

ANIMAL BITE INJURIES IN MAXILLOFACIAL REGION: A REVIEW

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ABSTRACT-

Facial Soft tissue and Hard tissue lacerations of the head and neck region are one of the most common consultations for oral and maxillofacial surgeons in the emergency department. Bite injuries to the aesthetic region like face, head and neck region can result in facial disfigurement with distressing physical, mental and psychological consequences of the patient. Animal bite wounds are most commonly occur on the upper extremities of the body, especially the hand, but some time large percentage are also located on the face as well as head region. The most frequently affected areas are the lips, chin, ears, and nose. It is particularly problematic if large areas of soft tissue in the head region are lost or amputated. An optimal aesthetic result sometimes can only be achieved by extensive surgery such as local flaps or microsurgical replantation. The aim of this study was to establish recommendations for treating animal bite wounds on the face and head based on analysis of our own cases and to discuss the problem of soft tissue loss. The clinical signs and symptoms and proper management of infected animal bite wounds are vary according to the animals and causative organisms. These kinds of wounds have always been considered complex injuries contaminated with a unique bacteria. This article reviews various animal bite in maxillofacial region, incidence, bacterial implications, risk factors associated with bite injuries and their complications. Animal bite wounds are commonly located on the face, head and neck an oral and maxillofacial surgeon needs to be familiar with the treatment modalities of animal bites, and their various surgical management and educate patients on ways to avoid future bite injuries.

Keywords: *Animal bites, Facial wounds, Bite wounds, Maxillofacial injuries, Human bites, Soft tissue injuries,*

Introduction:

In rural communities, human facial injuries are commonly inflicted by animals as well as occurring in urban areas¹. The most common bites are by dogs, generally attacked by pet. The children being the most affected². Dog bites constitute the majority (85–90%) of animal bites followed by cats (5–10%), humans (2–3%) and rodents (2–3%)(3). The animals are classified as small or medium size animals i.e cat, rat, dog and large size animals like cattle, buffalo, donkey, horse, et al¹. Commonest animals involved in a previous reports are cows, dogs and donkeys. Generally, injuries caused by animals were superficial and minor, most of which were soft tissue wounds only, without a bone fracture. Only a few cases had deep reported that can cause lacerations, damage to a blood vessel/ nerve or bony injury (1).

One of the causes of facial injuries are human bite arising out of aggressive human behaviour and can involve various structures like ears, eyelids, nose, cheek and lips⁴. Oral cavity contain bacteria flora and carry the risk of being infected. When there is partial or total loss of structure(s) of the face it is present as a surgical challenge⁴. The most common bacteria found in human bite is *A. streptococcus*². Human bites have been categorized as being dangerous bites owing to mixed bacterial flora of oral cavity. Patients presenting with human bite facial injuries usually require hospital admission for initial treatment in form of antibiotic coverage, analgesia, local wound management in the form of dressings and investigative work up for reconstruction which is cosmetically acceptable⁵

Bite force are frequently exaggerated or unsupportable. It is technically difficult to measure bite force (and pressure, which is force per unit area). There is only moderate correlation between weight and bite strength, except at the extremes of size. Beyond that the obvious finding is that larger dogs have the potential to inflict greater damage than smaller dogs⁶.saliva containing blood can only transmit of bloodborne viruses. The tissue damage, infection and psychological distress, are the main complications of mammalian bites³.

Animal bites can result in three main types of soft tissue trauma, namely punctures, lacerations, and avulsions, with or without an actual tissue defect. The typical dog bite results in a combination of torn tissues and adjacent punctures, the so-called ‘‘hole-and-tear’’ effect.(7)

Following are the risk factors for dog bites include:

- Children under 5 years of age
- Male gender
- Households with dogs, and
- Male, unsterilised dogs(3).

Approximately 0.2% cases visited to emergency department visits is related animal. In a previous study 27 of 333,687 dog bite-related injury visits to emergency department in the United States from 1992 through 1994 . The injury severity score is a standardized assessment of trauma-related injuries; scores range from 0 to 75, with a low score indicating a less severe injury. And 1.6 to 2.0/100,000 adults ≥ 20 years old.²⁹ Incidence in California has been reported as 2.6/100,000 persons,³⁰ whereas incidence in Kansas City, Mo, has been reported as

4.3/100,000 persons(6).

The most common complications are infections, occurring in 30% of cases and including *Staphylococcus aureus*, *Pasteurella multocida*, *Staphylococcus intermedius*, *Alpha-haemolytic streptococcus* and *Capnocytophaga animalis*.

