

Original Research Article

Diverse spectrum of facial dog bite presentation and their management

Rakesh Kumar Jain, Gautam Prakash*, Manojit Midya, Pankaj Sharma

Department of Plastic Surgery, SMS Medical College and Hospital, Jaipur, Rajasthan, India

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***Correspondence:**

Dr. Gautam Prakash,

E-mail: drgprakash86@gmail.com

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ABSTRACT

Background: Dog bite patients are frequently encountered in our hospital seeking immediate as well as delayed reconstruction. More than two third of dog bite injuries involve head, neck and scalp region. Facial dog bites present a challenge for the surgeon, as they lead to cosmetic disfigurement and psychological trauma to the patient. Following thorough washout and debridement, we have used various reconstructive techniques for definitive management of wounds like- primary repair, V-Y advancement flap, nasolabial flap, SSG, FTG and Karapandzic flap. Purpose of the present study is to share our experiences in management of dog bite wounds on the face in both adult and paediatric patients with available reconstructive options to maximize the functional and cosmetic outcomes by using basic principles of surgery.

Methods: Present study was a single centre retrospective study conducted in a tertiary care centre from February 2013 to January 2018. Total 497 patients of dog bite who presented in the emergency department were enrolled. Out of them 310 patients had involvement of head, neck and scalp requiring surgical intervention in any form.

Results: In last five years, we have encountered mid face predilection in face, head and neck cases. Out of 310 cases, lip (25.16%) and cheek (24.51%) were involved in majority of the patients. Flap cover surgery is required in majority of the scalp and nose group of patients, as there is less mobility of tissue present in surrounding region, while cheek and lip were managed with primary closure in most of the patients.

Conclusions: Although most of the dog bites are preventable, but cases of dog bite are increasing continuously. Child should never be left alone with dogs and, if they are fear of dogs, it's better not to obtain dogs. As far now, it's a major concern for treating physician or surgeon to provide optimal cosmetic as well as functional outcome. Early surgical intervention for wound management gives better results with the use of basic principles of plastic surgery.

Keywords: Dog bite, Dog bite management, Facial injury

INTRODUCTION

A substantial association has been seen between dogs and humans.¹ Dog bite patients are frequently encountered in our hospital seeking immediate as well as delayed reconstruction. More than two third of dog bite injuries involve head, neck and scalp region.^{2,3} Most of the dog bite injuries are deep seated, as skin flaps may appear viable but underlying tissue is devitalized requiring proper assessment (Table 1).⁴ Facial dog bites present a

challenge for the surgeon, as they lead to cosmetic disfigurement and psychological trauma to the patient.

Although dog bites have been reported on almost all areas of the body, but there is predilection for head, neck and scalp in pediatric age group and for upper limbs in adults.⁵ Young children are more prone for head and neck involvement due to relatively large head size, short stature and less fear of mishap. Also, young children are physically less able to defend themselves and escape.⁶

Grossly dogs are categorized as: pets (restricted and supervised); family dogs (partially restricted, wholly dependent); community dogs (unrestricted, partially dependent); and feral dogs (unrestricted, independent). In India maximum dogs belong to last three categories.⁷

Table 1: Lackmann classification of dog bite injury.

Classification	Definition
Type I	Superficial lesion without muscle involvement
Type II	Deep lesion with muscle involvement
Type III	Deep lesion with muscle involvement and tissue defect
Type IVa	Type III combined with vascular damage or nerve lesion
Type IVb	Type III combined with bone damage or organ involvement

The purpose of the present study is to share our experiences in management of dog bite wounds on the face in both adult and pediatric patients with available reconstructive options to maximize the functional and cosmetic outcomes by using basic principles of surgery. We have used various reconstructive techniques for definitive management of wounds like: primary repair, V-Y advancement flap, nasolabial flap, SSG, FTG and Karapandzic flap. Regardless of surgical techniques used, few patients develop complications or unsightly scars, which may require revision surgery like scar revision or expander placement.

METHODS

This is a single center retrospective study conducted in a tertiary care center, SMS Hospital Jaipur from February 2013 to January 2018. Data of total 497 patients of dog bite who presented in the emergency department was collected (Table 2).

Table 2: Patient demographic data.

