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CASE SERIES

Nonvenomous snakebites that mimic venomous snakes in Sri Lanka

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Abstract

***Introduction*:** Venomous snakes are of significant medical importance and are categorized into two groups: highly medically important snakes and lesser medically important snakes. In Sri Lanka, seven species of terrestrial snakes are classified as highly medically important. Accurate identification of these snakes can be challenging because several nonvenomous species closely resemble them in appearance. This case report describes two such snakebite incidents in Sri Lanka, highlighting the difficulties in snake identification and the potential clinical implications of misidentification.
***Case Report*:** Two patients presented with nonvenomous snakebites. A 14-year-old schoolgirl was admitted Emergency Treatment Unit at Teaching Hospital Ratnapura, Sri Lanka in 2020 due to a python bite to her left 4th toe. A 44-year-old female was transferred from a local hospital for further management of a suspected krait bite, which was later identified as a common wolf snake. The patient was bitten on the left 3rd finger. Neither patient developed envenoming features and was discharged on day 2 of the snakebite.
***Discussion*:** Even though nonvenomous snakebites do not cause envenoming effects, they are important. Juvenile pythons closely resemble adult Russell's vipers, whereas wolf snakes mimic kraits. Antivenoms are indicated for bites by Russell's vipers and kraits. Therefore, the correct identification of the snake is essential when managing these patients.
***Conclusion*:** Some nonvenomous snakes mimic medically important snakes through morphological similarity, particularly in colour variation. Therefore, characteristic features should be used to identify these snakes.

Keywords: Nonvenomous; Snakebites; Colubridae; Medically important snakes

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INTRODUCTION

Snakes are broadly categorized into two groups: venomous and nonvenomous. The term nonvenomous refers to snakes that do not produce venom or are not capable of injecting venom. Accordingly, nonvenomous snakes do not possess venom glands or fangs capable of delivering venom to their prey or humans. However, they do have solid or sharp teeth that assist in gripping, holding or manipulating prey. Bites from these snakes usually cause mechanical injuries. Nonvenomous snakes may bite humans when threatened, cornered or handled, as a defensive mechanism rather than an attempt to envenomate. Clinical features include pain at the bite site, local swelling, redness and local bleeding. Most nonvenomous snakes belong to the Family Colubridae, although some are found in other families such as Pythonidae and Boidae.

Venomous snakes are medically important and are further classified as highly medically important and lesser medically important [1-3]. In Sri Lanka, there are seven highly medically important land snakes: cobra (*Naja naja*), two kraits-Ceylon krait (*Bungarus ceylonicus*) and common krait (*Bungarus caeruleus*) and four vipers-Russell's viper (*Daboia russelii*), saw-scaled viper (*Echis carinatus*), hump-nosed viper (*Hypnale* spp.) and Green pit viper (*Peltopelor trigonocephalus*) [1]. This classification is based on the fact that highly medically important snakes can cause systemic envenoming, including venom-induced consumption coagulopathy, neuroparalysis, acute kidney injury, and some cardiac effects, with or without local manifestations. A limited number of medically important snakes are responsible for most severe envenomings in Sri Lanka and the clinical burden is compounded by variability

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in clinical manifestations [4, 5], and challenges in early species identification.

Identifying medically important snakes can be challenging because some nonvenomous snakes resemble highly medically important species. For example, juvenile pythons closely resemble adult Russell's vipers. While pythons have irregular dark-brown blotches, Russell's vipers have three rows of oval markings (Figure 1 and Table 1). Similarly, wolf and bridle snakes are commonly mistaken for kraits (Figure 2). A reliable method to distinguish kraits from wolf or bridle snakes is by examining the mid-dorsal scales (vertebral scales): kraits have a large hexagonal vertebral scale row, whereas wolf and bridle snakes have dorsal scales that are all small and uniform in size (Figure 3 and Table 1). This case report describes two nonvenomous snakebites that were initially mistaken for venomous bites: a python bite in a 14-year-old girl and a wolf snake bite in a 44-year-old female. Both patients experienced no envenoming effects.

