

Original Research Article

Study of local manifestations of snake bite and its surgical implications, at a rural hospital in India

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ABSTRACT

Background: Manifestations of snakebite have local and systemic implications. While systemic manifestations can be life-threatening, local complications like cellulitis, necrosis, and compartment syndrome secondary to snakebite can threaten limb survival. This study undertakes the recognition of local complications and its outcome.

Methods: A retrospective observational study was conducted at our tertiary center in India. 219 snake bitten patients presenting in between January 2013 to December 2020, were studied. Surgical interventions whenever required for managing local surgical complications were recorded and analyzed.

Results: Of the 219 patients, 118 (53.88%) of the patients were bitten by venomous snakes requiring systemic therapy and 101 (46.12%) were non-venomous. Of the 118 patients with venomous snakebite, 78 (35.62%) had signs and symptoms. 83.11% reported to the hospital within 6 hours of the bite, while 45.66% within 2 hours. There were 169 (77.17%) patients who had local signs of inflammation, ischemic changes in 28 (12.79%), compartment syndrome in 15 (6.88%). 167 (76.26%) patients were treated conservatively while 52 (23.74%) had to undergo surgical interventions. Those undergoing surgical interventions had longer hospital stays (mean=8.09615) as compared to those treated conservatively (mean=4.82635) (p value=< 0.001). In patients with no local inflammation, only 1 (0.46%) required surgical intervention as compared to 51 (23.29%) (p value=< 0.001) patients with local inflammation requiring surgical intervention.

Conclusions: Along with systemic medical treatment, local manifestations of most snakebites can be well managed with suitable surgical intervention. Surgical complications of snakebite are not infrequent leading to interventions. Such patients usually have a longer hospital stay.

Keywords: Surgical implications, Snakebite, Surgical interventions

INTRODUCTION

Of all the animals known to mankind snakes constitute an important animal causing harm to human beings especially when they are sharing the same environment. There are thousands of snake species, but only 15% are considered dangerous to humans.¹ In developing countries like India, snakebites are frequently encountered. In rural areas, where farming is mainly done bare-footed snakebites are

encountered frequently.² Even because of the urbanization of the rural areas the snakes and the other animals are forced to flee their normal habitat, thus increasing the chances of human-animal conflicts. Most snakes are non-poisonous. In India, there are 2 families that are mainly predominant, Colubridae (cobra, Krait, and pit vipers) and Viperidae (true vipers).³ Snakebites can be a serious surgical emergency, sometimes life-threatening, requiring swift diagnosis followed by appropriate treatment.³ Limbs, especially the lower limbs are common sites of snakebites.

Snakebite has a varied spectrum of signs and symptoms ranging from none at all to immediate burning pain followed by swelling, pigmentation, necrosis, and other inflammatory signs at the local site, which may even progress to systemic symptoms. Feared complications include compartment syndrome and gangrene of the affected part often leading to loss of the limb even after the appropriate surgical interventions.⁴ Along with the surgical management of the local sites, varied systemic medical complications like coagulopathies, encephalopathy, myocardial infarction, acute kidney injury, acute respiratory failure, disseminated intravascular coagulation, paralysis, coma, and death, are to be dealt with systemic therapy.⁵⁻⁷

METHODS

This is a retrospective observational study in which 219 patients of all age groups and both genders presenting with snakebite at the trauma center or the surgery outpatient department (OPD) at Shree Krishna Hospital, Karamsad, Gujarat, India, in between January 2013 and December 2020, were studied. The required data obtained from the electronic medical software of the hospital were recorded and analyzed. All patients with confirmed snake bite were included in this study. Clinical profile of the patients, time from the bite to hospital, all symptoms and signs of local complications of snakebite. All local manifestations like cellulitis, tissue necrosis, gangrene, and subsequent necrosis including debridement, fasciotomy, skin grafting, secondary suturing, and amputation were recorded. In most of the patients, data regarding the identification was not available and the bite was taken as a snakebite as per verbal description from the patient or their relatives. The patients were managed with appropriate systemic therapy including ASV, tetanus prophylaxis, antibiotics, limb elevation, glycerine magnesium sulfate dressing, and critical care support as and when required.^{5-7,11} Mean, median, mode were calculated where required.

