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Review Article

Emergency Management of Animal Bites among Patients in Jeddah, Saudi Arabia

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Abstract

Animal bites are an important public health problem, with the common of bites coming from dogs, cats and humans. These may present as punctures, abrasions, tears, or avulsions. The force and relative bluntness of the teeth similarly increases the likelihood of a crush injury with devitalized tissue. The clinical presentation and appropriate treatment of infected bite wounds vary according to the animal and causative organisms. These wounds have always been considered complex injuries contaminated with a unique polymicrobial inoculum. The administration of animal bites is an indication poor area and most recommendations are built on small case series, microbiological data and expert opinion. The main controversies contain whether wounds must or must not undergo primary closure and the use of prophylactic antimicrobials.

Keywords: *Animal Bites; Bite Wounds; Human Bites; Soft Tissue Injuries*

Introduction

The exact number of bite wounds worldwide is hard to determine in light of the fact that numerous animal bites are never revealed. In 2012, there were around 70 million pet dogs and 74 million pet cats in the United States. Reports gauge 4.5 million dog bites for each year [1], and in 2008 this brought about around 316,000 emergency department (ED) visits [2]. Substantially more dog bites occur than cat bites. These two species represent the greater part of (nonhuman) mammalian bite wounds encountered in the ED.

Most animal bites are dog bites (80 - 90%). Cat bites make up approximately 10%, and bites from various animals and rodents likewise participate to these figures. Most animal bites happen on the furthest points; however the head and neck area is additionally regularly influenced. Animal bites to the face are most regularly made by dogs or cats. Of all dog bites, 9 - 36% happens to the head and neck district. The head and neck area is harmed in 6 - 20% of people who support cat bites. Kids are harmed more regularly in the head and neck locale than adults. Most bites happen in the late spring months in the late evening. Furthermore, most bites happen in the victim's home or in the home of a companion or relative. Frequently, the animal is known to the victim (e.g. a pet). For sure, a review examines by Kumar., *et al*. [3] demonstrated that in pediatric patients, dog bites to the head, face, and neck requiring neurosurgical discussion frequently are exacted by the family pet, much of the time a substantial breed puppy who has shown no past episodes of hostility. In such patients, as indicated by the investigation, the cranial vault is generally harmed, with the most successive damage being discouraged skull fracture.

The average age of patients with a dog bite are approximately 30 years, and 75% of all animal bite patients are less than 45 years of age [2]. The peak incidence of animal bites, specifically dog bites, occurs among children aged 5 - 9 years [4,5]. Hospital admission rates are higher at the extremes of age. Females are more regularly bitten by cats, while males are more regularly bitten by dogs (in spite of being "man's best friend") [6]. For dog bites specifically, men comprise a higher percentage of those presenting to the emergency department (110.4 versus 97.8 visits/100,000), but the sexes are nearly equal for those admitted to the hospital [3].

Major bacteria involved and Pathogenesis Mechanisms

Dog bites normally cause a devastating sort wound as a result of their rounded teeth and solid jaws. A grown-up dog can apply 200 pounds per square inch (psi) of weight, with some vast dogs ready to apply 450 psi [7]. Such extraordinary weight may harm further structures, for example, bones, vessels, ligaments, muscle, and nerves. The sharp pointed teeth of cats more often than not cause cut injuries and lacerations that may vaccinate bacteria into profound tissues. Diseases caused by cat bites for the most part grow quicker than those of dogs [8,9]. Limited literature is available on other mammalian bites. Domesticated ferrets are accountable for several documented cases of unprovoked attacks on young children and infants. The bites of foxes, raccoons, skunks, bats, dogs, and cats have been obviously linked to rabies exposure. Bites from monkeys, mainly macaques, are of worry due to the probability of transmission of B virus, a herpes virus that causes fatal infection in humans. Bites from large herbivores generally have a significant crush element because of the force involved [10]. Bites of the hand commonly have a high threat for infection as a consequence of the relatively poor blood supply of many structures in the hand and anatomic concerns that make suitable cleansing of the wound hard. Generally, the better the vascular supply and the easier the wound is to clean (i.e. laceration vs puncture), the lower the risk of infection [11].

