www.jmscr.igmpublication.org
Impact Factor 5.84
Index Copernicus Value: 83.27
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v5i7.111

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Research Article

Viper Bite Envenomation- A Clinical study searching for Neurological Manifestations

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ABSTRACT
Background: *Viper bite envenomation is prevalent in northern Kerala. Its clinical manifestation is varied. Haematological features dominate its clinical presentation. This study focuses on its neurological effects.*
Methods: *We conducted a prospective study involving 52 patients in Kozhikode district with viper bite envenomation of which 35 were bitten by Russell's viper and the rest 17 by saw-scaled viper. All cases were subjected to detailed clinical evaluation with emphesis to local effects, hemorrhagic and local manifestations. Relevant investigations were done with special tests like neostigmin test in selected cases*
Results: *All patients had signs of local envenomation with local serosanginous blister formation in 8% and regional lymphadenopathy in 24%. Paralytic symptoms developed only in patients with Russell's viper envenomation. These were ptosis in 28%, external ophthalmoplegia in 20%, dysarthria (8%) and dysphagia (2.8%)*
Conclusions: *Neurological manifestations do occur after viper bite envenomation. It is observed only after Russell's viper bite. Ptosis and external ophthalmoplegia are the commonly seen manifestations, dysarthria and dysphagia occur in moderate to severe envenomation.*
Keywords: *Viper, Envenomation, neurological manifestations.*

INTRODUCTION

Snakes have inspired a mystic and mixed feeling of good and evil in human mind since the dawn of civilisation. The snake is the emblem of the healer and has long been associated with healing and with therapeutics in Western medicine

The Clinical manifestations of snake bite provide a field of great interest to the clinician. Its diverse neurological manifestations mean that snake bite must be considered in the differential diagnosis of cranial nerve palsies, myasthenic syndromes, symmetrical limb weakness, acute myopathies and even of coma.

In view of its prevalence in this area with its varied clinical manifestations, the subject of viper bite envenomation has been taken for study.

Local signs and symptoms and haemorrhagic manifestations usually dominate the clinical

picture of viper envenomation. Death is attributed to cardiovascular failure, shock, renal failure and sometimes to cerebral haemorrhage. Apart from the 'pre-paralytic' manifestations (headache, vomiting, loss of consciousness, loss of vision, paraesthesia and convulsions) neurological manifestations do not usually occur after bites from most species of viper. However, bites from Russell's viper is associated not only with local, hemolytic and coagulant effects but frequently with ptosis and external ophthalmoplegia. Occasionally it may cause dysphagia, difficulty in speaking, trismus and even limb paralysis.

Bites from saw-scaled viper can produce cerebral haemorrhage which may develop 2-7 days after the bite. Permanent visual defect can occur after bites from E. carinatus due to retinal spasm associated with severe haemorrhage.

Papilloedema and retinal haemorrhage occures due to the haemorrhagic effect of Vipera lebetina venom.

Myotoxic symptoms and signs may be associated with viper and pit viper envenomation. Aching, tender muscles and myoglobinuria were observed after Russell's viper envenomation

METHODS

PATIENT POPULATION

We conducted a prospective study involving patients with a diagnosis of snake-identified viper bite envonomation admitted in the snake bite unit of Calicut Medical College. The district Calicut officially and traditionally known as Kozhikode has a population of over 38 lakhs residing in urban and suburban region is one of the areas with a high incidence of snake bite in the country.

All cases were subjected to detailed clinical evaluation with special emphasis to Local effects, Hemorrhagic and Neurological manifestations.

STUDY DESIGN AND OVERVIEW

We recruited all patients with viper bite envenomation admitted in snake bite unit. The snake was identified by experienced physician using standard protocols.

Written informed consent was obtained from all participants or from the next of kin of severely ill patients. Patients were examined every 12 hours for the first 36 hours and thereafter daily and their progress noted. Neostigmin test was done in selected patients to observe the reversibility of neuroparalytic manifestations.

LABORATORY METHODS

The following investigations were carried out in each patient. We did a full haematological profile with tests of coagulation abnormalities. A random blood sugar, RFT, LFT, Chest radiograph and an ECG were done.

STATISTICAL ANALYSIS

We analysed demographic and clinical characteristics using descriptive statistics.

RESULTS

The following observations were made with regard to the epidemiology, clinical features including neurological manifestations and laboratory findings.

Age Distribution

The youngest patient in the study group was 13 years old and the oldest was aged 70 years. The age distribution is given in the following table.

Age (Years)	No. Of patients	Percentage
10 - 19	18	34.6
20 - 29	7	13.4
30 - 39	11	21.2
40 - 49	6	11.5
50 - 59	6	11.5
60 - 69	3	5
70 - 79	1	1.9

Sex incidence

The Incidence was high among males - 38 among 52 patients (73.1%) and low in females - 14 out of 52 (29.9%).

Site of bite

The majority of patients are bitten on the lower limb below the knee i.e., 48 patients (92%) and only 4 (8%) are bitten on the hand.

Time interval between the bite and the hospital admission

Most of the patients in this study got admitted in the hospital within 24 hours, as depicted in the following table.

