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## The application of Cobra Rapid Test® and enzyme-linked immunoassay in the diagnosis and antivenom therapy of Cobra bite

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**Objective:** To evaluate the role of a qualitative Cobra Rapid Test® (CRT) and quantitative enzyme-linked immunoassay (ELISA) of cobra venom in blood for diagnosis and to monitor the response to antivenom.

**Methods:** Prospective study among 3 institutions in Vietnam from 2013 to October 2015. Patients were diagnosed with cobra bite following a confirmed snake bite and presentation of the striking snake or its photograph. The patient's history and physical signs were recorded. The Poisoning Severity Score (PSS) and our local classification system were used to grade the severity of envenomation. The CRT (made in Taiwan, detection threshold 5 ng/ml) and ELISA (in-house assay, detection threshold 0.1 ng/ml) were performed simultaneously on the blood samples on admission, before and after antivenom. Snake antivenom (*Naja kaouthia*, Institute of Vaccines and Medical Biologicals, Vietnam) was indicated according to a local protocol. Patients were divided into 2 groups based on criteria for the cessation of antivenom: group 1 (physical signs) and group 2 (physical signs plus results of repeated CRT).

**Results:** 124 patients with cobra bite (108 *N.atra* bites, 15 *N.kaouthia* bites, 1 *N.sumatrana* bite were included. CRT: sensitivity 84.26% for all *N. atra* (93 symptomatic, 15 dry bites), 93.55% for symptomatic *N. atra* cases; specificity 90.24%. CRT positive in 93.3% of *N. kaouthia* bites and *N. sumatrana* bite. Duration of antivenom was 14.26 ± 9.89 hours group 1 and 5.19 ± 3.16 hours group 2 (P<0.0001). Duration of hospitalization 4.02 ± 2.06 days group 1 and 2.65 ± 1.75 days group 2 (P= 0.001), and total antivenom dose 32.24 ± 18.38 vials group 1 and 24.56 ± 14.0 vials group 2 (P =0.03). ELISA: admission mean (range) blood venom levels were 10.75 (0–299.92), 37.08 (0.28–463.38), 43.25 (0.11–634.55), 53 (0.18–996.18) and 257.22 ng/ml in asymptomatic, mild envenomation, moderate envenomation, severe envenomation and death group, respectively (p=0.007). The mean of blood venom levels peak at 6-12 hours and then decrease over the following 12 hours. There was an association between the severity of local pain with blood venom levels in patients admitted within the first 12 hours (Pearson correlation, R = 0.395, P=0.008). The associaton between blood venom levels and severity of evenomation is less clear within the first several hours or more than 24-48 hours after the bite. Blood venom levels decreased from median 58.59 to 0.225 ng/mL after antivenom and admission blood venom levels correlated with total dose of antivenom (Pearson correlation, R=0.493, P=0.000).

**Conclusion:** Cobra Rapid Test® has a good sensitivity and specificity and is helpful in the rapid diagnosis and monitoring of the response to the antivenom therapy, producing a result in less than 20 minutes. ELISA is useful for the evaluation of severity of envenomation and may guide antivenom dosing.