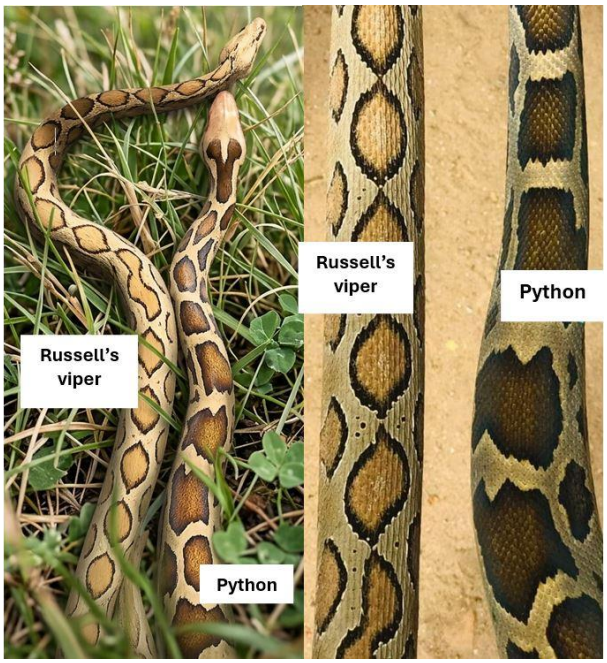

Figure 1. Key identification features of Russell's viper from python: In Russell's viper, three rows of oval-shaped markings with sharp margins; in python, irregular blotches with clear margins

CASE PRESENTATION

Case 1

A 14-year-old previously healthy schoolgirl was admitted to the Emergency Treatment Unit at Teaching Hospital Ratnapura, Sri Lanka at 3.25 PM on 30 May 2020 following a snakebite. Her parents identified the snake as a Russell's viper. While she was walking on a footpath, her left 4th toe was bitten at 3.20 PM. The snake was identified

Figure 2. Wolf and bridal snakes that are commonly mistaken for kraits in Sri Lanka (A) Common wolf snake (B) Show's wolf snake (C) Sri Lankan wolf snake (D) Common bridle snake (E) Chithrasekara's bridle snake

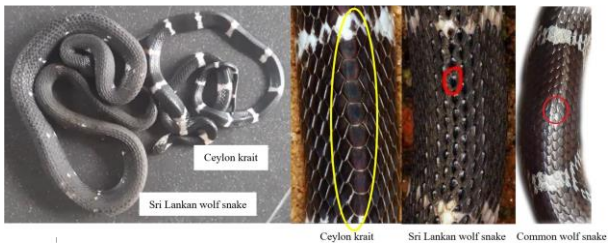

Figure 3. Key identification feature of krait from wolf/bridle snakes: In kraits, the enlarged hexagonal mid dorsal scale row (vertebral scales) [circled in yellow], in wolf/bridle snakes, dorsal scales are small and the same size (circled in red).

as a python (*Python molurus*) by the corresponding author (Figure 4). On admission, there were no complaints and on examination, there was no local swelling or redness except a bite mark. Her blood pressure was 110/70 mmHg and her pulse rate was 92 beats per minute. Bilateral lung fields were normal. Her 20-minute whole blood clotting test was normal. Other laboratory findings were white blood cell count-10 x 103/µL, neutrophils - 63%, lymphocytes - 36%, platelets - 307 x 103/µL, Hb -12.7g/dl, K+ - 3.8mmol/L, Na+ - 140mmol/L, blood urea - 2.2mmol/L, creatinine - 54µmol/L, PT - 14.2/12, INR - 1.18, SGOT - 22U/I, SGPT - 19U/I and CRP < 5mg/L. She was observed and was discharged on the following day.

