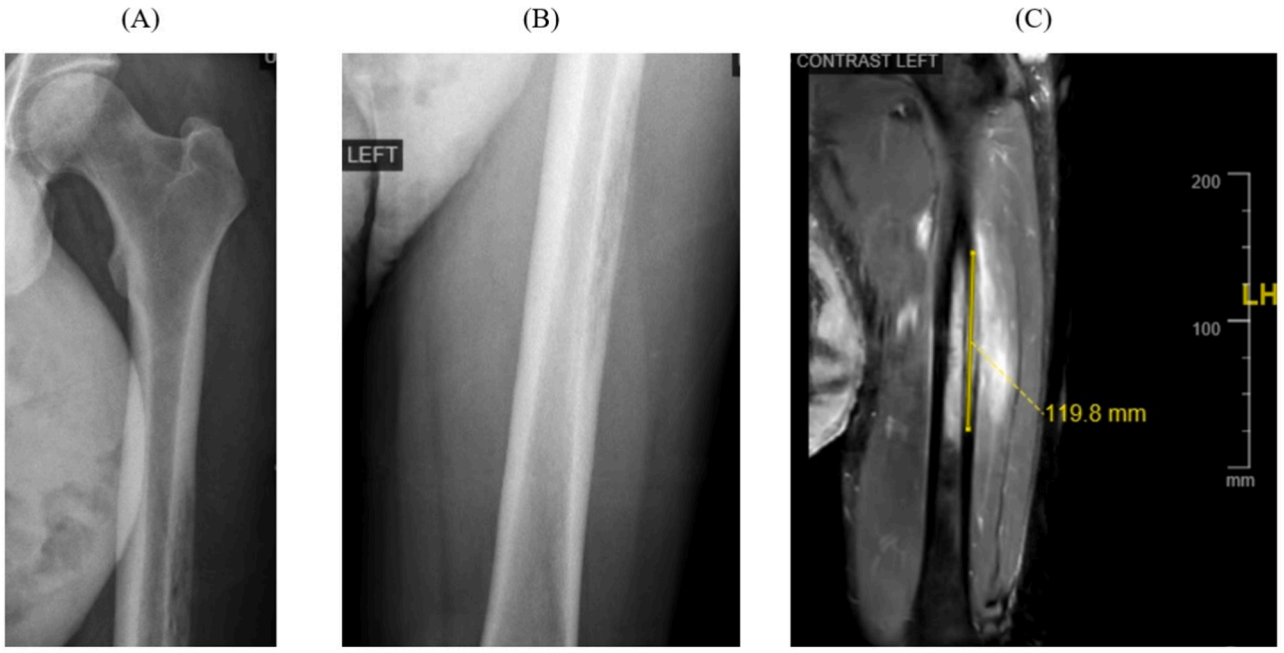

Fig. 1. A: Xray (anteroposterior). Permeative appearance of lateral diaphyseal cortex with irregular periosteal reaction concerning for malignancy. B: Same Xray with close up. C: MRI (T2-weighted). Enhancing, eccentric expansile lesion within the mid femoral shaft. Bone marrow and soft tissue edema concerning for osteosarcoma. MRI=Magnetic resonance imaging.