The patients were excluded which fall in the category of the unknown bite or unconfirmed/suspicious snakebite. This study is approved by the institutional ethics committee.

RESULTS

The data from January 2013 to December 2020 were analyzed. 219 patients, with a diagnosis of snakebite, were admitted at Shree Krishna Hospital of which 128 (58.45%) male and 91 (41.55%) female were admitted with a mean age of 34.9 years.

Table 1 shows that out of 219 patients, 118 (53.88%) were bites from venomous snakes and required systemic therapy (anti-snake venom). While the rest were non-venomous (101) and of the bites from venomous snakes, 78 (35.62%) had neurotoxin venom and 40 (18.26%) had hematotoxin venom.⁷ Non-venomous snakes are more frequently

encountered and may not require antivenom treatment but may end up with surgical implications.¹²

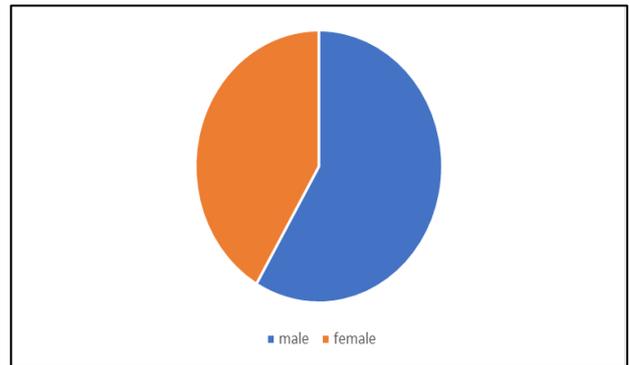


Figure 1: Gender representation of snakebite patients under study.

Table 1: Type of snake.

Type of snake and toxin	Frequency (%)	Overall frequency (%)
Venomous		
Neurotoxicity	78 (35.62)	118 (53.88)
Hematotoxicity	40 (18.26)	
Non-venomous		101 (46.12)

Table 2 shows the time elapsed between the bite and reporting to the hospital. It shows that 83.11% reported to the hospital within 6 hours. Considering that most snakebites occur in people working in the fields in far-flung rural areas in India where transportation and medical facilities are not nearby, morbidity and mortality could be high, though 45.66% of the patients did report within 2 hours. There is a tendency to visit local quacks for traditional care which many a time can be irrational, thus resulting in a delay in initiation of the appropriate treatment, hence increasing the morbidity and mortality. Early initiation of treatment does reduce morbidity and mortality.¹³

Table 2: Time elapsed between bite and reporting to the hospital.

Hours	Frequency (%)
0-2	100 (45.66)
2-6	82 (37.44)
6-12	15 (06.85)
12-24	14 (06.39)
>24	8 (03.65)

Table 3 shows that 77.17% of the patients had local signs and symptoms of cellulitis. It suggests that though systemic effects of the venom can be life-threatening, local manifestations like cellulitis, ischemic changes, and compartment syndrome can lead to high morbidity.¹¹

In this study, the pain was present in 141 (64.38%) patients, while bleeding from the site was present in 30 (13.70%) of the patients.

Table 3: Clinical manifestations in snake bite patients.

Clinical manifestations	Frequency (%)
Clinical signs of cellulitis	169 (77.17)
Ischemic changes present	28 (12.79)
Compartment syndrome present	15 (6.88)
Pain	141 (64.38)
Bleeding	30 (13.70)

Table 4 shows 76.26% of the patients were treated conservatively while 52 (23.74%) of the patients required surgical intervention/s and it compares the length of hospital stay in patients treated conservatively and those by surgical intervention. The duration of hospital stays of patients who had surgical intervention is higher as compared to those who were treated conservatively ($p < 0.001$).^{3,4,8}

Even though many of them would have recovered from the systemic complications of the snake venom, they still had higher morbidity and prolonged hospital stay resulting in an increased financial burden on the patients.

Table 4: Surgical intervention and the length of hospital stay.

Surgical intervention	Count (%)	Average length of hospital stay	Standard deviation
Conservative management	167 (76.26)	4.82635	2.96969
Surgical intervention	52 (23.74)	8.09615	4.96758
Total	219	5.60274	3.79911

Table 5 shows the surgical interventions done in patients. Fasciotomy was done in 18.26% of the patient and debridement in 15.07% of the patients.

