DOI: 10.7860/JCDR/2023/64937.18671

Case Series

Internal Medicine Section

Clinical Evaluation of Patients with Krait Bites in the Emergency Department: A Series of Three Cases

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ABSTRACT

Envenomation from snakebites continues to be a severe public health issue in many parts of the world, particularly in tropical and subtropical regions. The complex range of envenomation symptoms necessitates ongoing innovative approaches for the effective treatment of snakebite victims, especially those resulting from krait species. The present case series provides a comprehensive clinical assessment of krait bite patients (three male patients) in the Emergency Department (ED), emphasising the distinct clinical implications, cutting-edge perspectives, and critical requirements for reporting such occurrences. To identify both shared traits and unique attributes among the cases, authors analysed clinical records, laboratory data, treatment methods, and outcomes. Within the case series, three patients exhibited diverse envenomation symptoms. Notably, discrepancies were observed in the timing and severity of conventional neurotoxic indicators. Additionally, some individuals showed unusual coagulopathic symptoms, which posed challenges in diagnosis and treatment decisions. It is noteworthy that one patient demonstrated resistance to traditional antivenom therapy, raising the possibility of the need for individualised treatment plans. The wide range of clinical manifestations emphasises the importance of individualised care strategies and thorough surveillance. By illustrating the diverse clinical course of krait envenomation and the challenges it presents to healthcare professionals, present case series contributes to the current body of knowledge. The need for reporting and further research is particularly urgent, given the emergence of antivenom resistance. Reporting such occurrences becomes crucial in establishing global treatment recommendations and enhancing scientific understanding in the field as snakebite management tactics continue to evolve.

Keywords: Clinical assessment, Elapidae, Emergency medical services, Envenomation, Neurotoxicity, Snakebites

INTRODUCTION

Snakes, being cold-blooded vertebrates, cannot regulate their body temperature and become active in cold conditions [1]. Snakebites are a severe public health concern, causing numerous deaths in India annually. According to the World Health Organisation (WHO), upto 2.7 million envenomations are caused by an estimated 5 million snakebites each year. According to WHO reported data, there are 81,000 to 138,000 fatalities annually [2,3]. Venomous snakebites can result in a wide range of symptoms, from mild to life-threatening [3]. The onset of neurotoxic symptoms can be rapid and subtle, and respiratory failure is a major concern. Prompt diagnosis depends on history, examination, and laboratory tests [4].

Krait snakebites can lead to descending paralysis due to venom-containing β-bungarotoxins. Local symptoms are usually minor, and fang marks may or may not be visible [5]. In the ED, admission and antivenom therapy are crucial, while carefully monitoring for allergic reactions [6]. Maintaining the patient in intensive care is advised until major symptoms subside. In managing krait snakebites, the patient should rest, be kept warm, and movements minimised [7]. Neurotoxic symptoms should be regularly checked, and respiratory support provided if necessary. Fluid balance is important for hydration. Oropharyngeal paralysis or swallowing issues should prompt withholding oral intake and positioning the patient on their side with the head down [8]. Morphine and alcohol are avoided due to potential respiratory suppression. In cases of circulatory shock unresponsive to antivenom, plasma volume expanders and vasopressor agents may be considered [9]. Tetanus prophylaxis should be upto-date, and prophylactic antibiotics are not recommended. Special considerations may arise in cases of multiple bites or severe envenomation.

The main treatment for krait envenomation is antivenom therapy [10]. The patient's condition must be continuously monitored, and additional antivenom administered if needed. Patients are often kept in intensive care for 24 hours after significant symptom improvement. These actions can significantly enhance patient outcomes [11]. The specific antivenom used is a polyvalent formulation containing antitoxin against the four most poisonous snakes in India: standard cobra venom (Naja naja), standard common krait venom (Bangarus caeruleus), standard Russell's viper venom (Viperarusselli), and snake venom antiserum (polyvalent) [12]. Each vial contains specific amounts of these venoms. The antivenom is vital in neutralising the snake's venom and alleviating symptoms [13].

This research work offers fresh insights into the clinical range and dynamic nature of krait envenomation, in addition to literature findings. Due to the heterogeneity in symptom presentation, treatment response, and long-term results, ongoing monitoring and research are required. The discovery of treatment-resistant cases underscores the importance of sharing such experiences. They could indicate changes in venom composition, organism physiology, immune resistance, environmental shifts, treatment effectiveness, and recent advancements in treatment. Collaborative analysis can drive innovative solutions for better outcomes.

