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Клиническое наблюдение / Clinical observation

# Management of dog bite wounds: Our protocol and experience with early surgical intervention

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**Abstract**

Dog bites injuries are a significant cause of morbidity and mortality. Conventionally, it was suggested to leave the wounds open due to probable increased risk of infections and occurrence of rabies with suturing.Recent publications indicate that primary closure does not necessarily affect the chances of infection but definitely helps in improving the quality of scar. We are presenting our experience and protocol for primary closure of all dog bite wounds. From March 2020 to February 2021, 10 consecutive patients of all ages coming to the emergency of our hospital with category 3 dog bite that penetrated the epidermis and dermis and presenting within 48 hours of injury were included. Every patient was administered first dose of anti rabies vaccine (ARV) (zero dose) for active immunisation and was also given injection tetanus intramuscularly. Mean age of patients in our study was 20.9 with range from 2 years to 90 years. Only 2/10 patients developed infections which were managed conservatively with drainage of abscess and antibiotics. Rest all patients recovered without complications. Primary closure of dog bite wounds when associated with debridement, sufficient irrigation, povidine iodine cleansing and antibiotic administration resulted in improved cosmetic appearance without increase in the rate of infection.

**Keywords:** Anti rabies vaccine, Dog bite, immunisation, immunoglobulin, Punjab

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# Лечение ран укусов собак: наш протокол и опыт раннего хирургического вмешательства

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**Резюме**

Травмы от укусов собак являются серьезной причиной заболеваемости и смертности. Традиционно предлагалось оставлять раны открытыми из-за вероятного повышенного риска инфекций и возникновения бешенства при наложении швов. Недавние публикации показывают, что первичное закрытие раны не всегда влияет на повышенную вероятность инфицирования, но определенно способствует улучшению качества рубца. Мы представляем наш опыт и протокол первичного закрытия всех ран от укусов собак. С марта 2020 г. по февраль 2021 г. были включены 10 пациентов различного возраста, поступившие в отделение неотложной помощи нашей больницы в течение 48 часов после травмы, с укусом собаки категории 3, с повреждением эпидермиса и дермы. Каждому пациенту вводили первую дозу антирабической вакцины (нулевую дозу) для активной иммунизации, а также внутримышечно вводили противостолбнячную инъекцию. Средний возраст пациентов в нашем исследовании составил 20,9 в диапазоне от 2 до 90 лет. Только у 2/10 пациентов развились инфекции, которые лечились консервативно с помощью дренажа абсцесса и назначения антибактериальных препаратов. Все остальные пациенты выздоровели без осложнений. Первичное закрытие ран от укусов собак в сочетании с санацией, достаточным орошением, обработкой повидон-йодом и введением антибиотиков привело к улучшению косметического вида рубца без увеличения частоты инфекций.

**Ключевые слова:** вакцина против бешенства, укус собак, иммунизация, иммуноглобулин, Пенджаб

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## INTRODUCTION

Dog bites injuries are a significant cause of morbidity and mortality. There are no global estimates of incidence of dog bites but studies suggest that dog bites constitute millions of cases annually in the USA[1]. Incidence of dog bites in a developing country like India is estimated to be around 1.5% and it shares the more than one third of global burden of dog bite cases [1]. According to a state anti rabies programme report, Punjab reports approximately 1.2 lakh cases annually. Incidence of wound infections and complications are also more due to poor public awareness and inadequate vaccination protocols especially in rural populations. However most of these cases either don't report to the health care facility or report tolocal hospitals where resources for appropriate management of dog bite cases arelacking. Despite being a relatively common presentation in emergencies, controversies still surround certain aspects of their management even in the medical fraternity, e. g. choice of appropriate antibiotics and management of wounds.

Management of dog bite wounds is equally important apart from post exposure prophylaxis and rabies immunoglobulin as these are associated with higher risk of local wound infection by organisms present in dog's saliva (pasteurella, streptococcus, fusobacterium, prevotella) and bad scars along with probability of contracting rabies [2].