Table 5: Types of surgical interventions.

Surgical intervention	Frequency (%)
Fasciotomy	40 (18.26)
Debridement done	33 (15.07)
Suturing done	8 (03.65)
Skin grafting done	4 (01.83)
Amputation done	1 (0.46)

Table 6 shows that there is a significant correlation between the local inflammation and surgical intervention ($p \leq 0.001$). These patients are likely to end up with local surgical complications and subsequent surgical intervention. It does suggest that in presence of local signs of inflammation, there are more chances of developing

surgical complications requiring surgical intervention thereby increasing the morbidity.

Table 6: Comparison of surgical intervention in patients having cellulitis and those without local signs.

Type of management	No inflammation (%)	Inflam mation present (%)	Total (%)
Conservative management	49 (22.37)	118 (53.88)	167 (76.26)
Surgical intervention	1 (0.46)	51 (23.29)	52 (23.74)
Total	50 (22.83)	169 (77.17)	219 (100.00)

DISCUSSION

In India, there are 2000 species of snakes of which 52 are poisonous.³ Most of the patients would be from rural areas and work on farms barefooted, hence making them more susceptible to bites.

The morbidity and mortality also depend on how early the first aid was given to the patient and the initiation of the systemic therapy in the form of anti-snake venom, tetanus prophylaxis, critical care support, and surgical management.

The time elapsed between the bite and the start of the treatment has been an important factor. In India, patients tend to reach the hospital late as they reside in far-flung rural areas with difficult transport facilities, also they are initially ignorant to seek medical care and visit quacks.

Early administration of ASV reduces morbidity and mortality and the incidence of local surgical complications.¹³ In our study, 45.66% of patients came within 2 hours of the bite. In total 23.74% of patients had surgical intervention, which would suggest higher morbidity/mortality in the patients and longer hospital stay.

Snakebites are likely to develop local complications leading to cellulitis, deep lacerated wounds, tissue necrosis, slough, and compartment syndrome.¹ The decision on debridement should not be delayed. In our study 15.07% of patients required serial debridement whereas, in literature, it ranges from 0.05% to 38%.³ Some even suggest prophylactic debridement (in absence of local necrosis) to limit local envenomation.⁴

The most dreaded complication would be compartment syndrome where early fasciotomy would help in salvaging the limb.¹⁴ In our study, 15 (6.88%) patients developed compartment syndrome and required fasciotomy (18.26%), and debridement (15.07%). Debridement followed by wound regular dressing along with antibiotic administration seems to be a mainstay treatment in such

cases.^{9,10} The patients were subsequently treated with secondary suturing (3.65%), skin grafting (1.83%), and amputation (0.46%).

In our study, out of those patients who had no signs of inflammation (50) only 1 (0.46%) required surgical intervention while among those who had signs of local inflammation (169), 51 (23.29%) required surgical intervention, hence the presence of local signs and symptoms should warn us of impending surgical complications requiring further intervention.

The average hospital stay in other studies was 7.6 days to 11 days and in our study, 5.6 days (ranges from 1-30 days), but a mean of 8.1 days in those requiring surgical intervention and 4.8 days for those treated conservatively.^{3,4} This suggests a statistically significant ($p \leq 0.001$) difference between the hospital stay duration of those treated conservatively and those requiring surgical intervention. The unique objective of this study is to focus on the importance of surgical interventions in the treatment of snakebites, which is usually ignored primarily. Very few studies in the literature have documented its significance.

Limitations of this study include the difficulty in the follow-up of patients due to which only the immediate complications of snakebite were recorded and we are not able to predict its long-term implications. Also being a hospital-based study, a true reflection of the population is difficult. Identification of snakes based on patients' impressions, lacks accuracy

CONCLUSION

Our study suggested that by scrutiny of the local signs and inflammation one can estimate an impending surgical complication and thus start an early surgical intervention. Surgical complications of snakebite are not infrequent. Though most of them can be managed conservatively, surgical interventions are required in cases of exaggerated local response. Such patients usually have a longer hospital stay.

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