

## Comparative Study of Primary Closure Versus Non-Closure in Dog Bite Wounds

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### Abstract

*Introduction:* Dog bites are common in India accounting to 1-2% of patients presenting to Emergency department. There is long drawn controversy regarding the treatment protocol for dog bites. Several studies have shown comparable amount of wound infection in both these techniques with better aesthetic appearance following Primary closure. We conducted a study to compare the rate of infection, aesthetic outcome & the wound healing time between Primary closure and Non-closure technique. *Materials & Methods:* After Ethical committee clearance, 120 consecutive patients with Dog bite wounds were included in this Experimental control trial. The patients were divided into two groups based on computer-based randomization. All dog bite wounds received initial wound care. One group underwent Primary suturing of wound and in other group wounds were dressed without suturing. Prophylactic antibiotics were given to all patients. Human immunoglobulin was administered according to WHO guidelines. Infection rates, cosmetic appearance and healing time were compared. *Results:* The infection rate in primary closure was 8.3% as compared to 11.7% in Non-closure. However, it was not statistically significant ( $P=0.543$ ). Primarily closed wounds had 86.7% good scars as compared to 11.7% in Non-closure which was statistically significant ( $p=0.001$ ). We also found that the Mean healing time was 23.65 days in Primary closure and 49.05 in Non-closure. *Conclusion:* Primary suturing of dog bite wounds leads to faster healing rate with no significant change in the infection rate & yields a good cosmetic scar. Local infiltration of wound with immunoglobulin showed no change in the rate of infection.

**Keywords:** Dog Bite; Healing Time; Infection; Non-Closure; Primary Suturing.

### Introduction

Dog bites are common in India accounting to 1-2% of patients presenting to Emergency department [1,2,3]. There is long drawn controversy regarding the treatment protocol for dog bites. This controversy is regarding Primary closure of dog bite wounds v/s Non-closure [3,4,5]. Several studies have been

conducted comparing closure v/s Non-closure techniques [6-10]. Results have shown comparable amount of wound infection in both of these techniques [7,11,12]. But the aesthetic appearance following Primary closure out beats the Non-closure of wounds [6]. We conducted a study to compare the rate of infection, aesthetic outcome & the wound healing time between Primary closure and Non-closure techniques.

**Materials & Methods**

After ethical committee clearance, 120 consecutive patients with dog bite wounds were included in this experimental control trial. The patients were allocated to groups based on computer-based randomization & each group had sixty patients.

Inclusion Criteria was Full thickness dog bite (wounds penetrating the epidermis &/or dermis), Presentation to emergency room within first 6hrs post-injury, Wound size >3cm. Exclusion Criteria was any patient presenting >6hrs after dog bite, Deep penetrating wounds involving muscle, nerve, tendon, joint or bone, Patients with bites over the face, Size >15cm, wound with skin loss requiring plastic surgery, Infected wounds at presentation, Dog bites developing features suggestive of rabies, age less than 16 years, Pre-vaccinated Pet dog bites.

All dog bite wounds were thoroughly washed & irrigated with normal saline. Local cleansing was done using Povidone – Iodine (betadine 10% solution). Wound debridement was done. Haemostasis was achieved and subsequently patients were randomly allocated into two groups. First group underwent primary closure of wound and other group wounds were dressed without suturing.

According to WHO guidelines, Human Immunoglobulin dose was calculated as 20IU/Kg (Maximum dose 1500IU). In the first group, the calculated dose of immunoglobulin was infiltrated locally surrounding the wound as much as anatomically feasible and remainder was given intramuscularly to the lateral aspect of thigh. The other group received full dose of immunoglobulin intramuscularly to the lateral aspect of thigh. In cases with multiple dog bite wounds, the human immunoglobulin was diluted with Normal saline and administered. Monofilament Nylon 3-0 and 4-0 was used for suturing wounds over extremities and trunk. Amoxicillin + clavulanic acid 625mg every 12hours for 5 days was administered. Tetanus toxoid was administered to all patients. All patients received chick embryo vaccine as per WHO guidelines on 0, 3, 7, 14 & 28 days. All patients were followed up and reviewed at the end of 48hours, 3<sup>rd</sup>, 7<sup>th</sup> & 10<sup>th</sup> day. Wound dressing was done on regularly. Wound site was inspected for any signs of infection and documented accordingly. Infection rates were evaluated. Sutures were removed within 8-10 day for extremities and trunk. All patients were assessed for the appearance of the scar at 4th, 6th and 12<sup>th</sup> week. Pain assessment was done using visual analogue score (VAS) at 48hrs during follow-up. Criteria used for

wound infection included presence of one of the following -Erythema at wound site & local rise of temperature, fever > 38.5°C, local collection of serous fluids or pus. For wounds with infection Clindamycin was used. The dose was 500mg every 12hours for 5days. Width of scar, elevation of scar & induration were used for assessment of cosmetic appearance at the end of 12th week following injury [13-15]. Scars with Width <3mm, Scar elevation <2mm were considered as good scars.

