



Management of Facial Animal Bite Injuries: A Literature Review

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ABSTRACT

Objectives: The purpose of the literature review study was to review protocol for management of facial animal bite injuries.

Materials and Methods: Literature review through pubmed database.

Results: Early management of facial soft tissue injuries due to dog bites markedly improved the rate of wound healing without increasing the risk of wound infection. Also operating fresh tissues before tissue inflammation or retraction allowed easier reconstruction and so better cosmetic results.

Conclusions: Early proper wound cleaning, surgical debridement, immediate primary closure and the 3 A (Antirabies vaccine, Antitetanus vaccine, antibiotics) ensure satisfactory results in management of facial soft tissue injuries due to dog bites.

Conflicts of Interest: No conflicts of interest

Keywords: Dog bite, Antirabies, Facial animal bite.

INTRODUCTION

Dog bites account for 0.3% to 1.5% of all pediatric presentations for medical attention and almost 50% of children have sustained dog bites. Dog bites occur more frequently in young children and have a higher risk of resulting in serious injury or death, usually from exsanguinations. Specifically, research has identified two age groups of children that are bitten most often: those under the age of 2 years, and those aged 9–12.^[1]

As a special type of wound, dog bite wound had its characters, such as high infection rate and serious complications. The local infection, sometimes even intracranial infection, of the facial dog bite wound was inevitable and unmanageable generally. Although some pertinent literature have been published about dog bite facial wound, prospective studies was rarely concerned. At present, controversial focus existed about facial dog bite laceration management: One is whether it's appropriate to perform immediate primary closure; another is whether it is essential to give prophylactic antibiotic.^[2] In order to get definite answer to this question we have done review of literature.



Patient And Method:

A literature review was conducted using pubmed database, from 2012 to 2022. The articles selected were in English, related to management of facial animal bite injuries using following words: Animal bite, Dog bite, Head and neck animal bites. It included only articles that described management of animal bite injuries in head and neck region. It excluded those articles that included animal bites in region other than head and neck.

MANAGEMENT

Principles of treatment^[3]:

- A. Wound management
- B. Passive immunization (inj. of immunoglobulin/anti-sera)
- C. Active immunization i.e. inj. of anti-rabies vaccine (ARV)

A) WOUND MANAGEMENT

Cleaning and disinfection

In order to release the pain of patients, local anesthetic was administered before wound cleaning. After covering with sterilized dressing to the wounds, aseptic carbamide was used to scrub the area around the wounds 2-3 times with 20% liquid soap and water. Subsequently, the wounds were alternately doused with 20% liquid soap and physiological saline, and then 3% hydrogen peroxide and physiological saline. The total cleaning time was not less than 15 minutes for each wound. A great quantity of 0.05% iodophors (1 portion 0.5% iodophors stock solution + 9 portions physiological saline) was used to disinfect the wounds, not less than 5 minutes. Caution, during the whole cleaning and disinfection procedure, the interior part of the wounds was more important than the surface of the wounds.^[4]

Debridement

All the inactivated tissues, coagulated blood, foreign material and seriously contaminated tissues were carefully removed to expose surrounding healthy tissue. It was essential to remain their integrity as far as possible, so as to be repaired afterwards. The last procedure of debridement was to douse the inside part of the laceration with 0.05% iodophors again, the sterile gloves, aseptic covers and surgical instruments were prepared for tissue repair. At this time, passive immunity, if necessary, should be given (Rabies Immunoglobulin or Rabies Antiserum). Regarding the importance of impaired facial organ or tissue, it was essential to remain their integrity which could be repaired afterwards.^[4]

B) Immunization against rabies and tetanus:

Patients should be assessed for tetanus immunization status, and treated with immunization or immunoglobulins if necessary (Table 1). Necessity of rabies prophylaxis should be assessed on a case-by-case basis.^[2]

Table 1. Tetanus prophylaxis after dog bites

HISTORY OF ABSORBED TETANUS TOXOID (DOSES)	TETANUS PROPHYLAXIS	
	Td	TIG
< 3 or unknown	Yes	Yes
≥ 3	No*	No