Time interval between the bite and admission	No. Of cases	Percentage
Within 3 hours	26	50
3 - 12 hours	19	36.5
13 - 24 hours	3	6
More than 24 hours	4	7.6

Species of snake

Out of the 52 patients studied 35 were bitten by Russell's viper (67.3%) and the rest 17 (32.7%) by saw-scaled viper (Echis carinatus).

Neurological Manifestations

Preparalytic Symptoms

Vomiting

The commonest symptom noted was vomiting which was more common with Russell's viper bite (80%) than saw-scaled viper bite (58.8%). Most patients became nauseated and developed vomiting within 2 hours after the bite. In two of the patients vomiting followed after herbal medications from indigenous physician.

Headache

Headache was a common preparalytic symptom the distribution of which was almost equal in two groups i.e., 71.4% in Russell's viper bites and 70.5% in saw-scaled viper bites. Majority of the patients developed diffuse headache lasted for 30 - 60 minutes. One of the patients with a history of vascular headache had precipitation of migrainous attack after the bite.

Loss of consciousness

Transient loss of consciousness was observed in 4 patients (7%); 3 patients with history of Russell's viper bite and one after saw-scaled viper bite. In all the four patients the unconscious state lasted only for few minutes.

Convulsions

Generalised convulsions were observed in one patient who developed acute renal failure. None of the patients gave history of convulsions during the initial hours after the bite.

Paraesthesia

Paraesthesia involving a variable area of the limb around the bite marks was noticed in 13% of the patients. One of the patients had circumoral paraesthesia.

Other Symptoms

Hyperacusis was present in one patient and transient vertigo was observed in two of the patients.

The incidence of symptoms is summarised in the following table.

Symptoms	No. Of patients	Percentage
1. Headache	37	71.1
2. Vomiting	38	73
3. Loss of consciousness	4	7
Paraesthesia		
Circumoral	1	1.9
Local	7	13
5. Hyperacusis	1	1.9
6. Vertigo	2	3.8

The relative incidence of symptoms in the two groups is as follows:

Symptoms		Russell's viper bite group (35)		Saw-scaled viper bite (17)	
		Number of patients	%	Number of patients	%
1	Headache	25	71.4	12	70.5
2	Vomiting	28	80	10	58.8
3	Loss of Consciousness	3	8	1	5.8
4	Paraesthesia	5	14.2	3	17.4

Paralytic symptoms

The neuroparalytic manifestations noted after Russell's viper envenomation were ptosis, external ophthalmoplegia, dysarthria and dysphagia. No paralytic symptoms were observed after saw-scaled viper envenomation.

The distribution of each symptom and sign in Russell's viper envenomation is as follows:

Symptoms & Signs	No. Of patients	Percentage
Ptosis	10	28.5
External Ophthalmoplegia	7	20
Dysarthria	3	8
Dysphagia	1	2.8

Local manifestations

Pain at the site of bite was present in all patients. Oedema of the bitten part was observed in 86% of patients. Other manifestations in the descending order of frequency were bleeding from the wound, lymph node enlargement and tenderness, blisters and gangrene. The incidence of each is given below.

Symptoms & Signs	No. Of patients	Percentage
Pain	50	100
Oedema	43	86
Bleeding	18	36
Lymphadenopathy	12	24
Blisters	4	8
Gangrene	2	4

Haemorrhagic manifestations

Fourty two percent of patients under the study developed haemorrhagic manifestation which were more common after Russell's viper bites (48.5%) than after saw-scaled viper bites (29%).

Haemorrhagic manifestations		Number of patients		
		Total	RV Bite	SSV Bite
1	Heamaturia	13	10	3
2	Malaena	2	2	0
3	Haematemesis	1	0	1
4	Ecchymoses	3	2	1
5	Subconjunctival haemorrhage	3	3	0
Total		22 (42.3%)	17 (48.5%)	5 29.4%)

Acute renal failure

The incidence of acute renal failure in this study was 8 out of 52 (15.4%); 7 in Russell's viper bite group (20%) and 1 in saw-scaled viper group (5%).

Coagulation Time

Significant coagulation abnormalities were present in 21% of patients. Majority i.e., up to 50% showed normal coagulation time.

Coagulation time minutes (Lee-White Method)	No. Of patients	Percentage
Normal 5 - 15	26	50
16 - 30	15	28.8
> 30	11	21

Platelet count

Thrombocytopenia, with platelet count below 50,000 was observed in 7.6% of patient.

Platelet count	No. Of patients	Percentage
< 50,000	4	7.6
50,000 - 1,00,000	8	15.4
> 1,00,000	40	76.9

Mortality

One patient among saw-scaled viper bite group died due to shock which was resistant to intensive treatment (mortality 1.92%).

DISCUSSION

The incidence of viper envenomation is common in north Kerala. The literature contains many case reports of snake bite but not so many in which the snake is identified with certainty. The Present study included 52 patients with viper bite envenomation of which 35 were bitten by Russell's viper and the rest 17 by saw-scaled viper.