Conventionally, it was suggested to leave the wounds open due to probable increased risk of infections and occurrence of rabies with suturing [3–5]. This has led to loss of more man hours and patients have to undergo secondary surgeries for reconstruction of affected parts and scar revision [6, 7].

However, there are recent publications indicating that primary closure does not necessarily affect the chances of infection but definitely helps in improving the quality of scar [8–10].

Majority of the cases of rabies virus infection have an incubation period between 1 and 3 months. In the literature, the overall incubation period varies from approximately 1 month in 30% of the cases, 1–3 months in 54%, more than 3 months in 15% and only 1% of the cases after 1 year are recorded [11].

So, we made a protocol regarding overall management of dog bite wounds. We planned to do primary wound coverage of all cases of dog bite wounds presenting within 48 hours of dog bite. We decided to keep a followup of 1 year. We are describing our experience of 10 patients managed with the same protocol.

[1] https://www.who.int/news-room/fact-sheets/detail/animal-bites

## MATERIALS AND METHODS

This is a retrospective study conducted at Guru Gobind Singh Medical College and Hospital, Faridkot from March 2020 to February 2021. Patients of all ages coming to the emergency of our hospital with category 3 dog bite that penetrated the epidermis and dermis and presenting within 48 hours of injury were included. Thorough history taking was done and examinations were performed followed by admission of patients. All patients with compromised immune system or those with any comorbidity affecting the immune system were excluded.

Thorough irrigation of the wound was done under running tap water and soap for 20–25 minutes for mechanical removal and inactivation of virus. Subsequently,local scrubbing with the use of povidone-iodine was used for wound cleansing. Every patient was administered first dose of anti rabies vaccine (ARV) (zero dose) for active immunisation and was also given injection tetanus intramuscularly. Human Rabies Immunoglobulins (HRIG) were administered as per their weight (20IU/kg body weight) with half of the dose deep into and around the wound to provide neutralising antibodies at the site of exposure and half given as intramuscular injection to provide antibodies for inconspicuous wounds. Subsequent doses of ARV were administered as per protocol of administering at 3$^{rd}$, 7$^{th}$, 14$^{th}$ and 28$^{th}$ day (Essen regime). If the dog involved in the incident was found to be healthy, then the post exposure prophylaxis regimen was converted to pre exposure prophylaxis by skipping the dose on day 14 and day 28. Patients were started on prophylactic antibiotics which included amoxicillin and clavulanic acid combination, metronidazole and amikacin. Surgical debridement was performed in all cases as needed, with meticulous care to remove all tissues with compromised viability following which appropriate surgical intervention (primary closure, graft, flap) was done as per wound requirement. Wounds were primarily closed in all patients. Dressing changing and follow up was conducted every 2 days until day 10, and weekly thereafter until the third month from injury. Suture removal was performed at day 7 for wounds located at the head, face, and neck, at day 10 for wounds in upper extremities, and at day 14 for woundslocated atlower extremities. During follow up, two major outcome measures were evaluated: infection rate and cosmetic outcome. The presence of infection was assessed using definitive and relative criteria. Definitive criteria for infection considered the presence of systematic fever, local abscess, or lymphangitis. Relative criteria included erythema at the edges of the wound, local swelling, increased temperature or tenderness, as well as drainage from the wound (*Table 1*). Recording

of the cosmetic appearance of the wound was conducted at the end of the fourth week following initial injury with the use of the Vancouver Scar Scale (VSS).

Patients' demographics (age, gender, status of vaccination), dog related factors (whether dog was being immunised, tracable, stray or pet), type of procedure conducted and development of infection were noted. Patients were followed up for development of any symptoms of rabies for 1 year as incubation period for rabies may vary from 1 week to 1 year.

## RESULTS

During a period of 1 year i.e. from March 2020 to February 2021, 50 consecutive patients with dog bite fulfilling the inclusion criteria were included in this study.

7/10 (70%) patients included in the study were males (*Fig. 1*).