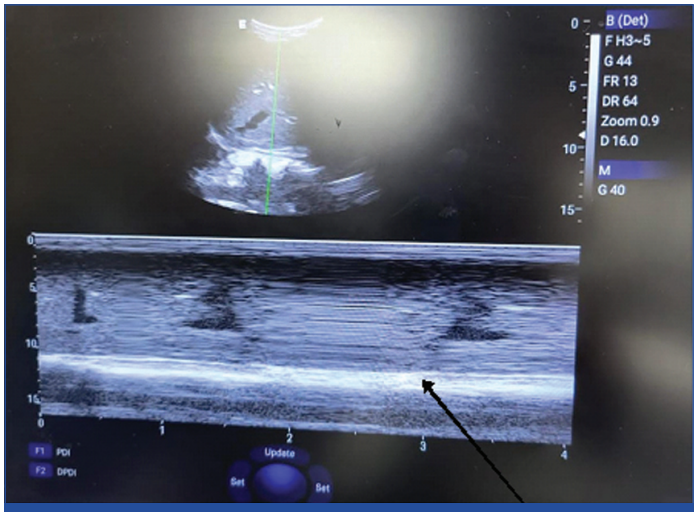
Case 1

A 12-year-old male child who had recently experienced a double krait snake bite on the right-side of his neck while playing in the garden during the evening, was presented to the ED. The patient was having fun in the garden when he suddenly began to experience severe neck discomfort. He informed his parents immediately, and they rushed him to the hospital. According to the youngster, the snake was long, thin, and light-coloured, with dark bands on its body. Since the incident, he has struggled with swallowing, slight

disorientation, growing discomfort at the bite site, and generalised weakness. The patient had no noteworthy prior dental or medical history. He had no known sensitivities or previous snakebite injuries.

The youngster showed ecchymosis and oedema at the bite site on the right-side of the neck, and he appeared apprehensive during the examination. There were two definite fang markings about a centimeter apart. When the patient's neck was palpated, it was sensitive. He had a normal oxygen saturation of 98% and respiratory rate, but he also exhibited tachycardia (heart rate of 110 beats per minute). According to a neurological assessment, upper and lower limb motor and sensory functions were both intact. A neck X-ray was taken to determine the location and depth of the fang markings. The X-ray showed no signs of bone damage or foreign objects.

Point-of-care ultrasound showed diaphragmatic paralysis on day one, two, three and four [Table/Fig-1]. The Magnetic Resonance Imaging (MRI) confirmed the suspicion of hypoxemic encephalopathy.

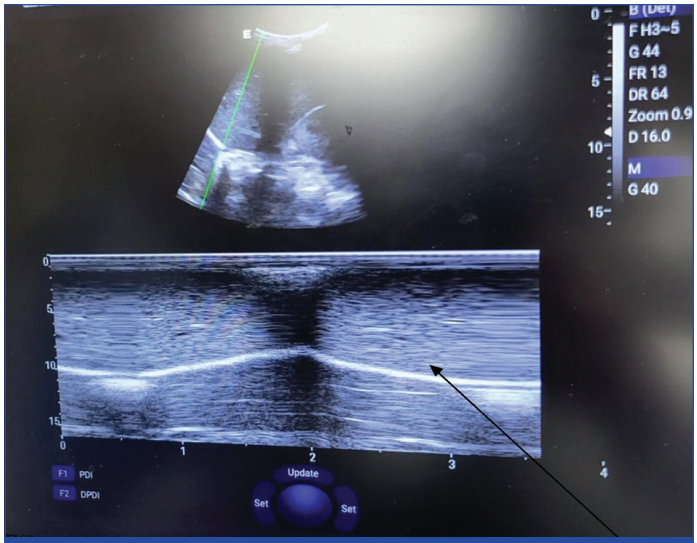


[Table/Fig-1]: Point-of-care M mode USG showing diaphragmatic palsy.

Probable diagnosis: The provisional diagnosis of venomous snakebite by a krait species (Bungarus spp.) was made based on the history, clinical examination, and presentation of a krait snake bite with neurotoxic symptoms. The patient was intensively monitored in the critical care unit. Vital signs, respiratory health, and neurological state were routinely checked. Laboratory tests, including complete blood count and coagulation profile, were carried out to check for any systemic effects of envenomation.

