

Autopsy Study of Renal Lesions in Snake Bite Cases

Vijay Balaji R¹, T. Selvaraj²

¹Assistant Professor, Department of Forensic Medicine, Government Stanley Medical College, Tamil Nadu, India, ²Associate Professor, Department of Forensic Medicine, Madurai Medical College, Tamil Nadu, India

How to cite this article: Vijay Balaji R, T. Selvaraj. Autopsy Study of Renal Lesions in Snake Bite Cases. Indian Journal of Forensic Medicine and Toxicology 2022;16(4).

Abstract

Background: Snake bite is the significant health problem in India, particularly in many rural regions. In general, the bites of snakes are due to the lower epidemiological profile and they are caused by non-poisonous snake bites, dry bites and envenomation. Venom is the saliva of snake ejected during the act of biting from the modified parotid glands. It can be neurotoxic, vasculotoxic in action.

Methods: A descriptive study was carried out in 107 patients conducted at Madurai Medical College & Hospital, Madurai from the period of April 2017 to march 2018. Out of 107 patients proportionate samples was selected based on the inclusion and exclusion criteria.

Findings: Out of the 107 patients, 49 (45%) were males and 58 (54.3%) were females. Similarly, deaths were reported to the hospital, who failed to receive ASV and with those patients who reported late to the hospital with a mortality rate, 81%. Other findings like local findings like pain and swelling 76 (43%), cellulitis, 76 (43%), gross findings and histopathological findings were recorded.

Conclusion: The rationalisation of anti- snake venom therapy can be done to prevent ASV related to kidney injury. Incidence of renal lesions in neurotoxic snake bites suggests a strict monitoring of renal parameters and timely intervention of treatment measures such as dialysis even in neurotoxic snake bite.

Keywords: Snake bite, renal lesions, neurotoxicity, Acute Kidney Injury.

Introduction

Considerable morbidity and mortality in tropic regions, is a significant public health problem caused by snake bite. Snake bite is known from ancient age, referring to ancient medical writings¹. Based on WHO reports, about 5 million people each year are affected by poisonous snake bite, which resulted 2.5 million envenomation, greater than 1 million deaths². Among

the rural population predominant high risk is seen in Asia and Sub-Saharan African regions. According to India, the mortality rate due to venomous snake bite cases is estimated to be 35000 to 50000 per year and recorded to be the highest among other countries. Increase mortality in India is due to various factors like social, economic and cultural reasons³.

Snake venom is a rich bio-resource of biologically

Corresponding Author: T. Selvaraj, Associate Professor, Department of Forensic Medicine, Madurai Medical College and Hospital, Madurai.

E-mail: vijay.medico88@gmail.com

active components, but only one percent of these molecules have been characterised. Identification and characterisation of toxic components present in snake venom are the main step not only to understand the pathophysiological changes observed after bites, but also to improve the treatment after snake bites. Snake venom is composed of 90% of proteins, polypeptides, many other organic and inorganic substances. Most snakes have 6-12% of enzymes in their venom. No venomous snake has all components few of which that are present are ATPase, Cardiotoxin, Hylauronidase, Neurotoxins, Ophanin, Phosphotidase etc.

Clinical manifestations mainly depend on the dose of venom injected, bite to needle time, potency and adequacy of anti-venom given to the patients. Envenomation causes certain complex effects, like insignificant lesions caused at the bite site to necrosis. Most of the life threatening effects of envenomation are disseminated intravascular coagulation, acute kidney injury, septicaemia and sudden cardiac death from arrhythmia⁴. Snake venom has isoenzyme, phospholipase PLA2 which is responsible for the manifestations of systemic functions such as local capillary damage, tissue necrosis and anticoagulation action. This kind of clinical syndrome is distinguished by hypotension, kidney injuries and pituitary failure⁵.

The present study aims to know the epidemiological profile of snake bite cases, spectrum of histopathological changes, lesions in association with post-mortem and mortality, major causes and long term changes in kidney function that follows hemotoxic envenomation.

Results and Discussion

Table 1: First aid prior to anti snake venom

First aid	No.of cases			Percentage (%)
	Male	Female	Total (n)	
No first aid	43	49	92	86
Tourniquet	3	4	7	7
Incision	0	0	0	0
Application of herbal medicine	3	5	8	7
Suction of venom form the bite site	0	0	0	0

Materials and Methods

Descriptive study was conducted by collecting data from the medico-legal autopsies of snake bite cases conducted at the mortuary of Madurai Medical College & Hospital, Madurai from the period of April 2017 to March 2018 after getting ethical clearance from Institutional Ethics Committee. One hundred and seven subjects were considered for this study out of which 49 were male subjects and 58 were female subjects, aged between 0 to >50 years. There are certain exclusion criteria included in this study are: Bite from other reptiles or animals, obscure histories, decomposed bodies and patients with pre-existing chronic renal illness.