*Statistics*

- Descriptive statistics of cosmetic appearance will be analysed of both the group & summarized in terms of mean with standard deviation.
- Infection rates will be summarized in terms of percentage.
- Independent t-test would be used to compare the cosmetic appearance between 2 groups. Chi-square test would be used to compare the infection rate between the two groups.

**Results**

We studied 120 patients between March 2017 to March 2018 who presented to Emergency department with dog bite wounds. The Mean age in Primary closure was 42.5yrs & 44.8yrs in Non-Closure group. The Age and Sex distribution in the two groups were comparable. The wound distribution was as shown in the following Table 1.

**Table 1:** Wound Distribution

	Primary closure	Non-closure
Upper limb	23(38.3%)	21(35%)
Trunk	6(10%)	4(6.6%)
Lower limb	31(51.6%)	35(58.3%)
Total	60	60

In our study, the overall infection rate was 12%. The infection rate in Primary closure was 8.3% as compared to 11.7% in the Non-closure group. However, it was not statistically significant (p=0.543). We observed that 5% of patients with infected wounds were Diabetics. The infection rate was more in hands as compared to other sites (9.9%).

Primarily closed wounds had 86.7% good scars as compared to 11.7% in Non-closure which was statistically significant (p=0.001).

We also found that the Mean healing time was 23.65 days in Primary closure and 49.05days in Non-

closure. The Mean healing time was more in diabetics. Mean healing time in Diabetic patient in Primary closure & Non-closure was 26.88days & 58.34days respectively. The Primary closed wounds were associated with decreased pain as assessed by Visual Analogue Scale (VAS) at end of 48 hours. The Mean VAS score in Primary closure was 2.5 & 5.8 in the Non-closure group. (Table 2 and Figure 1 & 2).

### Discussion

In recent years, there is increase in incidence of dog bite yet there is still controversy in the management of dog bite wounds. Dog bite wounds were assumed to have more infection rates due to mixed bacterial contamination [20] & hence were left open. There is still no consensus regarding suturing of wound and use of prophylactic antibiotics.

