Report of a Bite from a New Species of the *Echis* Genus—*Echis omanensis*

Badria A. Al Hatali · Said A. Al Mazroui ·
Abdullah S. Alreesi · Robert J. Geller ·
Brent W. Morgan · Ziad N. Kazzi

Published online: 18 November 2014
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Abstract

Background Carpet vipers (*Echis*) are found across the semi-arid regions of west, north, and east Africa; west, south, and east Arabia; parts of Iran and Afghanistan north to Uzbekistan; and in Pakistan, India, and Sri Lanka. Recently, a new species belonging to the *Echis* genus, *Echis omanensis* has been recognized in Oman. Not much is known about the clinical manifestations of envenomation from its bite.

Case Report A 63-year-old snake keeper presented to the emergency department shortly after being bitten by an Oman carpet viper (*E. omanensis*). The incident occurred during expression of the venom at a research center. The patient complained of severe pain and swelling of the left index finger, which extended to the mid-forearm within 1 h. His vital signs remained stable, with no evidence of systemic manifestations. He was treated initially with analgesics and tetanus toxoid. Due to rapidly progressive swelling and the potential for a delayed coagulopathy, the Saudi National Guard polyvalent snake antivenom was administered according to the Ministry of Health protocol. The patient was admitted to the intensive care unit, remained hemodynamically stable, and had normal serial coagulation tests, with subsequent resolution of the swelling.

Conclusion We report the first case of an *E. omanensis* bite in which the patient developed rapidly progressive local toxicity,

which improved after administration of the Saudi polyvalent antivenom.

Keywords *Echis omanensis* · Snake bite · Saudi National Guard polyvalent antivenom · Oman

Introduction

Carpet vipers (*Echis*) are found across the semi-arid regions of west, north, and east Africa; west, south, and east Arabia; parts of Iran and Afghanistan north to Uzbekistan; and in Pakistan, India, and Sri Lanka. They are often abundant, and, in many areas, are common causes of fatal snakebite in humans [1]. Despite its epidemiological importance, the genus *Echis* remains poorly understood taxonomically [2]. *Echis* snakes consist of four main groups: *Echis ocellatus*, *Echis coloratus*, *Echis pyramidum*, and *Echis carinatus*. All the *Echis* populations with the exception of *E. coloratus* were regarded at one time or another as *E. carinatus* or *E. pyramidum* [3]. In Oman, 9 % of all snake envenomations are caused by the saw-scaled viper (*E. carinatus*), which is distributed mostly in rocky areas of the country [4]. Recently, a new species belonging to the *E. coloratus* population *Echis omanensis* has been recognized in Northern Oman and United Arab Emirates [5]. Not much is known about the clinical manifestations of envenomation from its bite. Even though past reports of *E. omanensis* may have been falsely attributed to *E. coloratus*, we describe the first case of envenomation accurately attributed to *E. omanensis* that responded to the Saudi polyvalent antivenom.

Case Presentation

A 63-year-old snake keeper employed at Sultan Qaboos University animal house presented to the emergency department

B. W. Morgan · Z. N. Kazzi
Department of Emergency Medicine, Emory University and the
Georgia Poison Center, 80 Jesse Hill Jr. Drive, SE P.O. Box 26066,
Atlanta, GA 30303, USA

B. A. Al Hatali (✉) · S. A. Al Mazroui · R. J. Geller
Emory University and the Georgia Poison Center, Atlanta, GA, USA
e-mail: balhata@emory.edu

A. S. Alreesi
Department of Emergency Medicine, Sultan Qaboos University,
P.O. Box 38, PC 123 Muscat, Oman

10 min after being bitten by an *E. omanensis* snake in the left index finger while he was expressing venom to be studied in an experimental research project.

He complained of severe pain in the left index finger and abnormal taste in his tongue. There was no abdominal or chest pain, no shortness of breath, and no nausea or vomiting.

On examination, he had a pulse rate of 80/min, blood pressure of 150/90 mm of Hg, respiratory rate of 14/min, and oxygen saturation of 99 % on room air.

