Closed infected tibial plateau fracture and tibial tubercle avulsion: A case report

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**ABSTRACT**

**INTRODUCTION:** Acute hematogenous osteomyelitis in a closed fracture usually occurs pediatric and/or immunocompromised patients and only rarely in an immunocompetent patient.

**CASE PRESENTATION:** We report the case of a 44-year-old female patient who was diagnosed as acute hematogenous osteomyelitis in a tibial plateau fracture. Following a motorcyle accident she was diagnosed as having a subdural hematoma at the right parietal lobe and combined closed fracture of the left tibial plateau and avulsion of tibial tubercle. Intraoperatively a cloudy fluid was found at the fracture site of left tibial plateau that was cultured and grew *Staphylococcus aureus*. The risk factors for acute hematogenous osteomyelitis in a closed fracture of this patient were the subdural hematoma and multiple abrasion wounds around her left knee.

**CONCLUSION:** Not only open fractures have a risk of acute hematogenous osteomyelitis but closed fractures also have a chance of developing this infection. The surgeon should be concerned about this type of infection if the patient has risk factors such as evidence of head injury or multiple abrasion wounds.

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1. Introduction

Open fractures have a chance of infection with high incidences in Gustilo and Anderson types IIIA–C fractures. Infections rarely occur in closed fractures, but when they do are usually found in pediatric [1] or immunocompromised patients [2,3]. There are a few reports of closed fractures with acute hematogenous osteomyelitis, notably three cases of closed humeral fracture [2,4,5], two cases of femoral fracture [6,7] and one case of patellar fracture [8]. Herein we report the case of an active adult patient who was diagnosed with combined acute hematogenous osteomyelitis in combined closed tibial plateau fracture and tibial tubercle avulsion. This case was reported according to the SCARE criteria [9].

2. Case presentation

A 42-year-old Thai female had left knee pain after a motorcycle accident. She had developed drowsiness at the accident scene, and she was taken to the emergency room at our hospital. An acute trauma life support (ATLS) examination found a life-threatening condition, a subdural hematoma at the right parietal lobe. Her physical examination showed multiple shallow abrasion wounds over the left proximal tibia not involving the bone. She complained of pain at the lateral tibial plateau, with limited range of left knee motion due to pain. Anteroposterior and lateral radiographic images of the left knee revealed combined tibial plateau fracture and tibial tubercle avulsion (Fig. 1A–B) which was initially immobilized with a long leg slab. The initial results of serum investigations were white blood cell count 19,490/µL, hematocrit 26.7%, hemoglobin 8.6 g/dL, polymorphonuclear neutrophils 85.5%, lymphocytes 6.0%, eosinophils 0.2%, monocytes 8.2%, and platelets 336,000/µL. She was afebrile and admitted for close clinical observation in the intensive care unit for 3 days. There were no signs of wound infection at her left knee during the admission (Fig. 2). After the patient regained full consciousness, an open reduction and internal fixation with a locking plate (Synthes®) were performed on post-injury day 5. At the fracture site, a small amount of cloudy fluid was collected and sent for gram stain and culture. The fluid analysis showed *Staphylococcus aureus*. After the surgery, the patient was given intravenous ceftriaxone and clindamycin.

On post-operative day 3 the patient developed a fever and redness around the surgical wound (Fig. 3A–B), and she was investigated for sepsis. Chest radiograph showed no infiltration and a urine sample was clear. The erythrocyte sedimentation rate (ESR) was more than 140 mm/h (normal value 0–15 mm/h) and the C-reactive protein (CRP) was more than 19.2 mg/dL (normal value <0.6 mg/dL), which met the criteria for infection. Irrigation and debridement of the wound were then done on post-operative day 4 and the necrotic tissue removed. The infected site was copiously

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irrigated with 9 L of 0.9% normal saline. The necrotic tissue culture showed Staphylococcus aureus but the hemoculture was negative.

The patient continued to receive the combined intravenous ceftriaxone and clindamycin for another 10 days, and then they were switched to oral Augmentin for 4 weeks. Her clinical condition improved day by day. After the complete course of Augmentin the inflammatory markers (CBC, ESR and CRP) had disappeared. She was able to walk without aid and the plain radiograph of her left knee showed union of the left tibial plateau at a 4-month follow-up (Fig. 4A–B).

3. Discussion

Combined closed fracture and acute hematogenous osteomyelitis is rare. The surgeon should consider the origin of the pathogen which could be from soft tissue or the lymphatic or hematogenous systems [10–13]. The groups most at risk of developing an infection after a closed fracture are pediatric and immunocompromised patients. In the pediatric group, a closed fracture infection can develop after a silent infection such as an upper respiratory tract infection (URI) or urinary tract infection (UTI) which spreads
to the fracture site through the hematogenous and/or lymphatic routes. These infections usually show good response to antibiotics in pediatric patients, but they are hard to treat with only antibiotics in the immunocompromised group [2,3,14]. The immune system in immunocompromised patients is compromised for various reasons such as chronic infections, diseases such as DM or cancer, or prolonged steroid use.

In our case, the patient was a healthy female and the cause of infection was even established, although she had two risk factors, the subdural hematoma and multiple skin abrasions. The pathogen in this case was *Staphylococcus aureus* which can penetrate the subcutaneous tissue and reside in deeper tissues by destroyed the ability of the tissue to resist the bacteria [15]. If cloudy fluid or pus is seen during a closed fracture reduction, the surgeon should be aware of the risk of acute hematogenous osteomyelitis, and undertake irrigation and debridement, intraoperatively.

**Declaration of Competing Interest**

No conflicts of interest.

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**Ethical approval**

The present study was approved by the Prince of Songkla University Institutional Review Board, Faculty of Medicine, Songklanagarind Hospital, Prince of Songkla University (IRB number REC 63-194-11-1).
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.

Author contribution

Chaiwat Chuaychoosakoon — Preparation of case report, Literature review, Writing the paper.
Wachirapan Parinyakhup — Preparation of case report. Writing the paper.

Registration of research studies

None.

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