Ten vials of Antisnake Venom (ASV) were given immediately after receiving the patient in the ED. The patient was intubated on the night of day one. The patient's Glasgow Coma Scale (GCS) score was (E1V1M1) at the time of intubation. After intubation, the patient was kept on mechanical ventilation. Neostigmine and atropine were administered for 24 hours. Calcium gluconate was administered for six hours. Supportive care treatment with a focus on maintaining vital functions, monitoring neurological status, and managing complications was given for the next 2-6 days. An additional 10 vials of ASV were given on the 2nd day. On the 5th day of treatment, diaphragmatic paralysis was recovered [Table/Fig-2]. The patient's GCS score improved (E3VtM6) on the 6th day. The patient was extubated on the 8th day and kept on extubation. The patient had received supportive broad-spectrum antibiotic therapy during their hospital stay. No other significant findings were noted. The patient was discharged satisfactorily on the 10th day.

Polyvalent antivenom was provided without any allergic responses. The patient's symptoms gradually improved during the treatment. His neurological condition was stable, and the swelling and ecchymosis at the site of bite lessened at the time of discharge. There were no visible indicators of systemic envenomation at the time of discharge. The patient was given proper wound care instructions before being discharged, and a follow-up appointment was set for one week later to check for any complications due to polyvalent antivenom and envenomation-related late problems or sequelae. No significant complications or sequelae were noted during the follow-up.



[Table/Fig-2]: Point of care M mode USG showing diaphragmatic recovery.

Case 2

A 39-year-old male walking in the yard during the evening reported to the ED with agonising pain, swelling, and discoloration on his left hand as a result of a possible snakebite. The patient immediately noticed two small puncture wounds on his palm, which he suspected were caused by a snakebite. He experienced immediate pain, which quickly spread up his arm. Additionally, he reported slight vertigo, nausea, general weakness, ptosis, trouble swallowing, difficulty breathing, a low breath count (10 breaths/minute), and low single breath count (8 breaths/minute),. According to a relative, it was a krait snake. Upon assessment, the patient showed signs of worry and anxiety. The patient's vital signs were as follows: oxygen saturation on room air was 97%, blood pressure was 140/90 mmHg, heart rate was 100 beats/minute, and respiratory rate was 20 beats/minute. The patient had a GCS score of E2V2M2. Local examination of the left hand revealed two obvious fang marks with surrounding oedema, ecchymosis, and tenderness. Although the arm had slight oedema, there were no indications of compartment syndrome. A neurological evaluation of the injured limb revealed no alterations in sensory and motor functions. The patient was referred to us from the district hospital where he had received 15 units of antivenom one hour after the bite. The patient had no other notable prior dental or medical history. He had no known sensitivities or previous snakebite injuries.

Probable diagnosis: The provisional diagnosis was venomous snakebite, likely from a krait species, based on the patient's medical history, physical examination, and presentation of suspected snakebite symptoms combined with neurotoxic symptoms such as paralysis, ptosis, ophthalmoplegia, muscle weakness, blurred vision, and difficulty breathing. The patient was intubated and kept on mechanical ventilation. A 24 hour regimen of atropine and neostigmine was completed. Calcium gluconate was given for six hours. Point-of-care ultrasound showed diaphragmatic paralysis. On the next day, the patient had two episodes of a generalised tonic-clonic seizures, for which antiepileptic treatment (injection of midazolam and Levetiracetam) was started. On the 3rd day, the patient developed a fever and exhibited agitated behaviour. Secretions increased and the patient did not maintain SpO_2 (below 94%). Suction, increased oxygen flow, ambubag resuscitation, and intubation were performed. The addition of a glycopyrrolate injection reduced the secretions. The patient remained stable after 12 hours of continuous suctioning and monitoring. On the morning of the 4th day, the GCS improved to E3VtM5. On the evening of the 4th day, the GCS was E4VtM6. The patient was extubated and

kept off the ventilator. On the 5th day, the patient complained of haemoptysis. Chest X-ray showed infiltration in the left upper and middle zones. The patient received supportive broad-spectrum antibiotic therapy, and a sputum culture for antibiotic sensitivity was sent. After the treatment, the patient showed improvement. The patient was discharged satisfactorily on the 8th day of admission. After one week, the patient returned to the follow-up clinic and was normal without any major sequelae.

Case 3

A 48-year-old male who had been bitten by a snake arrived at the ED complaining of excruciating pain, swelling, and discolouration on his right foot. According to the patient's relative, the patient experienced sudden, intense pain on the lateral aspect of his right foot while he was outside his house at night. They witnessed a snake slithering away, and the relative described it as long, slender, light-coloured, and banded in dark colours, which is consistent with the description of a krait. The patient felt intense pain at the bite site. Additionally, the patient expressed concerns about generalised weakness, respiratory distress, and slight vertigo. Upon presentation to the ED, patient had low GCS (E2V2T2) and was gasping. The patient arrived at the district hospital three hours after the bite and was given 10 vials of antisnake venom. The patient had no other notable prior dental or medical history. He had no known sensitivities or previous snakebite injuries. A 20-minute whole blood coagulation test was negative at the time of presentation to the ED.

