



Case report

Local envenomation from the bite of a juvenile false water cobra (*Hydrodynastes gigas*; Dipsadidae)

D.E. Keyler ^{a, b, *}, D.P. Richards ^c, D.A. Warrell ^d, S.A. Weinstein ^e^a Animal Venom Research International, Moreno Valley, CA, 92556, USA^b Department of Experimental and Clinical Pharmacology, University of Minnesota, Minneapolis, MN, 55455, USA^c School of Life Sciences, University of Nottingham, United Kingdom^d Nuffield Department of Clinical Medicine, University of Oxford, Oxford, OX3 9DW, UK^e Toxinology Department, Women's and Children's Hospital, North Adelaide, 5006, Australia

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ABSTRACT

The false water cobra (*Hydrodynastes gigas*) is a non-front-fanged colubroid snake frequently exhibited in zoos, and maintained by amateur collectors. Little detailed documentation regarding the time-course of symptoms development and the consequences of their bites to humans has been published. Reported here is a case of envenoming in a 25 yo male that occurred after the bite of a juvenile *H. gigas*. The victim was bitten on the fourth digit of the left hand while processing the snake for sex determination, and the snake remained attached to the digit for approximately 30 s; there was no jaw advancement. Within 5 min, intense local pain developed, and at 4hr post bite the entire dorsal aspect of the hand was significantly edematous. The local effects progressed and involved the entire forearm, and the local pain referred to the axillary region. Mild paresthesia and local blanching (“pallor”) were noted in the affected digit, but resolved within 7 days. The clinical course in the patient showed that moderate localized symptoms may result from the bite of a juvenile *H. gigas*.

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1. Introduction

Hydrodynastes gigas is a non-front-fanged colubroid snake (NFFC), a species within a broadly varied group comprised of at least 2700 taxa, including some that were previously and inaccurately placed together in the largest of snake families, Colubridae. Although approximately 25% of “colubrids” have either been or will be taxonomically reassigned, these are often still called “rear-fanged colubrids” in reference to their posterior or mid-maxillary dentition that may or may not be enlarged or have external grooves, but lack completely enclosed internal lumens or canals. Some of these snakes have a gland that delivers its products under low pressure due to notably limited muscle attachment on the gland. This is associated with the aforementioned dentition, which secretes its contents into the oral cavity either through ducts that may open at the buccal mucosal level of the associated teeth, or release their products into the oral cavity. The gland has often been

considered functionally distinctive and termed “Duvernoy's gland” in order to distinguish them from the high pressure venom glands of elapid, viperid and atractaspine lamprophiids (front-fanged snakes, FFC), but has been grouped by some investigators with other squamate venom glands on the basis of shared development, assumed shared function, phylogeny, or similar toxin class expression.

Several species of NFFC have caused life threatening and/or fatal human envenomings. While some observations suggest that many common smaller species of NFFC present a low medical risk, such assessment must be cautiously tempered because of the limited available comprehensive data; some can produce significant local morbidity, and the vast majority of NFFC have not been studied at all. For these reasons, careful documentation of the clinical effects of NFFC bites is important even when featuring relatively mild local effects because this facilitates the construction of a medically accurate risk profile for a given species (Weinstein et al., 2011, 2013).

Hydrodynastes is a South American NFFC genus consisting of three species of which one, the false water cobra, *H. gigas*, is popular in private collections in South America, North America and Europe. We present here a case of local envenoming by a juvenile captive specimen of *H. gigas*. The case illustrates the unpredictable effects

* Corresponding author. Department of Experimental and Clinical Pharmacology, University of Minnesota, Minneapolis, MN, 55455, USA.

E-mail address: keyle001@umn.edu (D.E. Keyler).

that some NFFC bites can cause even when inflicted by a small specimen and from a species with a limited, yet insignificant history of medical significance.

2. Case report

In Feb 2014, a 25 yo male amateur collector and graduate student (one of the authors, DR) was handling a one month old juvenile (male) *H. gigas* (45 cm body length; 33 g body weight) (Fig. 1) while attempting to determine the sex of the specimen when the snake attached its jaws to the back of the left hand, but instantly released. The snake then immediately seized the proximal phalanx of the fourth digit of the left hand; however, it did not advance its jaws (“chew”). The victim completed the gender determination before removing the snake, which had been attached for approximately 30 s. Within 5 min, the victim began to feel throbbing pain and a sense of “warmth” in the affected digit. Edema restricted to the bite site was observed. At approximately 10 min post-bite, the edema had progressed from the fourth digit to the fourth metacarpal. By 20–30 min the pain at the bite site had decreased, while the edema had expanded across the dorsal aspect of the hand encompassing most of the metacarpal region (Fig. 2A). During the next hour, the victim developed a throbbing sensation that radiated to the tip of the bitten finger, and the metacarpophalangeal joints of the fourth, as well as second and third digits were tender to light touch (Fig. 2B, C). At 4 h, the edema involved the entire dorsal surface of the left hand (Fig. 2D) and the interphalangeal joints of the fourth digit became painful. Over the following 10 h, the edema progressed and eventually involved the forearm (Fig. 2E), and the victim reported sensitivity in the left axilla. The victim contacted the senior author (DEK) and sought toxinology consultation, which was provided concurrently with the evolution of the clinical effects. The left hand edema gradually began to subside as the forearm edema progressed. The edema persisted for 3 days, but by the mid-fourth day, it was almost fully resolved and a slight ecchymoses was noted over the dorsum of the hand, proximal to the fourth digit (Fig. 2F). The victim described mild sequelae consisting of paraesthesia in the bitten digit, and slight “pallor” of the digit when exposed to cold temperatures; however, the “pallor” (likely skin blanching) would resolve with warming of the hand. These persisted for 7 days following the bite, and all of the clinically observable effects of the bite were fully resolved after 7 d.