Case 2

A 44-year-old previously healthy female was transferred from Base Hospital Kahawatta, Sri Lanka for further management of a suspected krait bite. The patient was bitten on the left 3rd finger while she was working in the home garden at 11.30 AM and was admitted to the local hospital at 12.10 PM. The killed specimen was available

Table 1. Identifying features of some medically important snakes from their common mimics

Medically important snake	Common nonvenomous mimics	Distinguishing morphological features
1) Russell's viper (*Daboia russelii*)	Python (*Python molurus*)	**Russell's viper** Triangular head, three rows of oval spots with clear margins, inverted V-shaped thin, white mark on the head, keeled scales **Python** Irregular dark brown blotches, smooth scales, distinct neck Russell's viper Python  
2) Common krait (*Bungarus caeruleus*) 3) Ceylon krait (*Bungarus ceylonicus*)	Sri Lankan wolf snake (*Lycodon carinatus*), Common wolf snake (*Lycodon aulicus*), Show's wolf snake (*Lycodon striatus*) Common bridle snake (*Dryocalamus nympha*) Chithrasekara's bridle snake (*Dryocalamus chithrasekarai*)	**Common krait** No prominent neck, enlarged hexagonal vertebral scales row on the midline of the dorsum, uniserial subcaudals, thin double white bands in the dorsum, whitish appearance on the ventral side **Ceylon krait** No prominent neck, enlarged hexagonal vertebral scales row on the midline, uniserial subcaudals, thick single white bands in the dorsum, black and white appearance on the ventral side **Wolf snakes and bridle snakes** All dorsal scales are same in size, no enlarged mid dorsal scales, slightly prominent neck, biserial subcaudals   Common krait Common wolf snake   Ceylon krait Sri Lankan wolf snake

with the patient and it was identified as a common wolf snake (*Lycodon aulicus* -'Alu Radanakaya') by the corresponding author (Figure 5). On admission, she had faintness but no local pain. On examination, there was a bite mark and there was no local swelling or redness. Her blood pressure was 100/60 mmHg and her pulse rate was 100 beats per minute. Bilateral lung fields were normal. Her 20-minute whole blood clotting test was normal. Other

Figure 4. Snake responsible for the bite of case 1 patient- python (Python molurus) (A) dorsal view (B) ventral view

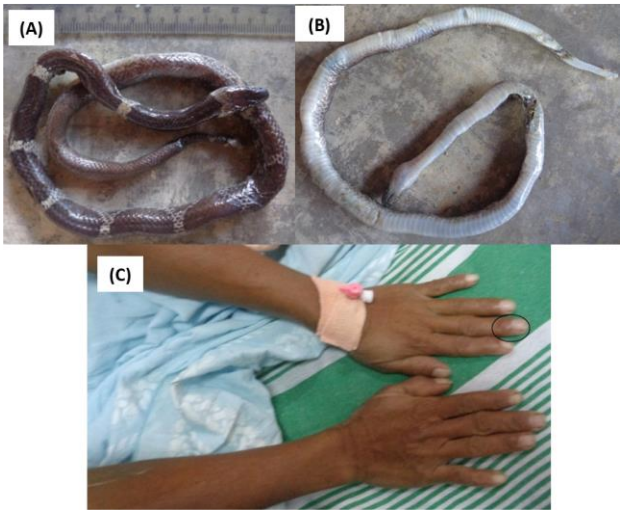

Figure 5. Snake responsible for the bite of case 2 patient- Common wolf snake (A) dorsal view (B) ventral view (C) site of the bite (circled)

laboratory findings were white blood cell count -11 x 103/µL, neutrophils -78%, lymphocytes -17%, platelets -278 x 103/µL, Hb -11.3 g/dl, K+ -3.7 mmol/L, Na+ -136 mmol/L, blood urea -8 mmol/L, creatinine -88 µmol/L, PT -14.4/12, INR -1.24, SGOT -19U/I, SGPT -30U/I and CRP-8 mg/L. She was observed and was discharged on the following day.