The local examination revealed a single puncture wound in the left index finger and minimal swelling that was limited to the left index finger. He did not have any hemorrhagic blisters or ecchymosis but minimal oozing from the wound. He had some restriction of movement in the finger due to the pain but no obvious neurological deficit with good perfusion. A bedside clotting test performed by collecting 5 mL of whole blood in a red top laboratory tube, showed complete sample clot after 20 min observation. His laboratory studies were all within normal limits including BUN 4.4 mmol/L (2.5 to 7.1 mmol/L); creatinine 0.77 mg/dL (0.7 to 1.3 mg/dL); sodium 139 mEq/L (135–145 mEq/L); potassium 4.6 mEq/L (3.7 to 5.2 mEq/L); hemoglobin 14 g/dL (13.5 to 17.5 g/dL); platelet count $354 \times 10^9/L$ ($150\text{--}400 \times 10^9/L$); PT 10.4 s (11–13.5 s); aPTT 31 s (21–35 s); and INR 1.01 (0.8–1.2).

He was placed on a cardiac monitor and was initially treated with 5 mg of morphine intravenously and tetanus toxoid. Over the following hour, the swelling progressed to his mid-forearm, with persistent severe pain that did not improve with morphine. Due to rapidly progressive swelling and the potential for a delayed coagulopathy, the only available snake antivenom, which is a polyvalent (equine derived) antivenom from the Saudi National Guard, was administered. Based on the local snake bite protocol, he received 40 mL of antivenom, diluted in 5 mL/kg of body weight of normal saline, and infused intravenously slowly over 30 min.

He was admitted to the intensive care unit and despite being hemodynamically stable with minimal progression in the forearm swelling; he continued to have severe pain during the first 4 h of admission. Consequently, he received another dose of 40 mL of the antivenom intravenously due to the concern for inadequate control. The swelling progression ceased and the pain improved over the next 24 h. His arm swelling slowly resolved over few days. Subsequent testing of his coagulation profile and renal function showed no changes compared to his baseline values, and he was discharged home after 48 h of admission.

Discussion

The Oman saw-scaled viper, *E. omanensis*, was recently recognized as a distinct species of *Echis* genus [3]. An extensive morphological and biographical analysis of the *E. coloratus*

population from northern Oman led to the recognition of it as a separate species named *E. omanensis* [1–3]. The new species are larger and more heavily built, and is usually a dark brown or gray overall with the top of the head being unmarked. They have a longer tail with higher subcaudal counts with unique nasal scale character (Fig. 1) [3, 5]. Despite the similarity in the clinical presentation between the major populations of *Echis* species in the region, venom composition varies considerably, making antivenom, raised against one venom, potentially ineffective in neutralizing another venom, while risking harmful consequences of antivenom administration [3]. Consequently, understanding the taxonomy of this genus is essential for efficient treatment.

In our case, due to the severity of the pain and the rapid expansion of the swelling, the patient was treated with the polyvalent snake antivenom, the only available antivenom in Oman. This antivenom is produced by the National Guard of Saudi Arabia from horses inoculated with the venom of six terrestrial snakes including *E. carinatus* and *E. coloratus* [6]. Despite the possibility of non-specificity of the antivenom towards this snake, the patient improved in terms of the pain and swelling. In view of the serious complications, delayed coagulopathy and significant renal impairment that had been reported previously related to the snakes' envenomation pattern in the region [4, 7], our patient was admitted in the intensive care unit, where he completed 48 h of observation without a major event. We are unable to determine if his clinical improvement was directly related to the antivenom administration or to the natural progression of the envenomation.

Several studies looked at the morphological data as well as the phylogeny of the genus *Echis* to determine the variation in venom composition [1–3, 8, 9]. The taxonomic distinction may suggest reconsideration of the antivenom use in Oman that developed for *E. coloratus*, and reevaluation of its neutralizing efficacy. Further study of the *E. omanensis* venom composition is required considering the dose-efficacy of monospecific antivenoms might be greater than polyspecific antivenom currently available in the country.

Fig. 1 Oman carpet viper (*Echis omanensis*)

Conclusion

We report the first case of an *E. omanensis* bite in which the patient developed rapidly progressive local toxicity, which improved after administration of the Saudi polyvalent antivenom.

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