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Epidemiology, clinical profile and management issues of cobra (*Naja naja*) bites in Sri Lanka: first authenticated case series

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Summary In Sri Lanka, the Spectacled cobra (*Naja naja*) inflicts fatal bites. This hospital-based prospective study describes 25 cases of proven cobra bites, including 10 (40%) males and 15 (60%) females with a median age of 36 years (range 13–70 years). In 22 cases (88%) bites occurred in the daytime and in 13 cases (52%) they occurred at the victim's home compound. The site of the bite was the upper limb in 10 cases (40%), and 12 patients (48%) had applied a tourniquet. There were 5 dry bites (20%), 20 local reactions (80%), 9 cases of neurotoxicity (36%) and 3 cases of coagulopathy (12%). Eight patients (32%) had severe local necrosis—five underwent desloughing and skin grafting and two (including one of the above) had fasciotomy and compartmental decompression of the upper limb. Two patients died (case fatality rate 8%; 95% CI 0.98–26.03) due to rapidly spreading necrosis of the upper limb. Four patients (16%; 95% CI 4.53–36.08) developed respiratory paralysis; their median time from bite to assisted ventilation was 2 h (range 2–5 h) and the median duration of ventilation was 24 h (range 18–24 h). Envenomed patients received Indian polyvalent antivenom. The findings highlight the magnitude of local necrosis, respiratory paralysis and antivenom failure in Spectacled cobra bite in Sri Lanka. Coagulopathy requires verification with robust laboratory tests.

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1. Introduction

The Spectacled cobra, *Naja naja* (Linnaeus, 1758), is the only recognised species of cobra in Sri Lanka (Figure 1). It is a hooded, easily recognisable elapid snake widely distributed in all peneplains of Sri Lanka, except at the highest altitude where the ambient temperature is low.^{1–3} Historically it had been treated with respect by natives on the

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Figure 1 Sri Lankan Spectacled cobra (*Naja naja*); live specimen 1500 mm long.

island, where early travellers and naturalists had made reference to the cobra and its bites both in humans and animals, documenting interesting clinical observations.^{4,5} The Spectacled cobra belongs to the genus *Naja* (Laurenti, 1768), of which the species *N. naja* is distributed in many Asian countries including Sri Lanka, India, Pakistan, Southern Nepal and Bangladesh.^{6,7} In the early taxonomy, Sri Lankan cobra was described as a subspecies, *Naja naja naja*, but it was considered as synonymous with the species *N. naja* in the revisions done a decade ago.^{1,6,7} By its nature, the Spectacled cobra bites less frequently than viper on the island but causes significant morbidity and mortality.⁸ This fact is strengthened by a field survey carried out in the early 1980s in the dry zone in Sri Lanka, when victims of snake bite sought indigenous treatment, which showed that 26% of the 110 deaths were caused by cobra bites.⁹ However, there is a dearth of authentic epidemiological and clinical data on cobra bites in Sri Lanka, except a description of two cases in 1990.¹⁰ Furthermore, the paucity of clinical data hampers the understanding and correlation of venom chemistry as well as the development of clinical management guidelines and syndromic diagnosis. Thus, a detailed account of the clinical profile and management of cobra bite is needed. In an attempt to fulfil this requirement, we describe the epidemiology, clinical features, management and outcome of cobra bite based on a larger series of patients who were managed and supervised personally by the study team over a period of many years.

2. Methods

This was a prospective, observational, hospital-based study of proven cobra bites carried out in two hospitals in different climatic zones, Anuradhapura (dry zone) from 1995 to 1998 and Peradeniya (up county, wet zone) from 2002 to 2007, where the authors were the physicians-in-charge of the patients and were primarily responsible for their management. All patients with a history of cobra bite were included in the data collection, except for children <12 years of age.

2.1. Snake identification

Offending snakes were identified by the authors as Spectacled cobra by studying morphological characteristics of the dead snake. Among them, five voucher specimens were catalogued and deposited in the Department of Medicine, Faculty of Medicine, Peradeniya University, Sri Lanka. Patients who presented without the killed specimen were excluded from further analysis.

2.2. Clinical assessment

Clinical assessment included a detailed history on admission, including: time, place and site of bite; first-aid given; treatment given at the local hospital; and symptoms of envenoming. Patients were examined for neurotoxicity (ptosis, eye movements, pupil size and reaction to light, power of neck flexors and limb muscles, respiratory rate, tidal volume, chest expansion, strength of speech and level of consciousness) and cardiac status (pulse rate and blood pressure). The site of the bite was examined for local effects (swelling and necrosis) at regular intervals. Further assessment included measurement of urine output, serum electrolytes, blood urea, serum creatinine and 12-lead electrocardiogram (ECG). An easily feasible, bedside, 20-min whole-blood clotting time (20WBCT) was performed using a clean small glass tube and repeated every 6 h if the result was positive. Regular follow-up was done at the clinic after recovery.

2.3. Treatment

The routine management protocol for cobra bite in the hospitals was adopted without modification based on the national guidelines published in the *Ceylon Medical Journal*¹¹ and by the Sri Lanka Medical Association. After initial resuscitation, patients in severe respiratory paralysis were offered assisted ventilation. Patients with stable respiration were monitored for early neuromuscular respiratory paralysis. Initiation of assisted ventilation was considered when the tidal volume was <200 ml, the power of neck flexors was below grade 3 and there were central cyanosis, mental confusion and failing speech. Local swelling was monitored three times a day for spread, discolouration, necrosis and compartmental effect. Clinical criteria such as disproportionately severe pain and tenderness in the swollen limb, weakness of intracompartmental muscles, hypoesthesia of respective dermatomes of intracompartmental nerves, and weak or absent distal arterial pulsation were observed to detect the development of compartmental effect. Patients who developed either necrosis of tissues or compartment effects were immediately referred to the surgical team for intervention.

With the earliest sign of systemic envenoming (ptosis, external ophthalmoplegia, impaired consciousness, positive 20WBCT, moderate swelling or rapidly increasing swelling of the bitten site), patients were treated with Indian polyvalent antivenom. Haffkine antivenom (Haffkine Bio-Pharmaceutical Corp. Ltd., Mumbai, India) and Vins antivenom (batch no. 3-2001; Vins Bioproducts Ltd., Hyderabad, India) were used at Anuradhapura and Peradeniya,

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