Demographic variables	Number of patients (%)	
Sex		
Male	208 (67.09%)	
Female	102 (32.90%)	
Age (years)		
<10	66	
11-20	102	
21-30	63	
31-40	33	
41-50	25	
>50	21	
Patient familiar with dog	Yes	221 (71.29%)
	No	89 (28.71%)

Out of them 310 patients had involvement of head, neck and scalp. Only the patients who needed surgical intervention (wounds more than 2 cm) were included in the study. Patients having wounds less than 2 cm, small laceration, immune-deficient, using immunosuppressive agent, autoimmune disorder and diabetes were excluded.

Our protocol for management of dog bite wound was to debride the wound thoroughly, and wash with 20% liquid soap, 3% hydrogen peroxide and normal saline. Repeated wash of two to three times for total of approximately 15 minutes was done under running saline. Local anesthetic was used judiciously if needed for adequate debridement. All the necrotic, slough tissue and dirt particles were debrided till healthy surrounding tissue.

Simple lacerations were primarily repaired in layers, and composite defects were managed with flap cover on emergency basis. Delayed cover was done only in cases who had concomitant life-threatening injuries. Prophylactic antibiotics (combination of amoxicillin and clavulanic acid) was given in intraoperative and postoperative period. We advised azithromycin to the patients who were found to be allergic to penicillin.⁸ Infection was assessed on the basis of three major criteria: fever (body temperature $\geq 38^{\circ}\text{C}$), abscess, and lymphangitis; or four of five minor criteria: wound-associated erythema that extended more than 3 cm from the edge of the wound, tenderness at the wound site, swelling at the site, purulent drainage, white cell count in the peripheral blood $>12,000/\text{ml}$. In consultation with anti-rabies department, anti-rabies vaccination (ARV) was done. Tetanus antitoxin was administered to all patients who were not immunized previously or those who did not remember their last booster dose. Rabies immunoglobulin was administered to all patients.

RESULTS

In last five years, we have encountered mid face predilection in face, head and neck cases. Out of 310 cases, lip (25.16%) and cheek (24.51%) were involved in majority of the patients. Flap cover surgery is required in majority of the scalp and nose group of patients, as there is less mobility of tissue present in surrounding region, while cheek and lip were managed with primary closure in most of the patients. We are showing results of four different anatomic regions.

Case 1

A two-year girl came to emergency department following bite by a stray dog over left side cheek and scalp avulsion (Figure 1). She was thoroughly evaluated and resuscitated as per our protocol mentioned above. Immediate cover of scalp wound with split skin graft and primary closure of facial laceration was done. In the postoperative period, facial and scalp wounds healed satisfactorily (Figure 2).

After 3 months, next surgery was planned and a 200ml silicone expander was placed in scalp in the right temporo-parietal region. Expander was inflated with normal saline at one-week intervals.



Figure 1: Post dog bite scalp avulsion in a two-year girl.



Figure 2: Follow up photograph seven days after split thickness skin grafting.

After achieving adequate expansion which took three months, the expander was removed under general anesthesia and flap advancement was done. Post operatively patient had a good pattern of hair distribution and a stable facial scar (Figure 3 and 4).



Figure 3: Tissue expander was placed in occipital region after 3 months.



Figure 4: Post-operative photograph after one year following expander placement, flap advancement and scar revision surgery.

Case 2

Three-year-old boy presented to our outpatient department with dog bite over lower lip. Patient had full thickness tissue loss of two third of left side of lower lip. (Figure 5).



Figure 5: Post dog bite 2/3rd full thickness central lower lip defect with bilateral intact oral commissure.

Patient was thoroughly evaluated, and primary care was done as per our protocol. Immediate reconstruction with left sided Karapandzic flap was done (Figure 6 and 7) Post-operative day 7 photograph (Figure 8).



Figure 6: Intra-operative photograph after debridement and marking of incision line.



Figure 7: Intra-operative photograph after raising and advancement of flaps.



Figure 8: Post op photograph after seven days showing acceptable scar line and oral competence.

Case 3

A thirty-five-year-old female came to us with dog bite over nose and upper lip with full thickness loss of tissue and defect of nose and upper central lip (Figure 9).



Figure 9: Post dog bite full thickness defect of central upper lip, columella and bilateral ala of nose in a 35-year female.

After initial management, immediate definitive reconstruction with lip switch for upper lip defect and paramedian forehead flap for nose defect was done (Figure 10).



Figure 10: Intra OP photograph showing lip switch flap for upper lip defect and paramedian forehead flap for nose defect.



Figure 11: Post op photograph after two months follow up.

After three weeks forehead and lip switch flap detachment and in-setting were done (Figure 11).



Figure 12: Post dog bite lower lip full thickness laceration in a 38-year male after seven days.