Td—tetanus-diphtheria toxoids, TIG—tetanus immune globulin.
*Yes, if ≥ 5 years since last dose.
Adapted from American Academy of Pediatrics.¹²

Guide for Post-Exposure Prophylaxis (PEP)



Category	Type of contact	Recommended Post Exposure Prophylaxis
I	Touching or feeding animals Licks on intact skin	None, if reliable case history is available.
II	Nibbling of uncovered skin Minor scratches or abrasions without bleeding	1. Wound management 2. Administer anti-rabies vaccine immediately 3. Convert Post Exposure Prophylaxis to Pre Exposure Prophylaxis if dog/cat remains healthy throughout the observation period of 10 days or if it is killed humanely and found to be negative for Rabies by appropriate laboratory techniques.
III	Single or multiple transdermal bites or scratches. Contamination of mucous membrane with saliva(i.e. licks) Licks on broken skin	1. Wound Management 2. Administer rabies immunoglobulin 3. Administer anti-rabies vaccine immediately Stop treatment if dog/cat remains healthy throughout an observation period of 10 days or if it is killed humanely and found to be negative for rabies by appropriate laboratory techniques.

a) Passive immunization (immunoglobulin/anti-sera):

Human Rabies Immunoglobulin (HRIG): 20 IU/kg body wt, maximum 1500 IU

Equine Rabies Immunoglobulin (ERIG) : 40 IU/kg body wt, maximum 3000 IU

Either of the above is to be used where indicated – i.e. all Category III bites and also Category II bites in case of immune-compromised persons.

Local infiltration of rabies immunoglobulin: RIG should be infiltrated in the depth and around each of the wounds to inactivate the locally present rabies viruses. Infiltrate as much as possible in the depth and around the wounds; remaining quantity, if any, is to be administered intramuscularly at a site away from the site where vaccine is administered. If RIG is insufficient (by volume) for infiltration into all the wounds, dilute it with sterile normal saline (up to twice or thrice the volume). Infiltrate into all Category III wounds. ^[3]

b). Active immunization (Vaccination):

Route of inoculation: Intramuscular or Intradermal.

Site of inoculation: Deltoid muscle or anterolateral part of thigh. Not recommended in gluteal region, since there is chance of low absorption due to presence of fatty tissue.

Post exposure Vaccine schedule:

The vaccination schedule may be either of the following. However, in healthcare institutions, the latter (Intradermal Regimen) is more cost effective and is mandatory in State Government set-ups except in documented exceptional cases.

I) Essen Intramuscular Regimen:

- Standard intramuscular regimen.
 - One dose (0.5ml or 1ml) each into deltoid on day 0, 3, 7, 14 and 28.
- Locally infiltrate anti-rabies immunoglobulin on day 0 as described under Passive Immunization.
- In IM route of ARV, switching between brands does not make any difference.

ii. Intradermal Regimen (approved in India)

2 site regimen (Updated Thai regimen)

Dose: 0.1 ml

Site: Upper arm over each deltoid /antero-lateral aspect of thigh

Schedule: 2-2-2-0-2

Day 0 - 2 sites

Day 3 - 2 sites

Day 7 - 2 sites

Day 14 - No Dose

Day 28 - 2 sites

ANTIBIOTIC PROPHYLAXIS:

It had reported that infection type of the dog bite wounds included aerobic and anaerobic infection. *Canis pasteurella* species is the most common stain, *Streptococcus*, *Staphylococci*, *Moraella* and *Neisseria* is the most common aerobic, and *Fusobacterium*, *Bacteroides* and *Porohyromonas* is the most common anaerobic. Furthermore, most species isolated from infected bite wounds are b-lactamase producers [1,2,11,12]. Considering the type of bacterias and sensitive antibiotics, the author recommend a combination of b-lactam antibiotic and a b-lactamase inhibitor, a second-generation cephalosporin or clindamycin and a fluorquinolone, in antibiotics administration.^[4]

The effect of primary closure to facial laceration healing :

It was obvious in our study that immediate primary closure had great promotion in facial laceration healing.. It is well known that debridement is designed to make contaminated wound into clean wound, so that it can be sutured immediately and reach primary healing. Because if the wound is left open, it would get secondary healing (scar healing), and the wound would experience inflammation-hyperplasia of granulation tissue formation-scar formation in the process. The healing time will be extended, and the function would not recovery completely due to scar hyperplasia or contracture . This was confirmed by our findings.