7/10 (70%) of the patients included in the study were of ageless than 14 years (*Fig. 2*). Mean age of patients in our study was 20.9 with range from 2 years to 90 years.

In 3/10 (30%) cases, the dog was immunised (*Fig. 3*). Rest of the dogs (70%) were stray dogs. In 5 cases, the dog was traceable. All patients received post exposure vaccination and human immunoglobulins.

Most common site of dog bite was head and neck, followed by upperlimb andlowerlimb (*Fig. 4*).

8 patients were managed with primary closure of wounds. 1 patient was managed with STSG. In one case, dieffenbach flap was performed for partial pinnaloss (*Fig. 5*).

2 patients developed infections which were managed conservatively with drainage of abscess and antibiotics. One patient developed fever which responds to drainage of abscess (*Fig. 6*).

Average Hospital stay was 6.2 days. No patients developed any signs of rabies on 1 year followup. There were no fatalities of children due to dog bites during our study period.

**FIGURE 1. Distribution of patients according to gender**
**РИСУНОК 1. Распределение пациентов по полу**

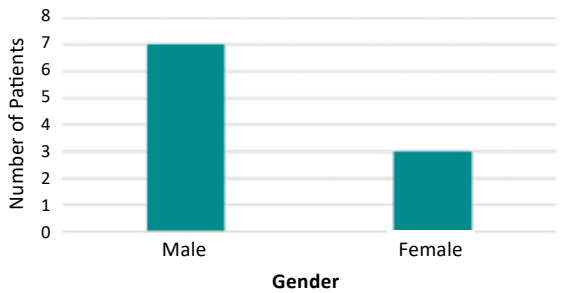


**FIGURE 2. Distribution of patients according to age group**
**РИСУНОК 2. Распределение пациентов по возрастным группам**

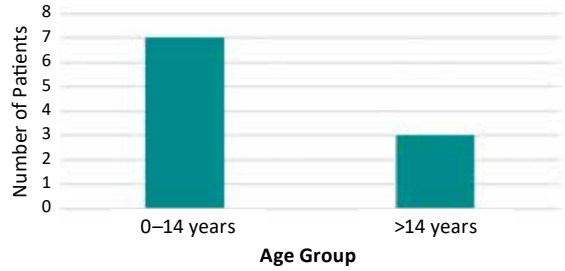


**FIGURE 3. Immunisation status of dog**
**РИСУНОК 3. Иммунный статус собаки**

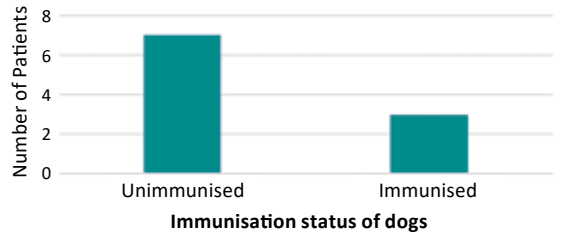


**FIGURE 4. Distribution of patients according to sites of dog bite**
**РИСУНОК 4. Распределение больных по месту укуса собакой**

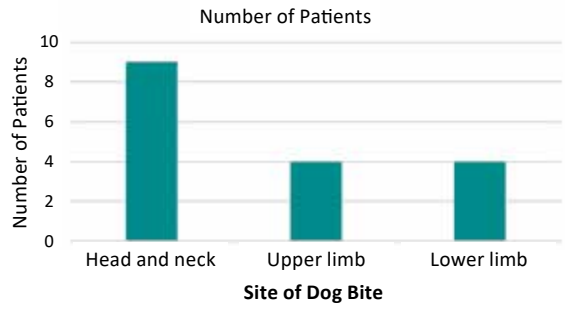


**FIGURE 5. Type of procedure for early reconstruction**
**РИСУНОК 5. Тип методики ранней реконструкции**

FIGURE 6. **Post operative complications**
РИСУНОК 6. **Послеоперационные осложнения**