Infection risk according to species

Dog bites

Approximately up to 18% of dog bites become infected, however, this percentage increases when the hand is involved. The microbiology of dog bite wounds is polymicrobial, with a mixture of aerobes and anaerobes. Of particular importance is the presence of species isolated in 50% of dog bite wounds. *Pasteurella* species are the predominant organism in the oral flora of many animals, and is noteworthy because it produces a characteristic rapidly progressive skin and soft tissue infection and is generally resistant to flucloxacillin, first generation cephalosporins and clindamycin(3).

Cat bites

Twenty-eight to 80% of cat bites may become infected, with *P. multocida* isolated in 75% of cases. *Bartonella henselae* (the causative organism of cat scratch disease) can be transmitted via the scratch or bite of an infected cat or cat flea, and 30% of Australian cats are bacteraemic with this organism. In normal hosts, this is usually either asymptomatic or a self-limiting lymphadenitis but can be a life-threatening disseminated infection in an immunocompromised host(3)

Rodent bites

Rodent bites have an infection rate of approximately 10%. Rat bite fever is a disease caused by *Streptobacillus moniliformis* or *Spirillum minus* and should be considered in a case of systemic sepsis following a rodent bite. Treatment with penicillin or doxycycline is usually successful, however there are reports of serious complications such as endocarditis where mortality may be significant(3)

Monkey bites

Monkey bites can present zoo or laboratory workers. They Cercopithecine herpesvirus 1 (herpes simiae or B virus) infects old world macaque monkeys, can be transmitted by a bite or scratch. There is little data on the efficacy of postexposure prophylaxis; nonetheless expert opinion recommends 14 days of oral valacyclovir for moderate to high risk macaque monkey bites or scratches(3)

Bat bites

Australian bat lyssavirus (ABL) has been transmitted from bat bites. All bats in Australia can potentially transmit ABL, and considering the almost universal fatality rate of this disease, all bites should receive postexposure prophylaxis for rabies.(3)

Human bites

Human bites have a higher complication and infection rate than animal bites. Hepatitis B and C can be transmitted by human bites and human immunodeficiency virus (HIV) transmission has occurred on at least five occasions, mostly in the setting of bloody saliva and late stage HIV

disease(3). In addition to bites analogous to animal ones, human bites include a specific type of wound named “clenched-fist injury” (CFI), resulting from the forcible contact of the clenched fist of an assailant with the anterior upper teeth of his opponent

Management & Prognosis-

The steps followed in the management of the injuries included:

- Skin preparation and anesthesia
- Proper surgical toilet of the wound by irrigation.
- Meticulous but not overzealous debridement of devitalized tissue [Resection of skin tags, Removal of visible foreign particles]
- Primary closure of the wound except in the high risk cases.
- Appropriate antibiotic therapy.
- Tetanus and rabies immunization.
- Follow-up.

On arrival, all the patients were subjected to general examination by a pediatrician/physician depending on age of patient. vitals (pulse, temperature, respiratory rate, blood pressure) were recorded, examination for other associated injuries was carried out. Foundational to immediate wound care is appropriate hemostasis and anesthesia. Antibiotic therapy is indicated for infected bite wounds and fresh wounds considered at risk for infection. Antibiotic therapy (a combination of amoxicillin and clavulan acid) and other combinations of extended-spectrum penicillins with beta-lactamase inhibitors offer the best in vitro coverage of the pathogenic flora. Facial injuries may require complex repair and reconstruction with appropriate surgical referral. Initial treatment consists of thorough debridement and irrigation, local wound cleansing, careful excision of necrotic tissue, primary closure where feasible and secondary reconstruction in others. The surgical approach to bite injuries includes primary closure of the wound whenever possible. Postoperatively, attention to patient counseling, dressings, ointment, cleaning, and scar revision help assure an optimal outcome for the traumatized tissue. Sometimes the challenges of reconstruction of such defect could be great. Wound management with minimal debridement and closure gives good results on the face

DEFINITIVE TREATMENT-

Tetanus prophylaxis is an integral part of the treatment of any dog or cat bite and should take place in the treatment of human bites too . Depending on the immunisation status of the patient, the standard of care includes the administration of tetanus toxoid if a booster injection has not been given within the last five years, followed by immunoglobulin administration in non-immune patients.

Rabies prevention should be considered after dog bites that indicate such measures depending on the local incidence of the disease. Prevention of HIV transmission using antiviral medications including zidovudine (AZT), lamivudine (3TC), or indinavir (IDV), should be considered in human bites and clenched fist injuries, when particular risk factors are identified in the history .

Antibiotic choice

Bacterial infections from bite wounds are usually polymicrobial and are often mixtures of aerobes and anaerobes.

