



Human Bites Resulting in Hand Infections: Is Eikenella a Bug of the Past?

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Abstract

Purpose: The purpose of this study was to determine the incidence of infections related to Eikenella C. and other microorganisms involved in human bite injuries.

Methods: A retrospective chart review of patients evaluated for human bite to the hand from April 2007 to October 2011 was performed. ICD-9 codes E928.3 ("human bite") and E928.7 ("accidental, environmental causes") were used to identify patients.

Results: Forty-six patients met the inclusion criteria. The most frequently isolated microorganisms were Gram-positive aerobes (58%), of which 32.4% belonged to Streptococcus species and 57.1% of Staphylococcus aureus isolated were resistant to methicillin (MRSA). Eikenella corrodens was isolated in 6.7% of specimens.

Conclusion: Timely surgical debridement and broad spectrum antibiotic therapy are paramount in treating hand infections from human bites. Eikenella corrodens and MRSA are important microorganisms related to human bites. Antimicrobial therapy should be tailored based on final culture results.

Background

Human bites and other wounds contaminated with oral flora are common and result in frequent visits to emergency rooms. Clenched-fist injuries are the most serious of the human bite wounds and are sustained as the patient strikes the mouth of another person resulting in a tooth impaling most commonly over third, fourth, or fifth metacarpal head. Besides penetration of the skin, the joint space, sub-tendon space, and the dorsal subcutaneous space may also be violated and contribute to a more deep seated infection. Figure 1 demonstrates the hand of a patient who was involved in a fight, punched his opponent in the mouth resulting in penetration of the tooth into 3rd MCP joint space. Successful management depends on timely diagnosis, appropriate cultures, early administration of broad spectrum empiric antibiotics and tailoring based on culture results; thorough emergent surgical debridement and irrigation, and close follow-up are crucial. Traditionally, hand infections as a result of clenched-fist injury have been associated with Eikenella corrodens. The purpose of the current study is to identify the incidence of cultured microorganisms as a result of human bites, which would contribute to the initiation of a more accurate antimicrobial empirical therapy.

Materials and Methods

A retrospective chart review of patients who presented to Mount Sinai Medical Center in Chicago (level 1 trauma center) for evaluation after human bite to the hand between the time period of April 2007 and October 2011 was performed. All the patients were appropriately evaluated by the Hand surgery service in a timely fashion. In order to identify these patients ICD-9 codes E928.3 and E928.7 were used, which represent "human bite" and "accidental, environmental causes", respectively. Inclusion criteria were patients who sustained a human bite injury, had a diagnosis of hand infection, had aerobic and anaerobic cultures taken with available culture results. Patients who did not have any cultures done were excluded from the study. Age, location, mechanism of infection, and culture results were recorded. Statistical analysis was carried in order to assess the incidence of various microorganisms in the culture results. Our study did not address co-morbidities, HIV status, treatment course, or functional outcome.

Results

A total of 46 patients were identified who met the inclusion criteria. Of those, 40 hand infections were the result of clenched-fist injury, 4 of human bite, and 2 of nail biting. The average age of

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Table 1: Incidence of cultured microorganisms. N: Absolute number; sp: Species; MRSA: Methicillin-resistant staphylococcus aureus.

Isolated Microorganisms	N (%)
Gram + aerobes	
Streptococcus sp.	24 (32.4)
Staphylococcus aureus/ MRSA	7/4 (9.5/ 5.4)
Coagulase-negative staphylococcus	8 (10.8)
Corynebacterium	4 (5.4)
Gram – aerobes	
Neisseria sp.	1 (1.3)
Haemophilus sp.	5 (6.7)
Gram + anaerobes	
Peptostreptococcus	6 (8.1)
Propionibacterium	3 (4.1)
Gram – anaerobes	
Eikenella corrodens	5 (6.7)
Bacteroides sp.	1 (1.3)
Fusobacterium	4 (5.4)
Prevotella	1 (1.3)
Gram – enterics	
Enterobacter	1 (1.3)
Klebsiella	1 (1.3)
Pseudomonas	2 (2.6)
Fungi	
Candida	1 (1.3)
Total	74 (100)

Total number of patients: 46

Clenched fist injuries: 40

Human bites: 4

Nail bites: 2

the patients was 26.4 years (range 9-57 years). The most frequently isolated microorganisms were Gram-positive aerobes (58%), of which 32.4% belonged to Streptococcus species. More than half (57.1%) of Staphylococcus aureus isolated was resistant to methicillin (MRSA). Gram-negative anaerobes were noted in 14.7% of the isolates. Eikenella corrodens was isolated in 6.7% of specimens (Table 1).

Discussion

Human and other mammalian bite wounds are ubiquitous and account for 1% of all visits to hospital emergency rooms [1,2]. Most human bites result from aggression. In one study, the upper extremities accounted for the largest percentage of human bites (61.2%), and among specified bites of the upper extremities, bites of the hand including the thumb and fingers accounted for 55.4%; the shoulder, arm, forearm, and wrist accounted for the remainder [3].

Hand wounds have been shown to have a twofold increased risk for infection compared with wounds elsewhere [4]. Approximately 60% of hand infections are the result of trauma; 25% to 30% of these result from human bites, 10% to 15% from drug abuse, and 5% to 10% from animal bites [5]. Clenched-fist injuries are the most serious of the human bite wounds and if they involve penetration of the joint space or sub tendon dorsal subcutaneous space, they may lead to complications such as deep-space infection, septic arthritis, and osteomyelitis [6]. In Mennen's et al. [7] series of 100 patients, 27 presented more than 8 days after their injury, and the



Figure 1: Patient punched his opponent in the mouth resulting in penetration of the tooth into the 3rd MCP joint space.

amputation rate in their group was 66%. Hence, treatment must be initiated early with surgical exploration, washout, debridement, and appropriate antimicrobial coverage with broad spectrum antibiotics regimen, followed by de-escalation of therapy based on final culture results. Finally, early rehabilitation should be initiated as soon as improvement ensues in order to prevent joint stiffness.

Infections of the hand secondary to human bites have been shown to be polymicrobial. Most infections are due to Streptococcus and Staphylococcus sp., with Eikenella corrodens involved in 7% to 29%. Goldstein et al. reports a 25% to 29% incidence of Eikenella [8,9]. Weinzwieg et al. [10] study in a county hospital revealed the following microbial incidence: 60% strep, 26% staph and 11% Eikenella infections. Our study revealed Gram-positive aerobes (58%), of which 32.4% belonged to Streptococcus species. More than half (57.1%) of Staphylococcus aureus isolated was resistant to methicillin (MRSA). Gram-negative anaerobes were noted in 14.7% of the isolates. Eikenella corrodens was isolated in 6.7% of specimens.

Conclusion

Eikenella Corrodens is still identified in cultures of human bite specimens and is a key player when it comes to antimicrobial therapy. Methicillin Resistant Staphylococcus Aureus (MRSA) is identified in cultures of human bite injuries in increasing numbers and should be taken into consideration in the empiric antimicrobial treatment protocols of human bite wounds. Appropriate cultures, surgical management with debridement, immobilization and elevation of the extremity, with appropriate culture specific antibiotics (which should also, be effective against MRSA) are the key components of successful therapy in human bite injuries to the hand.

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