During post-mortem examination, the kidneys were collected and preserved using 10% formalin. After processing the tissue of 2-3 micron, sections were subjected to macroscopic and microscopic studies. The dissected tissues of kidneys were stained with haematoxylin and eosin. The slides were then subjected for study under light microscope to detect changes.

Statistical analysis

The collected data were stored using computer program. The data which is continuously exhibited is expressed as mean \pm SD. The mean calculated from the study is compared using unpaired t test. P value < 0.05 was considered to be statistically significant. All statistics were carried out using Graphpad Instat, Version 3.06.

Table 2: Bite to ASV time

Bite to ASV time	No.of cases		Total (n)	Percentage (%)
	Male	Female		
< 1 Hour	5	10	15	14
1-6 Hours	5	12	17	15
6-24 Hours	30	20	50	46
> 24 Hours	9	16	25	23

Table 3: Local findings

Local finding	No.of cases		Total (n)	Percentage (%)
	Male	Female		
Edema	36	40	76	43
Blisters	9	3	12	7
Ulceration	2	2	4	2
Cellulitis	36	40	76	43
Gangrene	5	6	11	6
Regional lymphadenopathy	17	10	27	15
Others	9	14	23	13

Table 4: Histopathological findings in kidney

Glomeruli	No.of cases in Krait	No.of cases in Viper	No.of cases in Cobra	No.of cases in undetermined
Congested capillary loops	8	13	7	3
Thickened capillary loops	0	6	1	1
Fibrin thrombi	1	7	2	1
Renal infarction and cortical Necrosis	8	4	3	0
Tubules				
Diffuse acute tubular necrosis	10	12	4	2
Focal acute tubular necrosis	6	25	6	6
Interstitium				
Normal	0	5	0	0
Congestion	0	4	4	0
Mild	3	13	5	2
Moderate	4	5	2	2
Severe	6	16	4	4
blood vessels				
Other ancillary findings(IHC/IF)	3	0	0	0

Age group most commonly involved in the study is 50 years and above (n=39,36%). This percentile differs from other studies such as Chugh et al⁶ where mean age of subjects was 33±10 years. In our

study percentage of males affected 45% (n=49) and percentage of females affected is 54.3% (n=58). More number of working women in Madurai district can be a reason for such discordance.

Snake bite during activity (n=92, 86%) predominated the snake bite during sleep (n=15, 14%). This is in contrast with Rupinder sharma et.al⁷ who demonstrated bite during sleep was more compared to bite during activity. The difference in numbers can be explained by the fact that neurotoxic bites especially Krait is most common during night and at indoors and it is predominant in North India. Lower limb was the commonest site of snake bite in our study followed by upper limb and abdomen. People accidentally step onto the snake during walking.

In most number of cases in our study, no first aid was given before ASV (n=92, 86%), tourniquet was inserted in 7% (n=7) of cases and herbal medicines was applied in 7% (n=8) of cases. Nonmedical treatment was not taken in a majority of cases. This is in discordance with Singh RR et.al in which 43% took non-medical treatment before ASV. Though most of our study group are uneducated, sensitisations among people even in rural areas have prevented them from taking non-medical measures.

Bite to ASV time is more than 6 hours (late SAV) in 70% (n=75) cases and less than 6 hours (early SAV) in 30% (n=32) cases. Bite to needle time is higher in our study due to the delay in reporting of patients. This is in concordance with Sharma N et.al⁸. Local pain and swelling is present in 43% (n=76) cases. Rubina Naqir et.al⁹ had a similar findings. This was partly due to late presentation of patients in our study leading to settlement of local symptoms. Cellulitis was also present in majority of cases in our study (n=76, 43%) Harshavardhan et.al¹⁰ reported that 96% of cases had cellulitis.

In our study, major gross findings noted was swelling and edema (n=79, 74%) followed by congestion (n=28, 26%) on outer surface. On cut section, medullary congestion was noted in 52% cases (n=55) and Petechial haemorrhages in cortico-medullary junction noted in 23% (n=25) cases. This is in unison with Yogesh C et.al¹¹ who observed congestion in majority of cases. Findings of Petechial haemorrhage are also consistent with Alakesh Halden et. al.¹² in which 21% cases reported Petechial haemorrhage. Pale cortex and congested medulla is seen in 55 cases (n=52%) in our study.