Dog and cat bites

The oral flora of dogs and cats frequently contain *Pasteurella* species, in contrast to human oral flora. Empirical antibiotic therapy for both prophylaxis and established infection in dog and cat bites should be directed against *pasteurella*, streptococci, staphylococci and anaerobes. Oral amoxicillin with clavulanate is the most useful drug, but for patients with a penicillin allergy other antibiotic combinations such as clindamycin plus ciprofloxacin, or clindamycin plus trimethoprim-sulfamethoxazole, may be used. Prophylaxis is generally given for 5–7 days, although there are no clear guidelines. Treatment of an established infection is usually for 7–10 days. Longer periods of intravenous therapy are required for more severe infections, especially those involving bones or joints.

Human bites

Human bite injuries transfer a larger number of bacteria than dog or cat bites due to a greater density of normal oral flora. Other important differences between human bites and dog and cat bites are the presence of *Eikenella corrodens*, the absence of *Pasteurella multocida*, and a higher frequency of beta-lactamase-producing organisms and anaerobes. The most commonly isolated organisms from human bites include alpha- and beta-haemolytic streptococci, *Staphylococcus aureus*, *Staphylococcus epidermidis*, corynebacteria, and *Eikenella corrodens*. *Eikenella corrodens* should be considered because of its unusual antimicrobial sensitivities; it is sensitive to penicillin and amoxicillin with clavulanate, but resistant to 'first generation' cephalosporins, methicillin and clindamycin. A Cochrane review of antibiotic prophylaxis after mammalian bites has concluded that the risk of infection is reduced with antibiotic prophylaxis after human bite injuries.⁴ Appropriate prophylactic antimicrobial choices for human bite injuries include amoxicillin with clavulanate. Alternative regimens for patients with penicillin allergy include clindamycin plus either ciprofloxacin or trimethoprim/sulfamethoxazole or doxycycline (to treat *Eikenella corrodens*). Prophylaxis for 5–7 days is reasonable (although not clearly defined in the literature), with longer periods required for infected wounds.

Tetanus prophylaxis

Complete management of bite injuries should include consideration of tetanus immunization. Any wound may be contaminated with tetanus spores, but wounds contaminated with dirt, saliva or certain types of wounds such as crush injuries and puncture wounds are more likely to be associated with tetanus inoculation. Patients presenting with bite wounds who have not been vaccinated in the past five years should be vaccinated. Those who are considered to have impaired immunity, and in whom the wound is considered to be tetanus-prone, should be considered for human tetanus immunoglobulin.

Discussion

Infected human bites may result in devastating consequences. Failure to recognize the destructive potential of infection so bone, tendons, joints, and soft tissue caused by oral microorganisms can lead to serious loss of intrinsic functions. Rapid prevention or resolution of infection by appropriate use of antibiotics and surgical treatment continues to be a therapeutic challenge. Facial injuries caused by animals are common, especially in China, the largest agricultural nation in the world. It is strongly recommended treatment should be performed as soon as possible. Adequate protective measures are necessary when animals are used for agriculture or kept as pets. Special attention should be paid to the use of antibiotics and administration of vaccines. Psychotherapy should be given when necessary. Preventive measures and awareness of the potential dangers of animals are needed to minimize the incidence of these injuries.(1)

Human bite facial injuries are complicated injuries with highest infection and complication rate of all mammalian bite injuries owing to wide range of bacterial flora in oral cavity.

In our study, males constituted majority of patients(11:1). Olaitan, et al , in their study on management of human bites of face found that the males outnumbered the females.

Maximum number of patients were in age group of 21-30 yrs (73%). DatuboBrown in his study of management of human bites of face found that females in the 3rd decade accounted for majority of patients.

In our study, **nose** was the commonest site of injury (80.76%) followed by ear (11.53%) and lower lip(7.69%). Henry FP et al in their study on human bite injuries observed that facial injuries due to human bites accounted for 84% of the injuries with ear accounting for 66% of facial injuries followed by nose, chin, cheek and lips.

In our study, **retroauricular Eave's flap** was employed to reconstruct the helical rim defects observed in 3 patients with no complication. Schonauer F et al in their study of patients with helical rim defects employed retroauricular flap for reconstruction of helical rim in 57 patients with uneventful healing in 97% of cases. Danialli L, et al established the versatility of Post Auricular flap for helical rim defects 2.5 cm or larger.

Sinwar PD et al has also reported that traumatic auricular amputation due to human bite is not a common event and such bite wounds are likely to be contaminated with unique poly-microbial inoculums(17).

02 patients in our study having sustained Middle third lip defects were managed by debridement and primary suturing. Uchendu reported a five year series consisting of 37 cases of human bite to the lip. All the patients underwent primary closure of the lip defects which was successful. Healing was uneventful in all the patients in our study group with no infective

complications(18).