A main worry in all bite wounds is following infection caused by bacteria, and, infrequently, viruses. With respect to dog bites, at least 64 species of bacteria are found in the canine mouth, and many resulting infections are polymicrobial (Table 1) [12-14].

Dog	Cat
Staphylococcus species	*Pasteurella* species
Streptococcus species	*Actinomyces* species
Eikenella species	*Propionibacterium* species
Pasteurella species	*Bacteroides* species
Proteus species	*Fusobacterium* species
Klebsiella species	*Clostridium* species
Haemophilus species	*Wolinella* species
Enterobacter species	*Peptostreptococcus* species
DF-2 or *Capnocytophaga canimorsus*	*Staphylococcus* species
Bacteroides species	*Streptococcus* species
Moraxella species	
Corynebacterium species	
Neisseria species	
Fusobacterium species	
Prevotella species	
Porphyromonas species	

Primate	Swine
Bacteroides species	*Pasteurella aerogenes*
Fusobacterium species	*Pasteurella multocida*
Eikenella corrodens	*Bacteroides* species
Streptococcus species	*Proteus* species
Enterococcus species	*Actinobacillus suis*
Staphylococcus species	*Streptococcus* species
Enterobacteriaceae	*Flavobacterium* species
Simian herpes virus	*Mycoplasma* species
Reptile	***Herbivore***
Aeromonas hydrophila	*Actinobacillus lignieresii*
Pseudomonas pseudomallei	*Actinobacillus suis*
Pseudomonas aeruginosa	*Pasteurella multocida*
Proteus species	*Pasteurella caballi*
Enterococcus species	*Staphylococcus hyicus* subsp
Clostridium species	*hyicus*

Table 1: *Common bacteria involved in dog, cat, primate, swine, reptile and herbivore bite wound infections include the following.*

Causes

Epidemiologic examinations have demonstrated that most dog and cat bites are not from stray animals. Somewhat, the animal is frequently the pet of the victim or an associate of the victim. In numerous animal bites in children, the animal was unintentionally provoked by the child. Baby swings have been linked to dog attacks [15]. A potential study by Touré [16] showed that hazard factors for dog bites to the face incorporate young age, a single-parent condition, and the presence of a German shepherd–type dog. In the study, which involved 108 facial dog-bite patients, 68.5% of victims were under age 16 years, with 33.3% of them aged 2 - 5 years; 91.3% of bites took place in a single-parent environment. A study by Rezac., et al. [17] indicated that human practices that increase the hazard of dog bites to the face incorporate twisting around a dog and putting one's face near a dog's face (76% and 19% of cases, respectively). Looking amongst people and dogs also increased the hazard (5% of cases). In the study, which included 132 cases, more than two thirds of those bitten were children.

Emergency Department Care

Most bite wounds can be managed in the ED. Basics of treatment is assessment, debridement, irrigation, and closure, if showed. Finish injury assessment periodically is demonstrated. Deliberately investigate bite wounds to recognize profound damage and devitalized tissue. Getting a sufficient investigation of a bite wound that has not been anesthetized is almost incomprehensible. Care ought to be taken to picture the base of the injury and, if material, to inspect the injury through a scope of movement. Debridement is a viable method for forestalling contamination. Expelling devitalized tissue, particulate issue, and clots keeps these from turning into a cause of infection, much like any remote body. Clean, surgical injury edges result in littler scars and advance speedier mending.

Irrigation is a key method for contamination avoidance. A 19-gage limit needle and a 35-mL syringe give sufficient weight (7 psi) and volume to clean most chomp wounds. As a rule, 100 - 200 mL of Irrigation arrangement per inch of wound is required [18]. Heavily sullied nibble wounds require more Irrigation.

