Journal of Infection and Public Health (2010) 3, 83—87

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# Role of neostigmine and polyvalent antivenom in Indian common krait (*Bungarus caeruleus*) bite

**A. Anil[a], Surjit Singh[a,*], Ashish Bhalla[a], Navneet Sharma[b], Ritesh Agarwal[b], Ian D. Simpson[c,d]**

[a] *Department of Internal Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh, India*
[b] *Pulmonary and Critical Care Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh, India*
[c] *Snakebite Taskforce, Tamil Nadu Government, Chennai, India*
[d] *Pakistan Medical Research Council, Islamabad, Pakistan*

Received 22 June 2009; received in revised form 20 January 2010; accepted 29 January 2010

**KEYWORDS**
Snake bites;
Antivenoms;
Asia;
Envenoming;
Neostigmine;
Neurotoxicity;
India

**Summary** *Bungarus caeruleus* (Indian common krait) bite during monsoons is common in Northwest India. This study was undertaken to find the effectiveness of neostigmine and polyvalent antivenom in improving neuromuscular paralysis following bite. All the consecutive patients admitted between June 2007 and December 2008 with common krait bite, identified either from brought snake or circumstantial evidence were studied. Ten vials of polyvalent antivenom and three doses of 2.5 mg neostigmine at 30 min intervals after administration of 0.6 mg of atropine were administered I.V. and patients were assessed for any improvement in neuroparalysis. Seventy-two patients were admitted during the study period. All the patients except two came from rural areas and were brought between June and September. Sixty-two patients were bitten during the day while clearing bricks, cutting grass or walking. The mean time interval between bite and arrival to hospital was 4.5 h. None of the patients showed any improvement following treatment and all patients developed respiratory paralysis, requiring assisted ventilation. Seventy survived and two died. Neostigmine is ineffective in reversing or improving neuroparalytic features in patients with *B. caeruleus* bite even at higher dose than normally recommended.


* Corresponding author at: Department of Internal Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh 160012, India. Tel.: +91 172 2756672; fax: +91 172 2744401/2745078.
*E-mail addresses:* surjit51@hotmail.com, surjit51200@yahoo.co.in (S. Singh).

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doi:10.1016/j.jiph.2010.01.002

## Introduction

The common krait (*Bungarus caeruleus*) is the most toxic snake found commonly in the plains of Northwest India and bites typically occur during July—September [1—3]. Kraits are elapid snakes and within the single genus *Bungarus*, 12 species are found [4]. They are generally nocturnal, shy and non-aggressive. Their diet consists of other snakes and it will therefore pursue them into human habitation, where the prey species are hunting for rodents. Bites generally occur when kraits are disturbed by sleeping humans moving, either naturally, or during REM sleep [5]. A significant number of patients die before they reach the hospital, largely due to the fact that the bite does not inflict sufficient pain or as a result of the bite itself or venom action and the victims are therefore unaware that they have been bitten.

In reported outcomes in proven common krait bites from Northwest India, mortality has been as high as 77% [6]. However since the availability of assisted ventilation, mortality is considerably lower in those patients who reach hospital in time.

The role of anticholinesterases in reversing neuroparalysis is controversial [5,7—12]. Kularatne et al. from Sri Lanka reported the failure of anticholinesterases and polyvalent antivenom in reversing paralysis or reducing duration of ventilation in 210 patients (99 with the identified snake) bitten by common krait (*B. caeruleus*) [5]. In Malayan krait (*Bungarus candidus*), one patient was reported as responding to neostigmine [7]. Anticholinesterase drugs, e.g. neostigmine, if proven effective in improving response to pre-synaptic envenomings such as krait bites, they can potentially present a significant intervention in improving patient outcome. Available polyvalent anti-snake venom (ASV) in India are only in lyophilized form and takes 30—60 min to be reconstituted. If anticholinestrase drugs are proven to be effective they could be deployed more rapidly and may improve patient outcome.

The present study was undertaken to establish the profile of venomous snake bite victims admitted in our hospital. We documented clinical features, outcome, efficacy of polyvalent antivenom and anticholinesterase, i.e. neostigmine in reversing neuroparalysis. As well to define optimum intensive care management of common krait envenoming bite.

## Patients and methods

This study was carried out over a period of 18 months from late June 2007 to 31 December 2008. All the consecutive patients with confirmed envenoming admitted to the emergency ward of Nehru Hospital attached to the Postgraduate Institute of Medical Education and Research, Chandigarh, a tertiary care referral center in Northwest India, were included in this study.

The details of age, sex, socioeconomic status, time, place and site of bite, clinical assessment, investigations and treatment were all recorded on proforma developed by the National Snakebite Committee in 2006 at the National Snakebite Meeting in Kochi (India). Patients were identified as having been bitten by common krait either by studying the characteristics of the snake, where the dead snake was produced, or identifying the snake from morphological description provided by patient and by showing them formalin preserved snakes. If it was still not possible to confirm the species, clinical features and circumstantial evidence were employed to identify the snake. The dead snakes brought by patients/attendants were preserved in 10% formalin and identified by an experienced herpetologist, using standard morphological keys (IDS).

Patients were assessed at the time of admission and then periodically until final outcome. They were assessed for neurotoxicity, i.e. ptosis, eye movements, pupillary size and reaction to light, power of neck flexors and limbs, respiratory rate, chest expansion, strength of speech, level of consciousness, blood pressure and local effects. The muscle power was graded from 0 to 5 using British Medical Research Council criteria and subsequently severity of neuromuscular weakness was graded as mild, moderate and severe. The alteration in consciousness was categorized as normal, drowsy, semiconscious and unconscious.

Patients with confirmed krait envenoming were given initial resuscitation if required and then administered 10 vials (100 ml) of polyvalent anti-snake venom (Bharat Serum and Vaccines Ltd.), intravenously. In 10 patients the dose was repeated within 2 h as symptoms had not improved or had worsened. In addition, patients were given three injections of neostigmine (1.5 mg each) I.V. after administration of 0.6 mg of atropine. After each administration of neostigmine, patients were assessed at 10 and 20 min for any objective improvement in ptosis, respiratory, neck muscle weakness, etc. Assisted mechanical ventilation was provided when patients had saturated oxygen below 85% or $pO_2 \geq 60$ mmHg.

The statistical analysis was undertaken using SPSS 15.0. The Ethics Committee of the Institute had approved the research project.