DISCUSSION

In our first case, a python bite was mistakenly identified by the patient's parents as a Russell's viper due to its similar appearance. In the second case, the admitting medical officer misidentified a wolf snake as a krait due to morphological similarity. Three species of wolf snakes-Sri Lankan wolf snake (*Lycodon carinatus*), common wolf snake (*Lycodon aulicus*) and Show's wolf snake (*Lycodon striatus*) mimic kraits. Two bridle snakes, the common bridle snake (*Dryocalamus nympha*) and Chithrasekara's bridle snake (*Dryocalamus chithrasekarai*), also closely resemble kraits (Figure 2). Out of two kraits (Ceylon krait and common krait), the Ceylon krait is endemic to the country. Ideally, antivenom should be available for the treatment of envenomation by these snakes. Currently, the antivenom available in Sri Lanka (Indian polyvalent antivenom) is indicated only for envenoming by cobra, Russell's viper, saw-scaled viper and common krait. There is evidence that antivenom has been administered in cases of wolf snake bites following misidentification as Ceylon kraits [6]. Lesser medically important snakes typically cause only local effects such as pain, swelling, redness, and blistering. This category includes cat-eyed snakes ("Mapila") [7], coral snakes ("*Depath Kaluwa*") [8, 9], Sri Lankan blossom krait ("Nihaluwa"), vine snakes ("Ahatulla"/"*Henakandaya*"), flying snakes ("*Mal Sara*"/"*Dagara Danda*") [10] and water snakes ("*Kunudiya kaluwa*"/"*Kadolana Diya Bariya*"/"*Dedunu diyabariya*").

Identification of some medically important snakes in Sri Lanka is challenging due to limited expertise and

experience among clinicians. Misidentification may have significant clinical consequences, including unnecessary referrals and hospitalization, unwarranted laboratory investigations, medico-legal implications and inappropriate administration of antivenom. Such errors can lead to inappropriate management, delayed treatment, missed complications, increased healthcare costs, poor patient outcomes and potentially fatal consequences. In addition, inaccurate species identification can adversely affect epidemiological data and surveillance efforts. These challenges are particularly relevant in Sri Lanka, where several venomous and non-venomous snake species share similar morphological characteristics. Therefore, both accurate snake identification and careful syndromic assessment are important for optimal patient care.

Inappropriate administration of antivenom carries substantial risks. The Indian polyvalent antivenom currently used in Sri Lanka is associated with a high incidence of adverse reactions, with more than half of treated patients developing acute allergic reactions and up to one-third experiencing anaphylaxis [11]. Consequently, unnecessary antivenom use should be avoided whenever possible. When the snake specimen is unavailable, diagnosis becomes more challenging. Major diagnostic difficulties include the inability to accurately identify the offending species, overlapping clinical syndromes among different snake species, delayed onset of manifestations of envenoming, difficulty distinguishing dry bites from true envenoming and the lack of widely available species-specific diagnostic tests. In such situations, management should be guided by careful clinical assessment, serial examinations and appropriate laboratory monitoring rather than relying solely on the reported identity of the snake. This syndromic approach is also important in snakebite diagnosis and management in Sri Lanka and many other snakebite-endemic regions.

Although expert snake identification can support diagnosis and help predict likely clinical syndromes, it also has important limitations, including the unavailability of the snake specimen every time and a lack of resource personnel. Therefore, routine snakebite management should be guided primarily by the patient's clinical presentation and laboratory evidence of envenoming rather than by snake identification alone.

Even if it is a nonvenomous snakebite identified by an experienced person, the patient should be observed in a hospital setting for 24 hours, particularly in paediatric patients, because sometimes the snake specimen brought is unrelated to the actual bite. A detailed history should therefore be obtained before confirming a bite as nonvenomous, even if the specimen is available. Management of nonvenomous snakebites includes:

- ✓ Reassure the patient
- ✓ Confirm snake identification with expert opinion
- ✓ Observe the patient for any clinical features. The duration may depend on clinical assessment, diagnostic certainty and local practice guidelines.
- ✓ Manage pain with paracetamol
- ✓ Monitor for progressive swelling, signs of infection and unexpected systemic effects
- ✓ Antibiotics are only used if an infection occurs
- ✓ Administer tetanus toxoid when indicated

CONCLUSION

Some of the nonvenomous snakes closely resemble medically important snakes due to their morphological similarity, particularly colour variation. Therefore, characteristic features should be used to identify these snakes.

Ethical Considerations

Ethical approval was not required for this case report in accordance with institutional policy. Written consent for publication of these case histories was obtained from the case 2 patient and the parents of the case 1 patient.

The authors confirm that all photographs and images presented in this manuscript are original images obtained by the authors during patient care and field identification activities, except Figure 2E and the authors hold the rights necessary for publication in an open-access journal. No previously published copyrighted images were used without permission.

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