Among the Viper cases reported (n=49, 46%). Glomerular changes noted in 26 cases 53% (congested capillary loops in 13 cases, thickened capillary loop in 6 cases and fibrin thrombi in 7 cases). Cortical necrosis in 4 cases (4%). Tubular changes in 37 cases (76%) (acute diffuse tubular necrosis in 12 cases, acute focal tubular necrosis in 25 cases). Interstitial changes in 34 cases (69%) (mild interstitial inflammation in 13 cases, moderate interstitial inflammation is 5 cases, severe interstitial inflammation in 16 cases). Among the krait cases reported, (n=24, 22%) histopathological changes noted in kidney are as follows: Glomerular changes in 9 cases (congested capillary loops in 8 cases & fibrin thrombi in 1 case). Tubular changes in 16 cases (focal ATN in 6 cases and diffuse ATN in 10 cases) and interstitial changes in 12 cases. Among the cases of Cobra bite reported in our study (n=21 cases). Glomerular lesions noted in 10 cases (congested capillary loops in 7 cases, fibrin thrombi in 2 cases and thickened capillary loop in 1 case). Tubular lesions noted in 10 cases (acute focal necrosis in 6 cases and diffuse type in 4 cases). Interstitial changes noted in 11 cases and renal cortical necrosis noted in 3 cases.

Conclusion

In the present study, out of 107 cases of snake bite, age group commonly involved is 50 years and above, most affected being agricultural labourer, maximum fatality occurred at winter and during activity. Lower limb was the commonest site involved and majority of cases received anti snake venom, even though bite to ASV time is more. Among the local findings, local pain and swelling predominated. Histopathological study of kidney revealed that tubular lesions (acute focal tubular necrosis) predominant in Viperid bites, tubular (diffuse ATN) and interstitial changes (severe inflammation) in Krait bite and glomerular (congested capillary loop) and interstitial (severe inflammation) changes in Cobra bite. Prevalence of acute kidney injury in our study was 79.5% which is very high compared to previous studies. Further monitoring of renal parameters even in neurotoxic snake bite and prompt dialysis should be done. This indicates the need for further large scale investigations with detailed pathology of neurotoxic snake bite with ultra-structural and molecular studies. Advanced age and increased time interval from snake bite to anti-

venom administration were independent risk factors for snake bite induced AKI. Special investigation into the biochemical and immunologic components of Cobra and Krait venom should also be considered. Rationalisation of anti-snake venom therapy to be done to prevent ASV related kidney injury.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Obtained from Institutional Ethics Committee, Madurai Medical College.

References

1. Kasturiratne A, Wickremasinghe AR, de Silva N, Gunawardena NK, Pathmeswaran A, Premaratna R, et. al. The global burden of snakebite: a literature analysis and modelling based on regional estimates of envenoming and deaths. *PLoS Medicine*, 2008; 5(11): e218.
2. Mohapatra B, Warrell DA, Suraweera W, Bhatia P, Dhingra N, Jotkar RM, et. al. Snakebite mortality in India: a nationally representative mortality survey. *PLoS Neglected Tropical Diseases*, 2011; 5(4): e1018.
3. Menon JC, Joseph JK, Kulkarni K. Treatment of snakebites - A Resume. *Cobra*, 2007; 1(4), pp.1-21.
4. Athappan G, Balaji MV, Navaneethan U, Thirumalikalundusubramanian P. Acute Renal Failure in Snake Envenomation: A Large Prospective Study. *Saudi Journal of Kidney Diseases and Transplantation*, 2008; 19(3), pp. 404-410.
5. Kohli HS, Sakhuja V. Snake Bites and Acute Renal Failure. *Saudi Journal of Kidney Diseases and Transplantation*, 2003; 14(2), pp. 165-176.
6. Chugh KS. Snake bite induced acute renal failure in India. *Kidney International*, 1989; 35(3), pp. 891-907.
7. Sharma R, Dogra V, Sharma G, Chauhan V. Mass awareness regarding snake bite induced early morning neuroparalysis can prevent many death in North India. *International Journal of Critical Illness and Injury Science*, 2016; 6(3), pp. 115-118.
8. Sharma N, Chauhan S, Faruqi S, Bhat P, Varma S. Snake envenomation in a North Indian hospital. *Emergency Medicine Journal*, 2005; 22(2), pp. 118-20.
9. Naqvi R. Snake bite induced acute kidney injury. *Journal of College of Physicians & Surgeons Pakistan*, 2016; 26(6), pp. 517-520.
10. Harshavardhan L, Lokesh AJ, Tejaswari HL, Halesha BR, Metri SS. A study of acute kidney injury in snake bites victims in a tertiary care centre. *Journal of clinical and Diagnostic Research*, 2013; 7(5), pp. 853-856.
11. Yogesh C, Satish KV. Study of clinicopathological profile of renal changes in snake bite cases for a period of 18 months reported to Victoria Hospital, Bangalore. *International Journal of Scientific and Research Publications*, 2004; 8(4), pp. 1-5.
12. Halder A, Das NK, Mandal T, Samanta AK. Study of Epidemiology, Morphological and Histopathological changes of stomach and kidneys in Poisonous Snake bite. *Journal of Medical Science and Clinical Research*, 2017; 5(2), pp. 17898-17902.