3. Discussion

The reported case is particularly interesting in that the snake



Fig. 1. False water cobra (*Hydrodynastes gigas*) specimen that inflicted the bite. This one-month old juvenile specimen remained attached to the victim for approximately 30 s. The bite caused local pain and progressive edema that required one week to fully resolve. These snakes are popular in private collections in the US, Western Europe and in some Latin American countries (photo David Richards).

involved was only a juvenile *H. gigas*, and the symptoms following the bite were definitely suggestive of envenomation despite the snake's small size. Typically, the bite of *H. gigas* is delivered by a large, robust snake capable of inflicting a powerful bite, which can result in substantial traumatic injury, independent of envenomation. Snakes of this species can attain a total body length of greater than 3 m, and the posterior maxillary teeth are significantly enlarged (Campbell and Lamar, 2004).

In the course of breeding captive *H. gigas*, the victim previously had received numerous (>10) brief bites from adult and juvenile specimens, and reported one bite sustained in 2009 that in comparison to the present case had caused “similar but slightly more severe” local envenoming. Additionally, there was a prior history of bites from various species of boas, pythons, king snakes, American rat snakes, as well as (*Gonyosoma oxycephalum* [red-tailed green rat snake] and *Boiga tahnajempeana* [Tanahjampeana cat eye snake] neither of which were protracted bites), but he had never had any type of reaction from bites by any of these species. The victim also had regular contact with snake products and byproducts (e.g. cloacal gland secretions, excreta, shed skins, etc.), during routine captive maintenance, and had worked with lyophilized snake venoms only with strict personal protection equipment (gloves, goggles, mask, and lab coat) within a laminar flow hood.

Previous reports of *H. gigas* bites have described or suggested bites of considerable duration often with active jaw advancement (Weinstein et al., 2011; Warrell, 1996), but bite contact time in the current case was only 30 s with no advancement observed. There are several postings of *H. gigas* bites on the Internet, that report significant localized symptoms, but none of these have had formal medical evaluation, thus the accuracy of reporting and validity of such reports are questionable. Aside from one contentious case (see ahead), none of the few well-documented bites caused any symptoms/signs but mild-moderate local erythema and edema (Weinstein et al., 2011). The features of the bite profile in the current case involved a brief bite from a very small snake with rapid development of local symptoms. These features suggest limited trauma from the bite, and that the reported symptoms were a result of local envenoming. However, given the patient's prior history of bites by *H. gigas*, the possibility of a Type 1 hypersensitivity reaction may have been a contributing factor. A published case of a protracted bite by an adult *H. gigas* reported effects including dysarthria, muscle weakness and paralysis following a sustained bite of 1.5 min duration (Manning et al., 1999). The mild early local effects were followed by the aforementioned delayed ataxic neuromotor effects, reportedly observed at 9 h post bite; laboratory tests were unremarkable. Retrospective medical analysis of the case suggested that the symptoms were likely due to anxiety and/or somatosensory amplification (Weinstein et al., 2011; Warrell, 2004). Laboratory assessment and blood analyses were not performed in the current case. Thus, the objective investigation of any possible systemic toxicity was not performed.

As the victim in this case did not have a formal medical review at the time of the bite, the case must be qualified as low quality evidence. Following the Strength of Recommendation Taxonomy (SORT) described by Ebell et al. (2004), as modified by Weinstein et al. (2011), the Evidence Level assigned to this case is “C/D” (e.g., in brief, a detailed case reported by a non-medically qualified individual without formal medical review).

Toxicity studies of *H. gigas* DuRoi's secretions are limited, but Glenn et al. reported a murine i.p. LD₅₀ 2.00 mg/kg (Glenn et al., 1992). The few reported venom yields have been obtained from anesthetized *H. gigas* specimens provided with parasymphathetic stimulation and have ranged from 0 to 50 μl (single gland)⁸–423 μl (7.3 mg dry yield; average from 11 specimens) (Hill and Mackessy, 1997). It must be noted that these data

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