

Animal bites

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ABSTRACT

Objectives: The aim of this study was to put forward a retrospective analysis of animal bites treated in our department.

Methods: A total of 1315 patients treated in the Department of Plastic Reconstructive and Aesthetic Surgery of Ankara Education and Research Hospital, Ankara, Turkey between January 2002 and March 2004 are included in the study. The fundamental treatment approaches were; copious saline irrigation, attentive debridement, appropriate antibiotic protocol, elevation and immobilization.

Results: Bites were produced by tamed (23.4%) and untamed animals (76.6%). The mostly encountered bites

were from dogs (76.2%) followed by cats (21.7%). The injury sites were mostly in the lower (35.0%) and upper (33.0%) extremities. Overall infection rate was found to be 4% which were mainly due to cat bites. A very low infection rate (0.03%) was found in the group of patients who did not receive prophylaxis.

Conclusions: Prophylactic antibiotics are recommended for severe injuries. Deep, dirty and defective injuries should be treated with delayed reconstruction. The majority of animal bite injuries in our country are consequence of untamed dogs and cats. The excessive lower extremity injuries can be attributed to this fact.

Saudi Med J 2005; Vol. 26 (5): 772-776

Animal bites account for approximately 1% of the total patients visiting to the emergency departments in the United States of America (USA). Every one of 2 Americans is exposed to animal bite throughout their lives.¹ Animal bite incidence is reported to be 175-740/100,000 in Europe and USA.^{2,3} However, it is a known fact that a good number of minor animal bites are never reported.

In a study held by Strassburg et al,⁴ between 1972 and 1979, a total of 350,000 animal bites have been reported to attend the Los Angeles Health Department with a wide range of severity from abrasion to fatal injuries. Sacks et al⁵ reported a total of 157 deaths as a result of dog bites in 2 year series in the USA.

Although animal bites can be seen in any part of the body and in any size, the mostly exposed sites are the upper extremities (especially hands) and the

facial regions.⁵⁻⁹ Berzon,¹⁰ have reported animal bites to affect mostly the 5 - 14 years age group.

The aim of this study is to put forward a retrospective analysis of animal bites evaluated in our department and report our treatment strategies. To the best of our knowledge, this is one of the largest series of animal bites reported so far.

Methods. A total of 1315 patients consulted and treated in our department between January 2002 and March 2004 were included in the study. Our hospital is the first order rabies center of the city. However, a significant number of patients also attend or are consulted from various regions of the country. Every patient is evaluated by the infectious diseases department for necessary vaccination and a possible antibiotic protocol. In some cases, involvement of more than one region of the body or

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Received 11th December 2004. Accepted for publication in final form 27th February 2005.

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Table 1 - Distribution of animal bites according to the modified Wolff classification¹¹ based on depth and severity of injury.

Grade	Clinical finding	(%)
1	Abrasions	(41.5)
2	Superficial injuries	(23)
3A	Non-defective deep injuries	(19)
3B	Defective deep injuries	(13)
4A	Injuries associated with vascular and nerve involvement	(3)
4B	Injuries associated with bone and organ involvement	(0.5)

Table 2 - Allocation of patients according to age group and gender.

Gender	Age group							Total	(%)
	1-4	5-9	10-16	17-24	25-44	45-64	65>		
Female	22	76	88	107	66	51	20	430	(32.7)
Male	44	141	171	176	177	153	23	885	(67.3)
Total	66	217	239	283	263	204	43	1315	(100)

Table 3 - Distribution of various animal bites between months.

Months	Dog bite	Cat bite	Other (horse, donkey, cow, rat)	Total
January, 2002	44	11	1	56
February, 2002	60	10	-	70
March, 2002	57	10	2	69
April, 2002	54	9	2	65
May, 2002	74	24	1	99
June, 2002	81	28	4	113
July, 2002	81	23	3	107
August, 2002	90	49	5	144
September, 2002	95	36	4	135
October, 2002	93	23	3	119
November, 2002	64	20	1	85
December, 2002	38	11	-	49
January, 2003	62	9	1	72
February, 2003	53	10	-	63
March, 2003	56	12	1	69
Total	1002	285	28	1315
(%)	(76.2)	(21.7)	(2.1)	(100)

Table 4 - Allocation of patients according to injury sites.