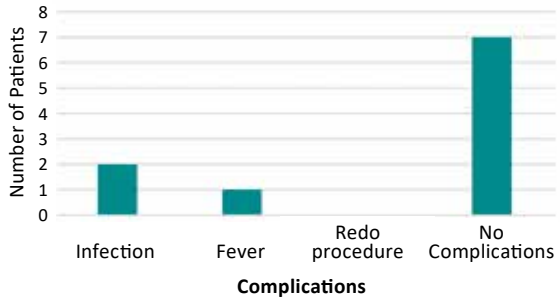


FIGURE 7. **A 5-year-old boy with a superficial scalp wound due to canine bite**
РИСУНОК 7. **5-летний мальчик с поверхностной раной кожи головы после укуса собаки**

A split thickness skin graft (STSG) was used to cover the defect. 100% engraftment without infectious complications

## DISCUSSION

Dog bite wounds should be treated as surgical wounds especially Category 3 dog bites. These patients usually belong to either paediatric and geriatric populations [9, 10]. Probable reason for children and old age persons having an increased incidence of dog bite islack of self-defence. Taking extra care of children and keeping a simple stick in the hands of old age people while they are walking would help in reducing the incidence of dog bite.

Most dog bite victims are males, probably due to the male dominant society in developing countries due to which males are involved more in outdoor work where they are more vulnerable for such injuries [9, 10].

In our study, a common site of dog bite was face in 9/10 cases. Upper and lower limbs were involved in 4 cases each. Within face, nose and lip are common sites of presentation. These findings were consistent with findings in previous studies which also show that face is the most common site of bite probably because face is always exposed.

The optimal management of these wounds is controversial. Conventional protocols suggest keeping the wounds of dog bite open for the fear of transmission of rabies and occurrence of infection [3–5, 12]. The management of dog bite wounds has evolved over the years. More recently, there has been a move to more early and definitive treatment, with authors advocating early washout and debridement of wounds and primary closure [6–8, 10]. These changes have arisen from findings that the infection rate increased if treatment was delayed following injury; that debridement reduced the incidence of infection by as much as 30-folds; and that primary treatment produced the best cosmetic and functional results. Current opinion advocates early surgical treatment with irrigation of the wound, minimal debridement, and direct closure where possible.

In our study, we managed the cases with immediate debridement and wound coverage. 8 patients underwent tag suturing (*Fig. 7, 8*).

Graft uptake was 100 percent and there was no infection.

Patient developed a minor infection which was managed with drainage and dressings without debriding the cartilage. After 6 weeks, second stage surgery was done for flap insetting (Dieffenbach procedure). There was no further complication.

Infection in dog bite cases can be managed by thorough cleansing of the wound with water and soap followed by antibiotic prophylaxis. In our study, we irrigated the wound in tap water and soap for 20-25 minutes. Prophylactic antibiotics administered were amoxycillin

**FIGURE 8. A 7-year-old boy with a partial loss of the pinna due to canine bite, which was reconstructed with a flap by Dieffenbach's technique**
**РИСУНОК 8. 7-летний мальчик с частичной потерей ушной раковины после укуса собаки, которая была реконструирована с помощью лоскута по методике Диффенбаха**



Cartilage reimplanted

Result after two stage Surgery

The patient developed a minor infection, which was treated with drainage and dressings without cartilage removal. After 6 weeks, a two-stage operation was performed to positioned a flap into the defect (according to the Dieffenbach's technique). The patient had no more complications.

and clavulanic acid combination, metronidazole and clindamycin which offers the best in vitro coverage of the pathogenic flora in cases of dog bite as per a study by Abuabara et al. [7, 9, 12]. Our antibiotic choice was consistent with this study and various other studies.

## CONCLUSION

Thus, primary closure of dog bite wounds when associated with debridement, sufficient irrigation, povidine iodine cleansing and antibiotic administration resulted in improved cosmetic appearance without increase in the rate of infection. Also early management of wounds is also one of the most factors contributing to lower infection rates and improved cosmetic appearance.

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