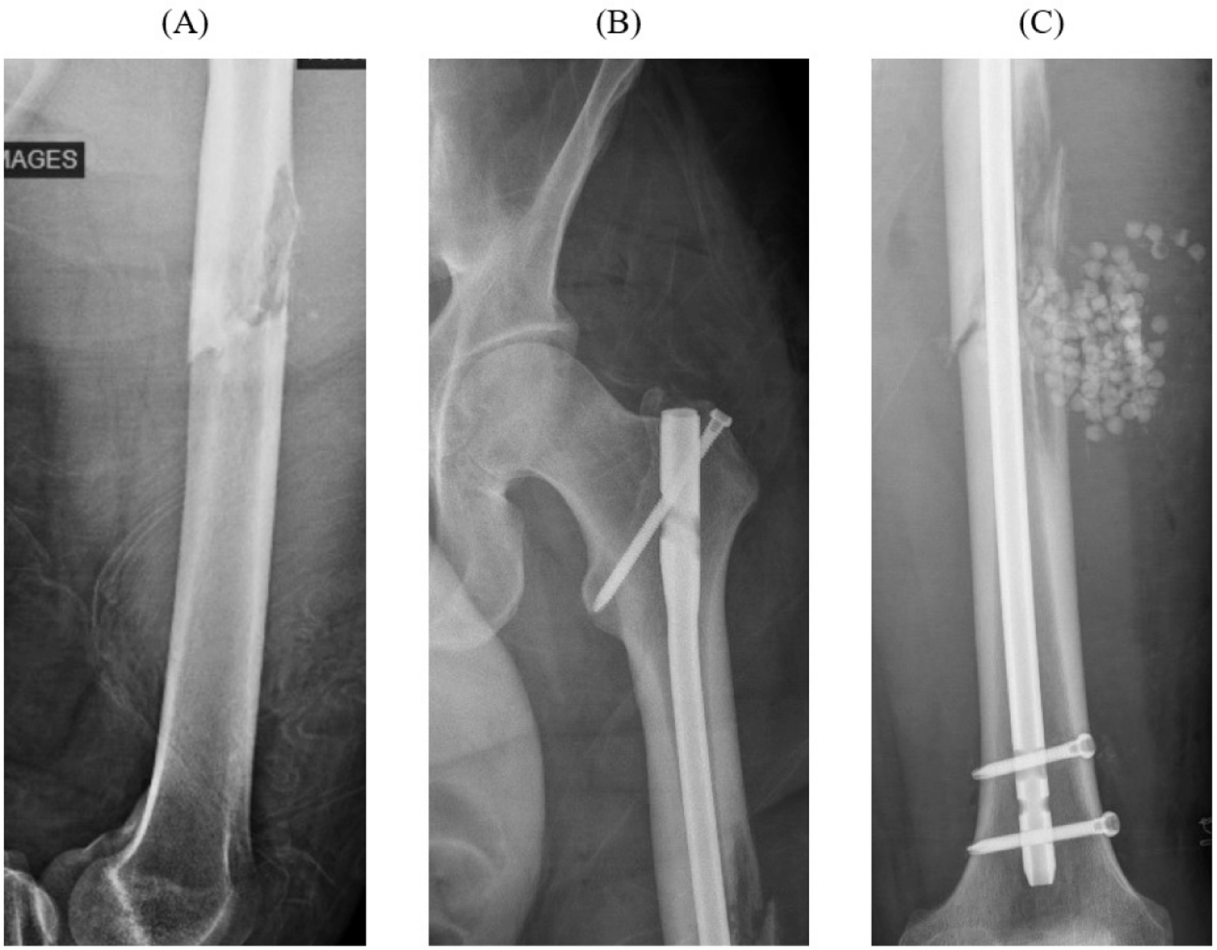

Fig. 2. A: Xray (lateral). Pathological fracture of mid diaphysis of left femur. B: Xray (anteroposterior). IMN with interlocking screw. C: Xray (anteroposterior). IMN with interlocking screws and antibiotic beads with alignment of mid diaphysis fracture. IMN= Intramedullary nail.

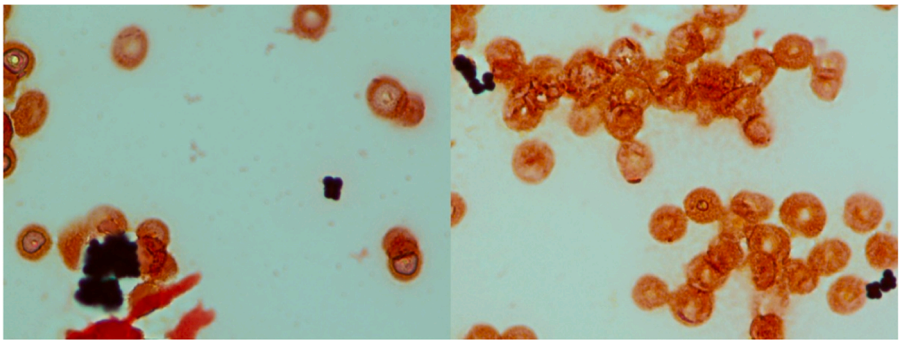

Fig. 3. Gram staining of specimen from blood culture bottles revealed clustered gram positive cocci.