Lindsey D, et al in their study of incidence of infection in cases of human bite injuries recorded the potential for infective complications to be between 10- 20%. None of the patients in our study group tested positive for HIV and Hepatitis owing to human bites(19).

Pretty IA, et al reported that viral transmission risk including HIV and viral Hepatitis due to human bites is a controversial subject.(20) Hepatitis C transmission due to human bite has been documented in case reports by Figueirido JF, et al (21) All the patients in our study group were administered antibiotics against Gram +ve, Gram -ve and anaerobes. Rittner AV, et al (22s) recommended the use of antibiotics in following human bites owing to the risk of infection.

Conclusion

Reference

1. Zhang Q, Zhang B, Zhang Z, Chen Q. The epidemiology of cranio-facial injuries caused by animals in southern-central China. *J Cranio-Maxillofacial Surg* [Internet]. 2012;40(6):506–9. Available from: <http://dx.doi.org/10.1016/j.jcms.2011.08.012>
2. Giraldo-ansio F, Garcfa-domfnguez MD, Abad-marifiez A. One-stage immediate reconstruction of partial auricular amputation by dog bite. 1997;260–2.
3. Looke D. Management of mammalian bites. 2009;38(11).
4. Olaitan PB, Ogbonnaya IS, Hospital NO, State E, Hospital NO. Management of human bites of the face in Enugu , Nigeria . 2007;50–4.
5. Sharma R, Singh K, Singh A. Profile of Human Bite Facial Injuries and Their Management. 2015;17(1):1–4.
6. Patronek GJ, Slavinski SA. Zoonosis Update. 2009;234(3).
7. Stefanopoulos PK, Dc MAJ. Management of Facial Bite Wounds. *Oral Maxillofac Surg Clin NA* [Internet]. 2009;21(2):247–57. Available from: <http://dx.doi.org/10.1016/j.coms.2008.12.009>
8. Ruskin JD, Laney TJ, Wendt S V, Markin RS. Treatment of Mammalian Bite Wounds of the Maxillofacial Region. *J Oral Maxillofac Surg* [Internet]. 1993;51(2):174–6. Available from: [http://dx.doi.org/10.1016/S0278-2391\(10\)80017-5](http://dx.doi.org/10.1016/S0278-2391(10)80017-5)
9. Goldstein EJC. Bite wound and infection. *Clin infect disease* 1992;14:633-38
10. Sherman KL , Lloyd KM, Luca Pytell DM, et al. Treatment and outcome of human bites in head and neck. *Otolaryngol Head Neck Surg* 2003; 128:795-801
11. Ambro BT ,Wright RJ, Heffelfinger RN. Management of bite wounds to head and neck. *Facial Plastic Surg* 2010;26:456-63
12. Olaitan PB, Antonia O,Uduezue, et al Management of human bites of the face in Nigeria. *Am Health Sci* 2007; 7:50-54
13. Datubo-Brown OD. Management of human bites of the face. *Postgraduate Doctor* 1988; 10(8):233-36
14. Henry FP , Purcell EM , Eadie PA. The human bite injuryA clinical audit and discussion

- regarding the management of this alcohol fuelled phenomenon. *Emerg Med J* 2007; 24:455-58.
15. Schonauer F, Vappalopal G, Martino S, et al. Versatility of the posterior auricular flap in partial ear reconstruction. *Plast Reconstr Surg* 2010;126:1213-21
 16. Danialli L, Payne E, Mathew TJ. Management and reconstruction of a helical rim defect with exposed cartilage. *Jr Plast Surg* 2013;13:74-75
 17. Sinwar PD. Auricle injury due to human bite - A rare case report and review literature. *Int J Surg Case Rep* 2015; 6C:5-7
 18. Uchendu BO. Primary closure of human bite losses of the lip. *Plast Reconstr Surg* 1993;91(7):136-39
 19. Lindsey D, Christopher M, Hollenbach J, et al. Natural course of the human bite wound: incidence of infections and complications in 434 bites and 803 lacerations in the same group of patients. *J Trauma* 1987;48:2745-48
 20. Pretty I A , Anderson G S, Sweet D J. Human bites and the risk of human immunodeficiency virus transmission. *Am J Forensic Med Pathol* 1999;20:232-39.
 21. Figueirido J F, Borges A S, Martinez R, et al. Transmission of hepatitis C but not human immunodeficiency virus type 1 by a human bite. *Clin Infect Dis* 1994;19:546-47.
 22. Rittner A V, Fitzpatrick K, Corfield A. Best evidence topic report. Are antibiotics indicated following human bites? *Emerg Med J* 2005;22:654-55.

LEGENDS-



FIG 1- DOG BITE



FIG 2- DOG BITE



FIG- 3 – CAT BITE



FIG 4- HUMAN BITE



FIG 5- RODENT BITE