Vast grimy injuries may require Irrigation in the working room. On the off chance that accessible, povidone-iodine arrangement has been appeared to be virucidal and is suggested for Irrigation by the US Centers for Disease Control (CDC) if there is worry for rabies. A 10% arrangement can be weakened (10 or 20:1) and used to both purify the surface of the injury too to inundate [19]. Additionally, iso-

tonic sodium chloride arrangement or faucet water is a safe, generally accessible, viable, and cheap flooding arrangement. Maybe a couple of the various different arrangements and blends of saline and anti-infection agents have any preferences over faucet water or saline [18]. If a shieldlike gadget is utilized, take care to keep the inundating arrangement from coming back to the wound, which diminishes the viability of the irrigation. It might be hard to properly inundate little cut injuries, particularly those dispensed by the teeth of a feline. Given that these have a higher rate of contamination, thought ought to be given to opening the injury with a 15-sharp edge surgical tool and making a 1 - 1.5 cm entry point that can be all around inundated and left open to recuperate by auxiliary goal [20]. Primary closure must only be considered in bite wounds that can be cleansed successfully. Bite wounds to the hands and lower extremities, with a delay in presentation (> 8 - 12 hours old), or in immunocompromised hosts, usually ought to be left open or treated by delayed primary closure [14]. Closure management decisions should be at the discretion of the provider after discussion with the patient and consultation with specialists if presented. Deep sutures must be prevented as they may act as a nidus for infection. If a bite wound includes the hand, consider immobilizing the hand in a bulky dressing or splint to limit use and promote elevation.

Studies evaluate the rate of infection of mammalian (dog, cat, human) bites to be almost 6 - 8% when closed primarily [21,22]. A study of dog bites showed developed cosmetic scores and no increased danger of infection with primary closure of wounds in multiple anatomic locations with provision of prophylactic antibiotics [21]. Facial wounds have a low danger of infection even when closed primarily because of their increased blood supply. A randomized clinical trial showed no increased risk of infection (without the use of prophylactic antibiotics) and improved wound healing times with primary closure of facial wounds from dog bites [23]. Specified the cosmetic implications of facial injuries, primary closure is thus desirable. Consider tetanus and rabies prophylaxis for all wounds. Anti-rabies management can be specified for bites by dogs and cats whose rabies status cannot be attained, or in foxes, bats, raccoons, or skunks in the Americas.

Oehler., *et al*. [24] recommended the following wound administration approach following animal bites, intended at avoiding severe complications:

- Culture for aerobes and anaerobes if abscess, severe cellulitis, devitalized tissue, or sepsis is present.
- Use saline solution for wound irrigation.
- Debride necrotic tissue and remove any foreign bodies.
- If fracture or bone penetration has occurred, radiography is indicated (MRI or CT may also be indicated).
- Initiate prophylactic antibiotics in selected cases (based on type and specific animal species involved).
- If methicillin-resistant Staphylococcus aureus (MRSA) is suspected, first-line antibiotics include trimethoprim-sulfamethoxazole, doxycycline, minocycline, and clindamycin [25].
- Hospitalization is indicated if fever, sepsis, spreading cellulitis, severe edema, crush injury, or loss of function is present; also consider hospitalization for patients who are immunocompromised or are likely to be noncompliant.
- Administer tetanus booster (if none given in past year) or initiate primary series in nonvaccinated individuals.
- Assess the need for rabies vaccine and immunoglobulin.

Emergency Treatment of Rabies

Eliciting a history of recent animal or bite exposures is of utmost importance, as many patients defined in the literature were primarily sent home by the emergency department. Postexposure prophylaxis (PEP) consists of wound cleaning, vaccination, and management of rabies immunoglobulin.

Prompt treatment, gave preceding the organization of immunization and immunoglobulin, comprises of the intensive cleaning of all nibble and scratch wounds with cleanser and water, 2% benzalkonium chloride, as well as a virucidal operator (i.e. povidone-iodine arrangement). Wound cleaning alone has been appeared to decrease the probability of rabies transmission in creature contemplates. Give twisted care as required; lockjaw prophylaxis is normally demonstrated, as are measures to avert bacterial contamination. Whenever proper, wound closure should be avoided [25].