The patient was intubated and kept on mechanical ventilation, and other supportive treatments were initiated. Blood and urine cultures were sent before starting antibiotic therapy. A 24-hour regimen of atropine and neostigmine was completed. Calcium gluconate was administered for six hours. A 20-unit antisnake venom was given during treatment. During the patient's time on the ventilator, sepsis, bleeding from the nose and ET tube developed. Prothrombin Time (PT)/International Normalised Ratio (INR) (2.5) was elevated, and Procalcitonin Test (PCT) (5 µg/L) was elevated, leading to a revision of antibiotic treatment and repeat blood and urine cultures. The patient developed acute renal failure during treatment, for which Continuous Renal Replacement Therapy (CRRT) was performed. Eight units of Fresh Frozen Plasma (FFP) and other supportive treatments were administered. Non Contrast Computer Tomography (NCCT) showed a large infarct in the Middle Cranial Artery (MCA) territory. The patient expired after eight days of treatment due to septic shock.

DISCUSSION

Krait snake bites pose a serious medical emergency, and prompt and appropriate management, including antivenom therapy, is essential for improving patient outcomes. The severity of symptoms varies, and close monitoring is critical. By following specific treatment procedures and using polyvalent antivenom, medical professionals can effectively address krait envenomation and save lives. The results of current research are consistent with earlier publications in the literature regarding the clinical manifestations and symptoms of krait snakebite. The present research showed a consistent pattern of neurotoxic symptoms in patients, including ptosis, ophthalmoplegia, dysarthria, and muscle weakness, similar to the cases described by Sharma SK et al., [14]. Warrell D et al., also mentioned abnormal symptoms like vomiting and stomach pain in some patients in their study, highlighting the possibility of variation in clinical manifestations [15]. The present study emphasised the vital importance of early delivery of proper antivenom therapy in managing krait snakebite patients, which is consistent with observations made by Alirol E et al., [16]. The mainstay of treatment, antivenom therapy aims to counteract the neurotoxic effects of the venom. However, the authors identified instances of antivenom resistance in the index patient cohort, similar to the incidents described by Silva A et al., [17]. This worrisome finding highlights the need for investigation alternative treatment options and potential changes in venom composition.

The article contributes new insights into the dynamic nature of krait snakebite envenomation, adding to the body of previous knowledge. Similar to the findings of Halesha BR et al., the discovery of treatment-resistant cases in the present cohort study emphasised the importance of promptly reporting such cases to spread knowledge of potential changes in venom properties. The present study findings, along with those of other researchers, emphasise the need for ongoing research, surveillance, and interdisciplinary cooperation to successfully address the challenges posed by krait envenomation [18]. Respiratory distress was the most common presenting symptom, and mechanical ventilation was required for all patients. ASV therapy was effective in reversing the symptoms of envenomation in all patients, but repeat doses were required in some cases. The use of vasopressin support and CRRT reflects the systemic complications associated with krait bites, including hypoxemic encephalopathy [19]. The mortality rate in this case series was 33%, which is lower than the reported mortality rates in some previous studies. This may be attributed to the prompt administration of Adaptive Support Ventilation (ASV) and the supportive care provided in the Intensive Care Unit (ICU) [20]. The mean length of ICU stay was nine days, highlighting the importance of close monitoring and aggressive management of complications in the ICU [20]. In one study, the most frequent bites were to the foot or toes; however, in present investigation, authors reported one case of a foot bite, one case of a hand bite, and one case of a neck bite [21].

CONCLUSION(S)

Krait bites are a medical emergency that requires prompt recognition and management in the ICU. Respiratory distress is the most common presenting symptom, and mechanical ventilation may be required in some cases. ASV therapy is effective in reversing the symptoms of envenomation, and supportive care is crucial in managing systemic complications. The mortality rate in present case series was lower than that reported in previous studies, emphasising the importance of early intervention and aggressive management in the ICU.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Apr 26, 2023
- Manual Googling: Aug 19, 2023
- iThenticate Software: Sep 22, 2023 (2%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Apr 22, 2023**
Date of Peer Review: **Aug 02, 2023**
Date of Acceptance: **Sep 25, 2023**
Date of Publishing: **Nov 01, 2023**