Epidemiology

Age incidence shows maximum number of patients in younger age group and the incidence was high among males (73%). This is because these are the people who are most commonly engaged in field work and hence exposed to snakes. 50% of the patients in this study got admitted in the hospital within 3hrs and only 7.6% after 24 hrs. This has important prognostic significance. The shorter the interval, the better is the outcome.

Clinical Features

Headache and vomiting were the commonest preparalytic symptoms, seen in over 70% of patients. One or both of these symptoms may develop within a few minutes of bite or they may be delayed for some hours. In the majority of

patients there was a single episode of vomiting but occasional patients showed repeated bouts during the first 24 hrs. Both these symptoms are thought to be due to a venom toxin or to venom released histamine acting on the cranial blood vessels and on the vomiting centre. The finding that one of the patients under the study had precipitation of migranous attack supports this view.

Sudden loss of consciousness occurring within a few minutes after viper bite was reported by several authors (Lounsberry 1934; Danzig and Abels 1961; Wiener 1960 and Campbell 1975). In the present study 7% of patients experienced this symptom. During this unconscious state convulsions may occur (Flecker 1940). None of the patient in this study developed convulsions during this period. Spontaneous recovery from this unconscious state in the norm. In some respects this clinical state resembles an anaphylactic type of reaction.

Paraesthesia, at times unpleasant, affecting variable area of the bitten limb were observed in 13% of patients. Circumoral paraesthesia was noted by one of the patients in the present study. Hyperacusis was present in one patient and transient vertigo in two patients.

Other documented symptoms like deafness (Willson 1934), tinnitus, loss of sense of taste and smell (Reid and Flecker 1950) were not observed in any of the patients in this series.

Neuroparalytic Symptoms

About 28% of patients in Russell's viper group developed neuroparalytic symptoms, ptosis and external ophthalmoplegia are the commonest, the incidence being 28% and 20% respectively. Dysarthria was observed in 8% and dysphagia in 2.8%.

No neuroparalytic symptoms were observed in patients with saw-scaled viper bite.

Neostigmine test

Neostigmine test was performed in 4 patients with ptosis ophthalmoplegia (Neostigmine methyl sulfate intramuscularly in a dose of 1.5mg and observing objective and subjective improvement within 30 minutes).

The test was negative in all the four patients i.e., no improvement of symptoms and signs was noticed. The inference is the presence of a presynaptic neurotoxin in Russell's viper venom.

The neurological manifestations are the result of two pathophysiological processes.

1) Due to the presence of specific neuromuscular blocking to toxins.
2) Due to coagulation abnormalities leading to haemorrhage and thrombosis resulting in CNS pathology.

Symptoms such as confusion, convulsions, coma, hemiplegia and cortical blindness may result from structural damage caused by haemorrhage or ischaemia or both.

Case reports from Tiruvalla Medical Mission Hospital, Kerala (Jacob. J) shows two cases of convulsions and coma, one patient with brainstem haemorrhage and one with left MCA infarction. Bashir and Jinkins (1989) reported a 13 year old female patient who developed left cerebral infarction following envenomation by Echis carinatus. A similar case of middle cerebral occlusion following Russell's viper bite was observed by Ameratunga from Srilanka. No such cerebrovascular problems were noticed in the present study.

Vasospastic manifestations are occasionally seen with viper envenomation. A patient with Raynaud's phenomenon after Russell's viper envenomation was observed from this institution (Sathynathan 1993). Report of a patient with transient blindness due to retinal spasm (Davenport et al 1953) is another example. No such manifestations were observed in this study.

Local signs & symptoms

Local pain and swelling invariably follow bite of a viper which has injected venom. More than 95% of patients developed local symptoms. Pain and swelling were noticed in over 85% of patients. The absence of local swelling 1hr after the bite suggests that no venom has been injected and the

bite poses no risk to the patient. Bleeding from the site of bite and regional lymph node enlargement and tenderness were observed in a significant number of patients. Blisters and local gangrene formation were noticed in a minority of patients with severe envenomation.

Bleeding manifestations

Hemorrhagic manifestations as reflected by bleeding from the gums, haematemesis or hematuria occurred in 42% patients. Russell's viper bite is more commonly associated with hemorrhagic manifestations i.e., 48% against 29% in saw-scaled viper bites.

In most cases of moderate or severe envenomation clotting time was prolonged. Thrombocytopenia with platelet count < 50,000 were seen in 7% of patients.

Acute renal failure

Russell's viper venom has got a direct nephrotoxic action apart from the ischaemic damage. Acute renal failure was observed in 20% of patients with Russell's viper envenomation and in 5% with saw-scaled viper envenomation.

CONCLUSION

1) Viper bite envenomation is still a common medical problem in Kerala.
2) Over 20% seek medical aid late thereby having an adverse bearing on the prognosis.
3) Neurological manifestations do occur after viper bite envenomation.It is observed only after Russell's viper envenomation.
4) Ptosis and external ophthalmoplegia are the commonly seen manifestations, dysarthria and dysphagia occurs in moderate to severe envenomation.
5) Negative neostigmine test in patients with neuroparalytic symptoms denote the presence of a presynaptic toxin in Russell's viper venom.
6) Respiratory paralysis is uncommon after viper bite envenomation.

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