Vaccines

The 2 rabies vaccines presently accessible in the United States are the human diploid cell vaccine (HDCV, Imovax) and the purified chick embryo cell vaccine (PCECV, RabAvert). Both are made for intramuscular organization and are equivalent in viability and wellbeing. The antibody takes 7 - 10 days to prompt a dynamic safe reaction, with invulnerability enduring around 2 years. Once a vaccination arrangement is started, it is normally finished with a similar antibody item, albeit no trials have been done to examine the impacts (valuable or unfavourable) of starting with one and completion with another [19]. Slight erythema might be normal with the two antibodies, yet any further skin changes ought to be accounted for to the wellbeing office to decide real need of immunization.

Rabies Immunoglobulins

Latent immunization with human rabies immunoglobulin (HRIG, HyperRab, Imogam) gives quick protection. The immunoglobulin evokes killing antibodies and has a half-existence of 21 days. Items are from hyperimmunized human contributor plasma and could possibly contain irresistible operators, despite the fact that this hazard is little auxiliary to beginning screening of benefactors. As of now, no archived transmission of unusual operators exists.

Neural tissue rabies immunizations should never again be utilized, despite the fact that they may in any case be utilized as a part of some creating nations [19]. In nations that can't manage the cost of the 5-measurement regimen, the World Health Organization (WHO) expresses that 2 regimens are accessible that satisfy their necessities. These have been utilized as a part of creating nations as trades for the more costly infusions. These infusions ought to be regulated in conference with the Centers for Disease Control and Prevention (CDC).

Postexposure Prophylaxis in Previously Unvaccinated Immunocompetent Persons

Human rabies immunoglobulin

Manage one dosage (20 IU/kg) to deliver infection killing antibodies. Regulate on day 0 in the meantime as the antibody. If not promptly accessible, the HRIG ought to be directed when it ends up plainly accessible up until and including day 7 of treatment. Focus however much of the measurements as could reasonably be expected in and around the injury (if wound area permits). The rest of the HRIG ought to be regulated intramuscularly at a site remove from the antibody organization [19].

Vaccine

Four doses (1 mL each) of either HDCV or PCECV antibody ought to be controlled on days 0, 3, 7, and 14. The principal dosage ought to be controlled at the earliest opportunity after presentation. It ought to be given intramuscularly into the deltoid muscle of grown-ups. In kids, it ought to be directed into either the deltoid muscle or the anterolateral part of the thigh. Try not to utilize the gluteal area, since this could bring about a diminished immunologic reaction. It is vital to give every one of the 4 dosages [19].

Postexposure Prophylaxis in Immunocompromised Persons

Immunocompromised people ought to get HRIG and the immunization as depicted above yet should, what's more, get a fifth measurements, on day 28. Any immunosuppressive operators ought to be quit amid rabies PEP unless vital and fundamental for administration of another condition. Also, serum ought to be tried to report seroconversion 1 - 2 weeks in the wake of finishing PEP. The rapid fluorescent focus inhibition test (RFFIT) ought to be utilized to verify that a fitting counter acting agent reaction has created. In the event that the patient does not seroconvert, the patient should proceed with administration with both the doctor and general wellbeing authorities [19].

Postexposure Prophylaxis in Previously Vaccinated Persons

Formerly vaccinated persons include those who have received the 3-dose preexposure series of HDCV, rabies adsorbed virus (RVA), or PCECV; a full PEP; or a previous vaccination with any rabies vaccine with a documented history of seroconversion. HRIG should not be managed. For the vaccine, manage 2 doses (1 mL each) into the deltoid muscle on day 0 and day 3.

Conclusion

Humans regularly sustain bites that often result in infection caused by the biter's oral flora as well as environmental bacteria. It is significant for providers to be familiar with the evaluation and management of bite wounds. Identify which are most likely to become infected and, if specified, which antibiotics are most effective.

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