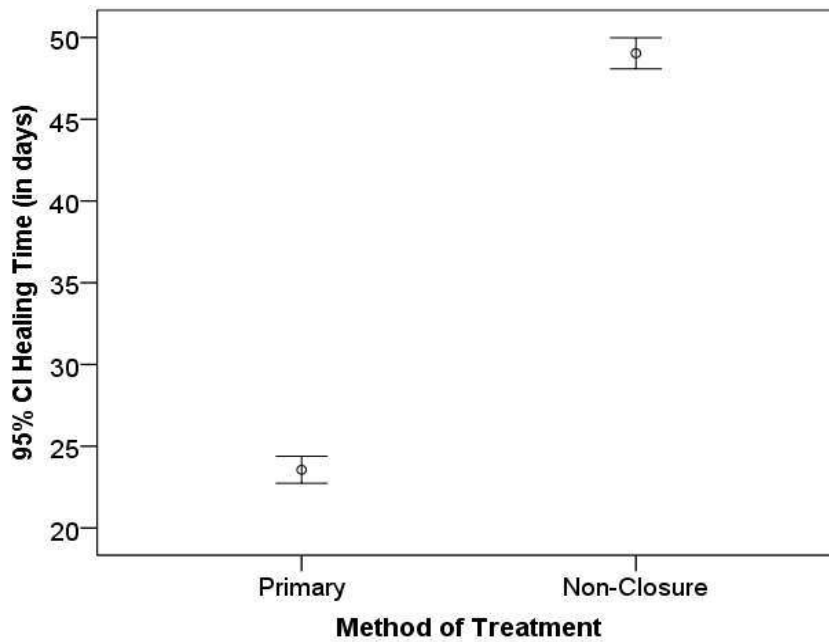


Fig. 1: Mean healing time

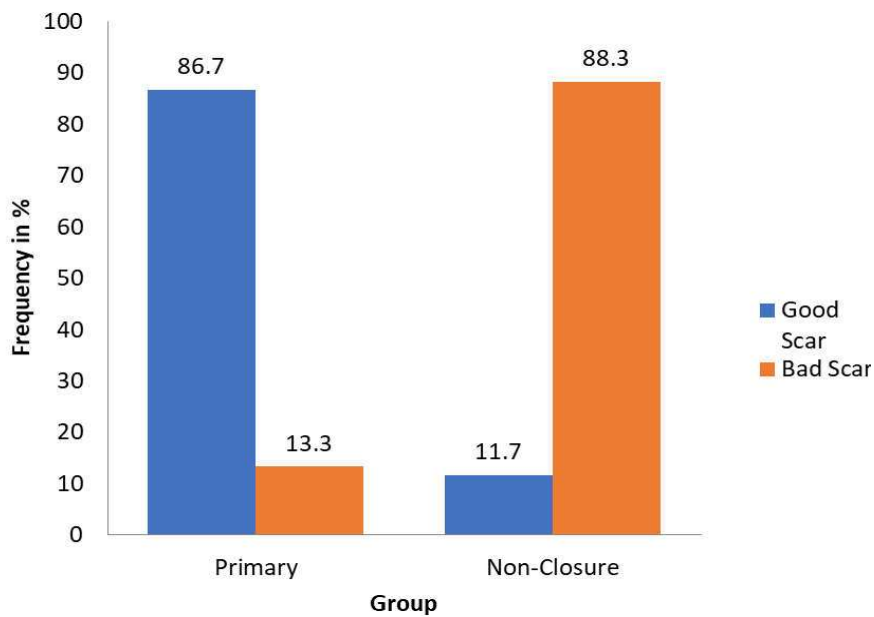


Fig. 2: Cosmetic appearance

Our study compared the Infection rate & Cosmetic outcome between the Primary Closure & Non-Closure. We found that there is no significant difference between rate of infection between two groups. The Infection rates were comparable between the two groups (8.3% v/s 11.7%). The cosmetic appearance of wounds in the primary closure group was better (86.7%) as compared to the wounds in Non-closure group (11.7%). Similar results have been obtained in previous studies. In a randomised control study done by Paschos et al comparing Primary closure with wounds left open the overall infection rate was 8.3%. There was no higher incidence of infection with primary closed wounds as compared to open wounds (9.7% v/s 6.9%), but primary closed wounds were associated with significantly improved cosmetic outcome [6]. Rui-feng et al found that immediate Primary closure of facial dog bite lacerations neither increased the wound infection rate nor accelerate wound infection. The infection rate in his study in primary closure was 6.3% as compared to open wounds which was 8.3% [19].

Wound debridement, irrigation, antibiotic and immunoglobulin were routinely used in all patients. The beneficial role of debridement is studied in past [17]. Thorough debridement will remove the contamination and the non-viable tissue which reduces infection and aids faster healing. High pressure irrigation of wounds acts as a bacterial decontamination technique [18]. Rui-feng et al. suggested that thorough wound debridement, normal passive immunity and active immunity were the most valid intervention to prevent rabies. The surgical debridement was the main factor for anti-infection [19].

The beneficial role of antibiotic is still debated [20-26]. We routinely used prophylactic antibiotics for all patients. The Cochrane review on mammalian bites suggests aggressive cleansing & debridement followed by a 2-5 days course of systemic antibiotics [25]. In a study done by Rui-feng et al. prophylactic antibiotics were not used & they suggest it is not necessary to use it routinely [19].

In our study all patients were assessed for the appearance of the scar at 4th, 6th and 12<sup>th</sup> week. Primarily closed wounds had 86.7% good scars as compared to 11.7% in Non-closure which was statistically significant ( $p=0.001$ ). Paschos et al found that the cosmetic appearance of the sutured wounds was significantly better as compared to the wound which were left open. They also found that

the cosmetic appearance of wounds located at head region was better as compared to extremities and trunk.

It was also observed that there was gross difference between the healing time, with primary closed wounds having a faster healing time. The Mean healing time in the primary closure group was  $23\pm 4$  days as compared to the Non-closure group, in which it was  $48\pm 8$  days.

The healing of scar occurs in 3 stages which includes Swelling, Rebuilding & Remodelling. The first phase of inflammation of tissue lasts for about 4 days. Subsequently the time for tissue formation overlaps with the 1<sup>st</sup> phase & continues for 2-14 days. Wound healing ends with tissue remodelling and lasts for 6 days-1 year. During this phase scars contract and increase in the tensile strength. Wound healing occurs by primary & secondary intention. In secondary intention there is overproduction of new tissue and hence the healing time increases. Sutured wounds heal by Primary intention and Open wounds heal by secondary intention. Hence the wound healing was prolonged in Non-closure group.

The role of wound location also plays an important role in development of infection [7,12,16,24]. In Our study we found that the wounds located on hands were showing a higher infection rates (9.9%) as compared to the other sites. Paschos et al found similar results with infection being higher in wounds located in hands (10.8%).

Traditionally full dose of immunoglobulin is given intramuscularly. There is little hesitancy in locally infiltrating the wound with immunoglobulin considering that the dog bite wounds are prone to infection. In our study, Human Immunoglobulin 20IU/kg was administered to all patients as per WHO recommendations. There were no statistically significant infection rates between the two groups.

The Primary closed wounds were associated with decreased pain as assessed by Visual Analogue Scale (VAS) at end of 48 hours. The Mean VAS score in Primary closure was 2.5 & 5.8 in the Non-closure group. The patients in Primary closure group had only mild pain as compared to moderate to severe pain in Non-closure group.

## Conclusion

Primary suturing of dog bite wounds leads to faster healing rate with no significant change in the infection rate & yields a good cosmetic scar. Local

infiltration of wound with immunoglobulin showed no change in the rate of infection.

#### Key Messages

Primary suturing of dog bite wounds leads to faster healing rate with no significant change in the infection rate & yields a good cosmetic scar. Local infiltration of wound with immunoglobulin showed no change in the rate of infection.

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