Furthermore, in our clinical work we found that secondary healing was more poor than primary healing on scar size and appearance looking. Especially involved the eyes, nose, ears and mouth, the scar of the lacerations could induce serious deformity or complications (such as ectropion and trichiasis). Even in those patients with scar diathesis, the scar would more obvious and outstanding which could bring great physical and psychological harm to them.^[5]



a) Category III Dog bite



b) After primary closure



c) Follow up after 2 weeks

DISCUSSION

Dog bite wound is a special surgical wound. High infection rate (range from 18% to 25%), serious complications, and almost 100% fatality rate of rabies was reported [1,2]. During seven years from the beginning of Rabies Prophylaxis and



Immunity Clinic established, more than 50,000 dog bite patients had visited the clinic, among which the facial dog bite patients occupied 13.4%. The facial bite wounds could not only induce severe complications, such as fatal intracranial infection, fistula of parotid gland, ectropion, and nasolacrimal canal injury, but also resulted in facial cicatrix which affected facial cosmetology. As far as contaminated with the oral flora of the culprit concerned, the bite wounds infection prevention should also be concerned seriously, except for rabies and tetanus prophylaxis. Furthermore, in the management of non-complicated bite wounds, primary closure and prophylactic antibiotics application in initially uninfected wounds were still controversial issues.^[6]

Whether immediate primary closure increased infection rate

Our findings suggested that immediate primary closure had no statistical discrepancy compared with the dog bite facial wounds left open in infection rate and infection time. In other words, immediate primary closure the facial dog bite lacerations neither increase the wounds infection rate nor accelerate wounds infection. However, there was a very important issue should be emphasized, that is primary closure must be enforced after thorough cleaning, disinfection and debridement. Our previous study had indicated that using 0.05% iodophors instead of 2.5%-3.5% iodine tincture and 75% alcohol to sterilize the inside of the dog bite wounds could decrease the infection rate to 10% approximately without prophylactic antibiotics (facial wound is about 7.5%) .

Although, in the past 7 years over 50,000 dog bite patients visited to our clinic, some of which bitten by certified rabies dogs, none of the patients had acquired rabies. Our study had suggested that thorough wounds debridement, normal passive immunity and active immunity were the most valid intervention to prevent rabies [7-9]. Therefore, we believed that thorough debridement without delay was not only one of the key points in preventing rabies but also in decreasing wound infection rate. And we enforced immediate primary closure to dog bite facial laceration.

The findings of the current study confirm the contribution of the time of management to the final outcome. Early management of the bite wounds seems to be correlated with lower infection rates and improved cosmetic outcomes regardless of the closure or not of the wound. The role of timing in the infection rate for non-bite related traumatic wounds has recently gained more attention [17,23]. However, it is not clear whether primary closure can reverse the recognised tendency of older wounds for infection, nor the exact time period within which the wounds can be safely closed [17,23,24]. In dog bite wounds, the potential for infection is increased compared to non-bite related wounds, possibly due to the mixed bacterial population [5]. Results suggest that time is an important factor in the development of infection, And early management in bite wounds can offer significant advantages to the overall outcome.^[7]

CONCLUSION

Primary suturing of dog bite wounds when associated with debridement, high pressure irrigation, povidine iodine cleansing and antibiotic administration resulted in improved cosmetic appearance with no significant increase in the rate of infection. A non-suturing approach was found to be less successful in regards to scar formation. According to this study, one of the most important factors contributing to the outcome was the timing of the management, with early treatment (<8 h) resulting in lower infection rates and improved cosmetic appearance. Wound location also was found to affect the final outcome, with wounds at the head and face demonstrating overall better results.

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