

# Osteomyelitis of the Fifth Toe after Human Bite

Tarik Zahouani\*, Claudia Lopez, Liliana Burdea, Anyelina De LaCruz, Patrick Polonio, Catalina Marino, Yekaterina Sitnitskaya

Department of Pediatrics of Lincoln Medical Center, New York, USA

\*Corresponding author: [Tarikzahouani@gmail.com](mailto:Tarikzahouani@gmail.com)

**Abstract** Human bite wounds are the third leading cause of bite wounds seen in the emergency departments. Osteomyelitis due to animal bite is well known. However there are very few reports of osteomyelitis secondary to human bite. We present a case of osteomyelitis of the fifth toe due to a human bite. A 13 year old previously healthy Male developed severe pain, redness and swelling with oozing from the wound, 2 days after sustaining a human bite to the right foot. The Magnetic Resonance Imaging (MRI) showed a mild T2 prolongation and enhancement within the proximal phalanx of the fifth digit consistent with osteomyelitis. He was treated for 4 weeks: Ampicillin/Sulbactam for 5 days followed by 11 days of Amoxicillin/Clavulanic and Clindamycin for 25 days. Human bite wounds are a source of serious morbidity with hand and foot wounds due to higher risk of infection. The oral cavity harbors more than 300 different bacterial species. The most common bacteria isolated from bite wounds are Streptococcus sp., Staphylococcal epidermis and Staphylococcus aureus. Anaerobes such as Eikenella, Fusobacterium, Peptostreptococcus, Prevotella and Porphyromonas species are also common. The teeth can cause a deep laceration implanting oral and skin organisms into the joint capsules causing septic arthritis or osteomyelitis with signs and symptoms appearing within 24 to 72 hours. The absence of fever or laboratory evidence of serious bacterial infection in our patient is due to non-hematogenous, contiguous nature of spread of infection. Without imaging by MRI, osteomyelitis would have been missed in this case. Though rare, human bites to the distal extremities should be suspected and assessed for underlying osteomyelitis using MRI to guide appropriate length of antibiotic treatment.

**Keywords:** Osteomyelitis, toe, human bite, Magnetic Resonance Imaging, antibiotic

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## 1. Introduction

Human bite wounds are the third leading cause of bite wounds seen in the emergency departments (ED). Although, the true frequency is difficult to estimate as most human bites are presumably unreported.[1] The human oral cavity harbors more than 300 different bacterial species and as such the majority of human bite wounds contain a mixture of organisms.[2] Thus an early estimation of infection risk, adequate antibiotic therapy and, if indicated, surgical treatment are essential to ascertain the best outcome and to prevent significant morbidity. [3] We present a case of osteomyelitis of the fifth toe secondary to a human bite.

## 2. Case Report

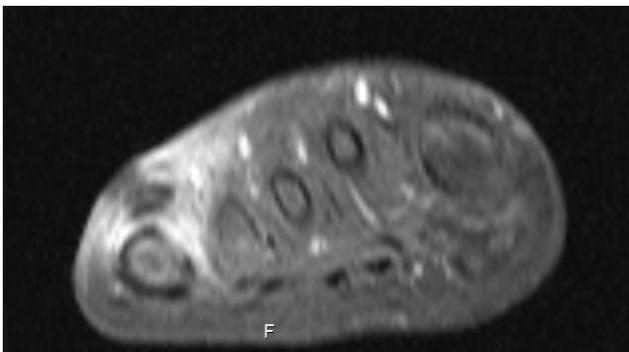
A 13 year old previously healthy Male developed severe pain, redness and swelling with oozing from the wound, 2 days after sustaining a human bite to the right foot. On arrival to the ED vital signs were: T: 97.7 F, HR: 64/min, BP: 90/42, RR: 20/min, O2 Sat: 100% on room air. On physical examination (PE), the patient was not sick-looking and had a 19x11cm area of swelling and

tenderness over the right foot, a 6x4cm erythema over the lateral dorsal aspect of the foot; and a central bite wound with necrotic borders and no discharge.

The range of motion in the lateral 3 toes and ankle were limited. A solitary 1cm mobile non-tender lymph node was palpated in the right inguinal area. The WBC count was 7.8 10<sup>9</sup>/l, and C-reactive protein (CRP) was 0.59mg/dL. Wound and blood cultures were negative. The right foot X-ray was unremarkable. The Magnetic Resonance Imaging (MRI) showed a mild T2 prolongation and enhancement within the proximal phalanx of the fifth digit consistent with osteomyelitis (Figure 1), a moderate soft tissue edema overlying distal and lateral metatarsals consistent with cellulitis, and a 1cm non-enhancing fluid collection within the dorsal soft tissues overlying the distal fifth metatarsal consistent with abscess (Figure 2). Orthopedic surgery was consulted and no intervention was deemed necessary. The patient was treated with Ampicillin/Sulbactam for 5 days. He remained afebrile throughout the hospital course. A decrease in swelling and erythema were noted in 2 days. The 4 weeks of treatment were completed with Amoxicillin/Clavulanic for 11 days and Clindamycin for 25 days. The patient did not present at follow up visit in 1 week, but the mother was contacted over the phone and stated that the patient was ambulating without limp and the wound had healing.