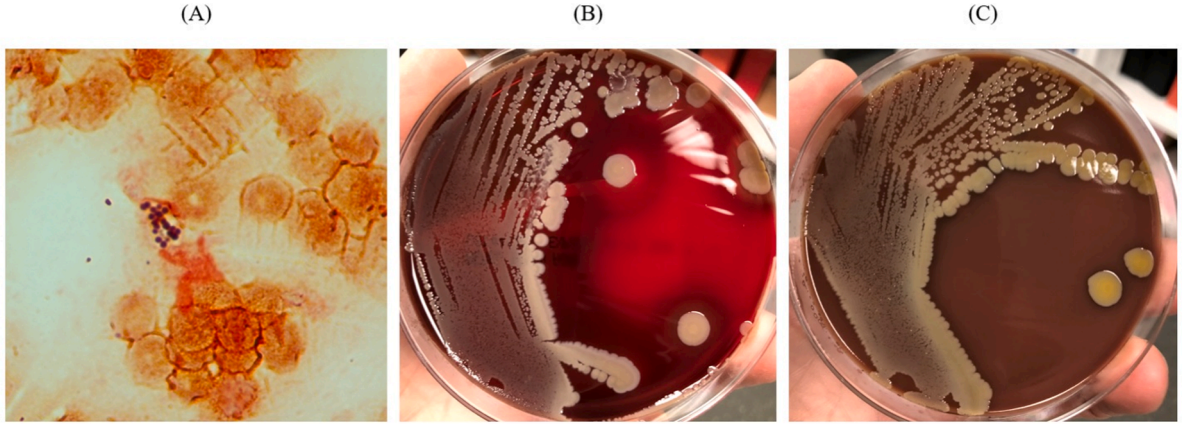

Fig. 4. Gram staining of tissue/bone culture specimen with gram positive cocci in clusters (A). Culture plates: blood agar (B) and chocolate agar (C) with light to golden yellow colonies of *Staphylococcus aureus*.

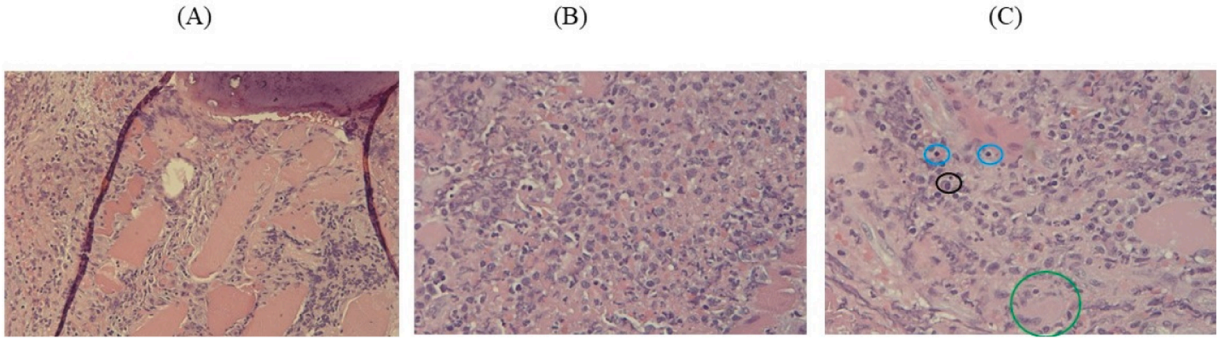

Fig. 5. A: Fragments of bone with mixed inflammatory infiltrate (H&E stain, original magnification x20). B: With focal acute inflammation with neutrophils (H&E stain, original magnification x40). C: With predominantly chronic inflammation (H&E stain, original magnification x40) with plasma cells (black circle), lymphocytes (blue circle), MNG cells (green circle). H&E = Hematoxylin and Eosin stain. MNG= Multinuclear giant cells.

not reveal any valvular vegetation.