Bite site	Number of patients	(%)
Lower extremity	460	(35)
Upper extremity	434	(33)
Head and neck	250	(19)
Gluteal area	79	(6)
Trunk	76	(5.8)
Genital area	16	(1.2)
Total	1315	(100)

multiple injuries at the same region was encountered. These patients were classified according to their major injuries. In order to record the depth of injury, a modified Wolff classification¹¹ was used, (Table 1) which primarily was described for facial bites, however a modified version was adapted and used for other sites.

Injuries are irrigated with saline solution and a meticulous debridement was carried out. Other than patients having grade 1 and 2 injuries, a prophylactic antibiotic (sulbactam) regimen is applied for 5 - 7 days. While clean, superficial injuries are treated with early repair, a delayed treatment for defective and contaminated injuries was preferred. For the latter, appropriate dressings followed by late reconstruction modalities are undertaken such as late primary suture, grafting and flap reconstruction including free flap surgery. Nerve, tendon and bone injuries are treated with proper measures. Immobilization and elevation are constantly used for upper and lower extremity injuries. Hospitalized patients' wounds and wounds showing signs of infection were cultured and an antibiogram was obtained in order to choose the most appropriate antibiotic.

Results. The age range was between 1 and 87 with an average of 17 years. A significant number of these were children (39.6%). There were 430 females (32.7%) and 885 males (67.3%) (Table 2). The bites were mainly from dogs (76.2%) (Figure 1) and cats (21.7%) followed by a small percentage (2.1%) of other animal bites such as; horses (Figure 2), donkeys, and cows (Figure 3) and rats. Animal bites were more prevalent during summer and fall (Table 3). Bites were produced by tamed (23.4%) and untamed animals (76.6%).

Allocation according to the injury site revealed a nearly equal distribution of lower (35%) and upper (33%) extremities. Among other areas were; head and neck (19%), gluteal (6%), trunk (5.8%) and genital (1.2%) (Table 4).

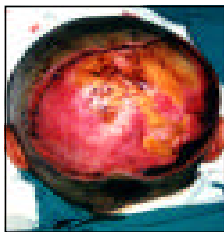


Figure 1 - Scalp avulsion caused by a dog bite. The amputated part suffered from crush injury and had multiple lacerations, thus, a replantation attempt had failed. One week after appropriate dressings, debridement and prophylactic antibiotic therapy, the defect was reconstructed via local flaps and free skin grafts.



Figure 2 - Amputation of the second finger due to horse bite.

According to our modified classification, the majority of the injuries were graded as 1 (41.5%) and 2 (23%) (Table 1). The most frequently isolated microorganisms from the cultures were *streptococci* and *staphylococci* and this was found to be in concordance with the literature.

Discussion. This is the largest animal bites series reported from our country. Injuries were mostly produced by dog, cat, horse, donkey, cow and rat bites in our series. The results of previous studies reported from our country^{2,13} were in concordance with our results as far as assaulting animals are of concern. There are a vast number of choices, from primary closure to free tissue transfer, for the reconstruction of soft tissue losses due to animal bites. The primary aim should be to restore the best aesthetic and functional outcome. Timing for primary or secondary reconstruction, and the use of prophylactic antibiotics are still debatable topics.^{14,15} These points will be discussed in the light of our results.



Figure 3 - Late presentation of a previously sutured thigh injury caused by a cow bite.

