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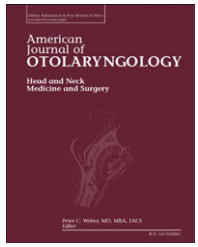

Dog bites of the head and neck: an evaluation of a common pediatric trauma and associated treatment

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ABSTRACT

Purpose: To identify which patients and canines are involved in dog bites of the head and neck, and how they impact health systems.

Materials and methods: This is a single center, retrospective cohort study conducted from January 2012 to June 2013 in an academic, tertiary care center situated between multiple suburban and urban communities. Patients were identified by queried search for all bite-related diagnoses codes.

Results: 334 unique dog bites were identified, of which 101 involved the head and neck. The mean patient age was 15.1 ± 18.1 years. Of the more than 8 different breeds identified, one-third were caused by pit bull terriers and resulted in the highest rate of consultation (94%) and had 5 times the relative rate of surgical intervention. Unlike all other breeds, pit bull terriers were relatively more likely to attack an unknown individual (+31%), and without provocation (+48%). Injuries of the head and neck had an average follow-up of 1.26 ± 2.4 visits, and average specialty follow-up of 3.1 ± 3.5 visits.

Conclusions: The patients most likely to suffer dog bite injuries of the head and neck are children. Although a number of dog breeds were identified, the largest group were pit bull terriers, whose resultant injuries were more severe and resulted from unprovoked, unknown dogs. More severe injuries required a greater number of interventions, a greater number of inpatient physicians, and more outpatient follow-up encounters. Healthcare utilization and costs associated with dog bites warrant further investigation.

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1. Introduction

Animal bites are a preventable public health issue, and yet these injuries have been on the rise. Canine bites became a national concern with the 1985 CDC release that reported as many as 4.7 million Americans are annually bitten by dogs [1]. Of these 4.7 million people, approximately 800,000 dog bite victims seek medical care [1]. At the time of this report, dog bites were not a new issue; this CDC report was one of the first times this type of injury shifted from a local or regional concern to the national stage [2]. Despite this national attention, the rate of dog ownership has continued to increase. In 2001, Shuler and her colleagues estimated that nearly 70 million dogs are owned in the United States, and that over 112 million people, or 40% of the population, have at least one dog in their home [3]. With this increase in ownership, it is now estimated that lifetime risk of being bitten by a dog approaches 50% [4].

Dog bites account for over 80% of mammalian bites [5]. Dog bites, unlike the bites of cats, rats or human are crush injuries [2,6]. At first glance, these injuries can appear less severe than wounds from these other bites because the superficial tissue may remain intact. While the dermis may not be broken, the underlying tissue may still be devitalized by crushing, tearing, and/or avulsing the supporting blood supply [6]. The force applied by a dog's jaw is often estimated to be between 300 and 450 pounds per square inch (PSI) [5,7]. There are reports of some canine bites having forces of upwards of 1800 PSI, but the primary sources for this claim cannot be verified [8–11]. The force generated from some dog bites can fracture bone, dependent on the patient, dog breed and site of bite [12,13].

Dog bites injuries found in the head and neck disproportionately affect children, and have been previously reported to account for 3%-4% of all pediatric emergency visits, and up to 40% of all pediatric traumas [14–18]. These injuries can lead to disfiguring scars and lengthy treatments. The need for facial plastic and reconstructive surgery and scar revisions for these injuries has been previously reported to be as high as 77% for these patients [7]. The treatment of dog bite injuries has been reported as the 5th most common ICD-9 code used by plastic surgeons [19]. Primary closure of open dog bite injuries of the head and neck is an accepted treatment due to the significant morbidity associated with scarring from healing from secondary intention [20–25].

Due to the significant morbidity and controversy surrounding dog bite injuries, this investigation was initiated to identify which patients and canines are involved in these injuries of the head and neck, and how these injuries are currently treated. The *objectives* of this study include the following: 1) describe the patient population that suffer dog bites in the head and neck, 2) determine the dog breeds and circumstances responsible for these head and neck injuries, and 3) evaluate the current treatment and follow-up care associated with dog bite injuries of the head and neck. We sought to test the following *hypotheses*: 1) The patients who present with dog bite injuries of the head and neck will be significantly younger, than those bitten in other anatomical locations. 2) The dogs responsible for these injuries will be known to the patient and will be more likely to bite these patients after they are provoked. 3) We further hypothesized that the most severely injured patients would require significantly more resources, measured by consultation, operations, and follow-up.

2. Materials and methods

This is a single center retrospective cohort study conducted using patient data from January 2012 through June 2013. The study was performed at the University of California Davis Health System, a public, academic, tertiary care center, which is situated between multiple suburban and urban communities in Sacramento, California. UC Davis is one of three trauma centers in the greater Sacramento area, and is the sole Level 1 Trauma Center for a catchment area of over two-million people. Prior to the initiation of this study it was approved under the supervision of the UC Davis Institutional Review Board.

Patients in the UC Davis Electronic Medical Record (EMR) were identified by queried search for all bite-related chief complaints and bite-related diagnoses codes (Emergency Department (ED) and/or admit). Patients with non-dog bite injuries were excluded from the study. For each encounter, the following information was extracted from the EMR: date of service, medical record number, name, age, sex, length of stay, chief complaint, diagnosis code, location of incident, insurance provider, and discharge date and time. Further data were extracted from the primary encounter narrative and all subsequent follow-up visits. This extracted data included: time of incident, breed, bodily location of injury, dog's vaccination status, consultations, interventions, inpatient and outpatient antibiotics, relation of dog to patient, circumstances associated with the bite, tetanus and rabies vaccine administration, complications, and follow-up visit encounters. For clarity, the site of injury was dichotomized to *general population (GP)* of patients where bites affecting the body

Table 1 – Dog Bite Complication Index.

Label	Description	Score
Minor	3 cm or smaller simple laceration Without join involvement Without laceration/breaking of dermis in hand or foot	1
Mild	Greater than 3 cm simple laceration Can involve hands or feet Can involve the face, without neck or eye injury Does not involve poorly vascular structures (joints, cartilage, etc.)	2
Moderate	Greater than 3 cm complex lacerations Requires surgical exploration of wound or surrounding structures Involvement of poorly vascular structures Involvement of neck or eye	3
Severe	Tissue maceration Bone involvement Avulsion and removal of tissue Other destruction of vascular supply	4