

Cat Bite Infections of the Hand: Assessment of Morbidity and Predictors of Severe Infection

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Purpose To assess the overall morbidity of cat bites to the hand and identify risk factors for hospitalization after such an injury.

Methods All patients recently treated at our institution for cat bite injuries to the hand were retrospectively reviewed. We identified 193 patients in a 3-year period between January 1, 2009, and December 31, 2011. Patient demographics, medical history, physical examination findings, laboratory values, and long-term follow-up data were collected. Univariate and multivariate statistical regression were used to analyze the data.

Results Thirty percent (n = 57) of patients with cat bites to the hand were hospitalized. The average length of stay for these patients was 3.2 days. Of the hospitalized patients, 67% (n = 38) underwent irrigation and debridement, with 8 patients requiring more than 1 operation. Complications were common among these patients. Risk factors associated with hospitalization included smoking, immunocompromised state, and location of bite over a joint or tendon sheath. Physical examination findings of erythema and swelling at presentation were also associated with increased risk of hospitalization. Time from bite to presentation, white blood cell count, erythrocyte sedimentation rate, and C-reactive protein values at presentation were not associated with hospitalization.

Conclusions Cat bite injuries to the hand can progress to serious infection. The treatment of such infections often requires hospitalization, intravenous antibiotic therapy, and operative treatment. Clinical findings suggestive of the need for hospitalization include location of the bite over a joint or tendon sheath, erythema, pain, and swelling. These findings should increase concern for a severe infection and warrant hospitalization and urgent consultation with a hand surgeon. (*J Hand Surg Am.* 2014;39(2):286–290. Copyright © 2014 by the American Society for Surgery of the Hand. All rights reserved.)

Type of study/level of evidence Therapeutic III.

Key words Cat bite, animal bite, infection.

ANIMAL BITES ACCOUNT FOR approximately 1% to 2% of emergency room visits each year in the United States. The majority of these bites come from dogs (60%–90%), although a noteworthy

percentage comes from cats (10%–15%).^{1–3} Dog bites tend to be mechanically destructive as a result of a tearing action of blunt teeth and strong jaws. Cats, however, have very sharp teeth that can deeply penetrate soft tissues and inoculate bacteria into closed spaces, such as tendon sheaths, joints, and bone.^{4,5}

The most common pathogen implicated in animal bites is *Pasteurella multocida*. *P. multocida* is a small, Gram-negative, non-spore-forming coccobacillus that is part of the normal oral flora of many animals including dogs and cats.^{6,7} The bacteria are found in the oral cavity in 70% to 90% of healthy cats.^{8,9} In a study by Westling et al,¹⁰ 80% of infected cat bite

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wound cultures grew *Pasteurella* strains. Infected cat bites typically present as erythema surrounding the puncture wound(s). More severe infection is manifested by abscess formation, septic arthritis, tenosynovitis, osteomyelitis, and rarely, bacteremia.^{6,11}

Cat bites have a propensity to occur in the upper extremity with 45% to 85% of bites involving the hand or wrist.^{1,12} Cat bites to the hand pose a major risk of morbidity and can result in varying degrees of infection. Treatment options include observation alone, outpatient oral antibiotics, hospitalization for intravenous antibiotics, and if indicated, surgical irrigation and debridement. No widely accepted treatment algorithm for bites to the hand exists, so clinicians rely solely on judgment for each patient. Although early prophylactic antibiotic use following cat bites to the hand decreases infection rates from 28% to 2%,¹³ predicting which patients will fail outpatient antibiotic therapy and require hospitalization remains a difficult. Previous studies have shown that hospitalization rates for cat bites range from 30% to 40%, with the indication for hospitalization being administration of intravenous antibiotics and possible surgical treatment.^{4,6,14}

The literature lacks studies that focus on upper extremity bite injuries. The superficial proximity of tendon sheaths and joints in the hand places them at risk for inoculation by the sharp teeth of cats. Despite a benign outward appearance, a serious infection involving the tendon sheath or joint may be present. Anecdotally, definitive treatment may require multiple operations and prolonged antibiotic therapy, occasionally with major sequelae. We sought to review our experience with these injuries in order to determine the incidence of infections requiring hospitalization and operative treatment and to identify factors predictive of the need for such intervention.

METHODS

Patients treated at our institution for cat bite injuries to the hand were retrospectively reviewed over a 3-year period between 2009 and 2011. Study approval was obtained from the institutional review board. All patients presenting to the emergency department or primary care setting with a primary complaint of cat bite to the hand or wrist were included. Patients with bites proximal to the wrist were excluded. We identified 196 patients who fit these criteria. Three patients were excluded with bites from wild cats specifically identified as a lynx or bobcat. Patient demographics, medical history,

physical examination findings, laboratory values, hospital course (if applicable), and long-term follow-up data were collected. Detailed location of the bite was noted when possible. No standard criteria or algorithm was used to determine the initial treatment of bites. Not all patients had complete data for each variable.

We examined multiple variables to identify those that are associated with hospitalization in the treatment of cat bite infection (Table 1). Descriptive statistics are reported as number and percentage or mean (SD) as appropriate. Univariate logistical regression was used to identify variables associated with hospitalization. Backward selection was used to identify the final multiple variable model, also using logistic regression. Observed risk is reported for each variable. An alpha level (*P*) of .05 was considered to be statistically significant.

RESULTS

Of the 193 patients, 69% were female and the mean age was 49 years. Approximately half of the patients at our institution presented initially to the emergency department (51%) with the others presenting first to primary care. Mean time from bite to presentation for medical care was 27 hours (range, 1–240 h). Thirty percent (*n* = 57) of patients with cat bites to the hand were hospitalized. The average length of stay for these patients was 3.2 days. Of the 193 patients, 36 were directly admitted upon presentation, 154 were treated as outpatients with oral antibiotics, and 3 were not treated. Twenty-one patients failed outpatient antibiotic treatment and were subsequently hospitalized (14% failure rate). Twelve of these 21 patients (57%) who failed outpatient antibiotics ultimately underwent irrigation and debridement. Twenty-six of the 36 (72%) patients admitted upon initial presentation underwent irrigation and debridement. Eight patients required more than 1 operation. Complications of infection were common and included abscess formation (*n* = 6), tendon involvement (*n* = 14), nerve involvement (*n* = 2), and loss of joint mobility following resolution of infection (*n* = 14) as noted in follow-up visits. Risk factors associated with hospitalization are shown in Table 1. Multivariate analysis identified the following as independent risk factors for hospitalization: location of bite over joint/tendon sheath versus soft tissue and physical examination findings of erythema and swelling. Time from bite to presentation, white blood cell count, erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) values at presentation were

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