There are conflicting results on the use of prophylactic antibiotics in the literature.^{7,16} Animal bite injuries should be approached differently than other injuries as generally mixed organisms are isolated from oral flora of animals. Thus, there is a potential high risk for infection.¹⁷ However, the risk of infection varies according to the character of the bite, size of the wound, and risk factors inherit in the local injury site as well as the host defense mechanisms. Garcia¹⁸ have reported a 2-fold higher risk of infection in cat bites than dogs. Dire⁷ have reported the risk to be higher in deep and lower extremity wounds. Presutti¹⁹ have recommended against using antibiotics if there are no clinical signs of infection and reported that it is sufficient to perform saline solution irrigation and debridement. However, some authors convincingly recommend the use of prophylactic antibiotics^{7,15} especially for lower extremity bites.¹⁶ Although as much as 30% infection rates have been reported in literature, it is approximately 5% according to others.^{7,11,20,21} This may be due to different protocols used in the treatment regimens.

Some authors advocate the use of antibiotics only in diabetics, hand and lower extremity bites or for some specific injury types like deep contaminated wounds. This is probably based on the results of some studies that had showed no statistically significant decrease in wound infection, compared with controls, when prophylactic antibiotics are used.^{22,23} Callaham²⁴ have advocated the use of dicloxacillin or cephalixin if any sign of infection was detected during follow-up. We usually use prophylactic antibiotics (especially penicillin derivatives) for 5 - 7 days except for clean grade 1 and 2 injuries. Thus, approximately 35.5% of the patients have received prophylactic antibiotics in our series. A very low infection rate (0.03%) was found in the group of patients who did not receive antibiotic prophylaxis. We believe that wound classification according to severity is very important

and mandatory in order to distinguish the group of patients that will receive the antibiotic treatment. Open fractures, joint injuries, and exposed vital organs should be covered with well vascularized tissues as microbiological analyses of such wounds reveal mixed infections showing both aerobic and anaerobic microorganisms.^{17,25} With such an evaluation our infection rate was found to be 4% in our series which can be interpreted to be lower than common expectancy. Additionally, bites that revealed positive wound cultures were generally produced by cats and untamed animals.

Although there was a common consensus in the literature that the most frequently injured regions of the body by animal bites were; the upper extremity (especially the hand) and the head and neck areas, however, it was the lower extremities in our series. This was similar to the study of Mitmoonpitak et al.²⁶ who found a 64% rate of lower extremity injuries followed by upper extremities (21%), head-neck, torso and abdomen (15%). It is predictable that the majority of animal bites resulting from pets will affect the upper extremities (especially the hand). In the USA, 34 million people feed at least one dog at home. Thus, a good number of the reported injuries are caused by their own or neighborhood animals.¹⁹ Higher involvement of the lower extremities can be interpreted as a consequence of untamed animal bites (especially dogs and cats), which is still a major problem in our country. Yet, any type or site of injury in the body should be expected since rather unusual injuries such as pneumothorax,²⁰ external genital injuries¹⁴ or scalp avulsions, as in our series (Figure 1), can be encountered. According to our data, number of dog bites, effecting especially children, rises during summer and fall months (Table 3).

A study held by Ebinger et al.²⁷ informs us that the average cost of treatment for a single animal bite to be over 6100 Euro in European countries. Similarly, Griego et al.²⁸ reports the annual cost of animal bites to be over 30 million dollars in the USA. Every year, 3.5% of the total bite cases all over the country, are evaluated and treated in our hospital. According to our Ministry of Health records, approximately 100,000 new animal bite cases are reported annually (5 - 8% of these result in fatality)²⁰ which is obviously a heavy economic burden. However, this is surely an underestimation of the real number as a significant number of bites, are never reported.

Briefly, the protocol of our department in treating animal bites are as follows: copious saline irrigation, fastidious debridement, appropriate prophylactic antibiotics, elevation and immobilization. We recommend using prophylactic antibiotics for 5 - 7 days when more severe injuries than grade 2 are of concern. Clean, superficial wounds can be repaired by primary intention,

whereas defective, dirty wounds should be followed for approximately one week with appropriate dressings and a late reconstruction planned. Infectious diseases department should always evaluate the patient for a possible vaccination program.

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