Figure 13: Post op photograph after seven days.

Case 4

Thirty-eight-year-old male presented to our outpatient department 5 days after dog bite over lower lip (Figure 12). He had received three doses of ARV in local hospital in his town. Re-suturing was done under general anesthesia, in which margins were freshened, slough and necrotic tissue was debrided. Primary closure of skin flaps was done. Post op result after seven days (Figure 13).

DISCUSSION

Dog bite is a serious concern for parents as well as clinicians. Majority of the patients in our study are in younger age group with grade IV injury. Other studies also have similar data of dog bite in pediatric age group.^{9,10} Also, young boys are more commonly affected in comparison to girls. This is in sync with our society and cultural scenario where boys are more commonly involved in outdoor games/ activities while girls usually remain indoors. Various other studies have also shown male dominance in dog bite (Table 2).^{2,10,11}

Table 3: Distribution dog bite on face.

Site involved	Number of patients
Scalp	59
Nose	30
Cheek	76
Lip	78
Eyelid	23
Multiple	44

As a child plays with the dog, hugs, kisses or pulls the tail, they might unintentionally provoke it for biting. These activities place the face in closest position; making it the most vulnerable area for dog bites in children. Involvement of midface structures like lip and nose is predominant.^{12,13} In the present study midface is more frequently involved similar to other studies (Table 3). As

midface is the center of attraction in face, hence in view of disfigurement, immediate primary repair is preferred.

Most of our patients (71.29%) were familiar to the dog and were either owners of the pet, or some relatives were the owner, or it was a common neighborhood pet, similar to study by Kaye.¹⁴ Hence this shows familiarity of dog with the victim is not an absolute surety against getting bitten by it.¹⁵⁻¹⁷ There is no standard protocol for wound closure surgery either primary repair or flap cover. Previously, in view of risk of infection, usually wounds were left for healing by secondary intention or delayed repair.^{18,19} As per recent studies immediate primary repair of facial dog bite wounds give the best cosmetic and functional outcomes.^{2, 18}

Table 4: Various surgical procedure in dog bite of head neck.

Site involved	Type of operation	No. of patients
Scalp	Primary closure	14
	SSG/flap cover	45
Nose	Primary closure	03
	Flap cover	27
Cheek	Primary closure	48
	Flap cover	28
Lip	Primary closure	43
	Flap cover	35
Eyelid	Primary closure	16
	Flap cover	07
Multiple site	Primary closure	12
	Flap cover	18
	Primary closure and flap cover	14

Scalp and nose have less tissue mobility; hence primary closure is not possible in large wounds and require flap cover surgery. In contrary to above cheek, lip and eyelid have sufficient laxity which allows primary closure of wounds (Table 4).

Table 5: complications and revision surgery.

Complications	Number of cases
Alopecia	38
Ectropion	6
Hypertrophic scar	17
Microstomia	8

Present study also points similar figures as previously studied, showing low rate of infection n = 4 patients (1.29%) in facial dog bite after primary repair.²⁰

All four patients were managed with debridement and injectable antibiotics. None of patient had rabies or intracranial infection during treatment and follow up period so far.

It is clear from the present study that primary repair of facial dog bite gives best outcome, as wound heal by primary intention leading to less scarring and deformity formation. In contrary, wounds will experience inflammation-hyperplasia of granulation tissue in secondary intention healing, leads to broad and ugly scar formation. Wounds near angle of mouth, ala of nose, eyelid leads to severe cosmetic as well as functional disfigurement after secondary intention healing.

Revision surgeries were performed in follow up period for unavoidable complications like scar, alopecia and microstomia etc. (Table 5). Scar revision was the most frequently performed procedure in revision surgery group. Majority of the patients were very much satisfied after revision surgeries for alopecia and scar.

CONCLUSION

Although most of the dog bites are preventable, but cases of dog bite are increasing continuously. It is clear from various studies that majority of the dog bites are in pediatric age group. Most of the dog bites are preventable, as children must be taught not to interact with unfamiliar dogs. Child should never be left alone with dogs and, if they are fear of dogs, it's better not to obtain dogs. Before planning to obtain a dog, we must enquire about aggressive nature or any abnormal behavior of the dog. Proper vaccination of the obtained dog should be insured.

Hence, pediatrician and health care worker must participate in the dog bite awareness programs. As far now, it's a major concern for treating physician or surgeon to provide optimal cosmetic as well as functional outcome. Early surgical intervention for wound management gives better results.

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