**Figure 1.** Enhancement within the proximal phalanx of the fifth digit



**Figure 2.** Non-enhancing fluid collection within the soft tissue

### 3. Discussion

Human bite wounds are the third leading cause of bite wounds seen in ED after dog and cat bites, accounting for 3.6% to 23% of all bite wounds. [1] Although post injury rates of infection can be minimized through early administration of proper wound care principles, human bite wounds are a source of serious morbidity with hand and foot wounds having higher risk of infection. [4] A majority of human bite wounds contain a mixture of organisms and its microbiology varies with the oral cavity and skin flora. The oral cavity harbors more than 300 different bacterial species with concentrations of bacteria ranging from 108 colony forming unit/ml (CFU/ml) in saliva, to 1011 CFU/ml on tooth surfaces. The most

common bacteria isolated from bite wounds are *Streptococcus* sp., *Staphylococcal* epidermis and penicillinase producing *Staphylococcus aureus*. Anaerobes such as *Eikenella*, *Fusobacterium*, *Peptostreptococcus*, *Prevotella* and *Porphyromonas* species are also involved. [2] Viral pathogens including hepatitis, human immunodeficiency virus, and herpes simplex virus are also transmissible by human bites, although clinical descriptions have been limited to case reports [1,3].

Human bites are classified according to the mechanism of injury into clenched-fist injuries or occlusion bites. Clenched-fist injuries primarily occur among males when a closed fist strikes another individual's teeth creating an injury over the dorsal surface of the third, fourth and fifth metacarpophalangeal (MCP) joints. They are the worst human bites due to the soft tissue penetration by the wound and the bacterial inoculation inside avascular structures such as the MCP joints. Occlusion bites occur with similar frequency in males and females when there is sufficient force to break the tissue. They commonly present as elliptical or ovoid patterns of ecchymosis or abrasions. Due to the morphology of the human incisors and canines, these bites usually compress tissue without avulsing it unlike animal bites [1,5].

Human bites are generally more serious than animal bites with a severity ranging from superficial abrasions, tears, and crush wounds to degloving injuries with major tissue loss, extending to the underlying bone. Human bites generally do not cause immediate symptoms in addition to the laceration injury. However, the teeth can cause a deep laceration that implants oral and skin organisms into the joint capsules or dorsal tendons, thus causing septic arthritis or osteomyelitis with signs and symptoms appearing within 24 to 72 hours. The signs of infection include redness, swelling, clear or purulent discharge, pain, fever and malaise. The adjacent lymph nodes may be enlarged, and range of motion of an extremity can be reduced. [5,6] Our patient had no symptoms of systemic infection.

Leukocytosis may occur, with 15,000 to 30,000 cells/mm<sup>3</sup>. The ESR or CRP can help in cases of osteomyelitis and septic arthritis to determine the duration of antimicrobial therapy. [6] Wound culture should be performed for wounds that appear infected. Diagnostic imaging is indicated for penetrating injuries overlying bones or joints, for suspected fracture or to assess foreign body inoculation [4].

The absence of fever or laboratory evidence of serious bacterial infection in our patient is due to non-hematogenous, contiguous nature of spread of infection. Without imaging by MRI, osteomyelitis would have been missed in this case.

Osteomyelitis is one of the rare but feared complications of a human bite wound. Deep penetration of a tooth, delayed initial treatment, inadequate initial debridement and initial suturing of the wound are factors implicated in the development of osteomyelitis [7].

Management of human bites is based on proper local wound care and use of antimicrobial agents when needed. Careful examination of the wound is crucial to determine the depth, type, location, range of motion, joint involvement, and nerve and tendon damage. [6] Irrigation is one of the most important means of infection prevention. The wound should be vigorously irrigated through a 19

gauge needle with isotonic sodium chloride (100-200 mL/inch of wound). Larger dirty wounds may require irrigation in the operating room. Debridement of the wound edges and nonviable tissue helps prevent infection. Debrided material should be sent for aerobic and anaerobic culture analysis.<sup>1</sup> Primary closure is contraindicated for human bites (except on the face) [5].

The ascertainment of the patient's tetanus immunization status is necessary with administration of tetanus toxoid and/or tetanus immune globulin when required. Human bites can transmit other infection including hepatitis viruses B and C, primary syphilis and herpes simplex virus. Post-exposure prophylaxis is not recommended as the risk for HIV transmission through saliva is very low [6].

All patients with human bite wounds, regardless of the appearance of the wound, should undergo antibiotic prophylaxis. The treatment of choice is amino-penicillin with a beta-lactamase inhibitor. The duration and route of antibiotic therapy should be individualized based on the site involved, the culture results and the response to treatment [1].

#### 4. Conclusion

The majority of human bites in children are superficial and do not become infected. These wounds can appear innocuous initially, but follow up is necessary since a serious infection can develop. Persistence of pain, loss of function and erythema are notorious signs of possible complications including osteomyelitis which can be

tenacious and prone to relapse after adequate initial treatment. Proper wound care, early wound debridement, antibiotic prophylaxis and follow up should be administered to all patients who present with bite injuries.

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