The patient was taken to the operating room and underwent open bone debridement, Reamer-Irrigator-Aspirator (RIA) intramedullary debridement, open reduction and internal fixation (ORIF) of the fracture with intramedullary nail (IMN) and calcium sulfate antibiotic beads (Fig. 2B, C). Intraoperative cultures grew MSSA (Fig. 4). Fungal and AFB cultures were negative. Bone histopathology was again consistent with osteomyelitis (Fig. 5). He was discharged home with 6 weeks of intravenous (IV) cefazolin and oral rifampin.

Discussion

Osteomyelitis, an inflammatory status of the bone, is one of the oldest known conditions in history. The concept of bone infection after fracture was first described by Hippocrates but osteomyelitis was described by Broomfield in 1773 as “Abcessus in medulla” and later described by Pasteur as “a boil of the bone marrow” [2].

The pathophysiology of osteomyelitis includes hematogenous seeding, traumatic induction, and infection from contagious tissue [1]. The most common bacterial etiology for bone infection is *Staphylococcus aureus*. Eradicating *Staphylococcus aureus* infection is challenging and often complicated by fractures, non-union, and bacteremia [3,5].

Histopathology would be the gold standard for diagnosis of osteomyelitis. Inflammatory markers are not specific for diagnosing osteomyelitis but can guide management by monitoring treatment response and recurrence. CRP could be more specific in distinguishing soft tissue

infection from osteomyelitis in some cases [6,7].

It is not uncommon for long bones osteomyelitis presentation to mimic bone malignancy [3,4]. While radiographic findings such as an involucrum and sequestrum suggest infection, periosteal reaction (as seen in this case) are common to both malignancy and osteomyelitis. Similarly, the penumbra sign on MRI suggests abscess however MRI detection of changes in bone marrow can be evident in both, bone malignancy and osteomyelitis as seen in our case [8,9].

After completion of 6 weeks of IV antibiotics and oral rifampin, our patient was placed on oral suppressive therapy. He followed up with orthopedics and infectious diseases showing notable improvement and no recurrence of infection.

Conclusion

Staphylococcus aureus is the most common bacterial cause of osteomyelitis. This case shows the importance of differentiating between long bone malignancies and osteomyelitis. Prompt diagnosis and management can avoid complications such as pathologic fracture and prolonged recovery from surgical interventions. Definitive treatment of osteomyelitis with source control with surgical debridement and drainage, along with appropriate antibiotics plays a crucial role in minimizing morbidity, patients' overall health and well-being [5,10].

We hope to underline the importance of considering alternative diagnoses beyond cancer when evaluating long bone tumors, with the goal of preventing life altering complications.

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Ethical approval

All authors have agreed to authorship, read and approved the manuscript, and given consent for publication of the manuscript. Ethical committee approval was not applicable since this was not a study on patients or volunteers.

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.

CRediT authorship contribution statement

Dr Rivera was the orthopedic surgeon involved in patient's care. Dr Azhar was the infectious diseases physician involved in patient's care. **Tat W. Yau**: Conceptualization, Investigation, Data curation, Writing, Visualization. **Bennet D. Franz**: Conceptualization, Investigation, Data curation, Writing, Visualization. **Hanadi A. Osman:** Conceptualization, Resources, Writing, Visualization. **Jessica C. Rivera**: Conceptualization, Methodology, Investigation, Resources, Data curation, Writing. **Ashaur Azhar**: Conceptualization, Investigation, Resources, Writing, Supervision, Project administration.

Declaration of Competing Interest

All authors report no potential conflicts of interest.

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