

CASE REPORT

Clinically Significant Envenomation From Postmortem Copperhead (*Agkistrodon contortrix*)



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Over 14,000 copperhead (*Agkistrodon contortrix*) bites were reported to United States poison centers between 1983 and 2008, and 1809 cases were reported to poison centers in 2014. The copperhead is primarily found in the southeastern United States and belongs to the pit viper subfamily Crotalinae, which also includes the water moccasin (*Agkistrodon piscivorus*) and rattlesnakes (*Crotalus* and *Sistrurus* genera). Postmortem rattlesnakes have been reported to cause clinically significant envenomation; we report a case of a postmortem copperhead causing clinically significant envenomation after inadvertent puncture with the deceased copperhead fang. The copperhead was transected twice, leaving the snake in 3 separate pieces. While handling the snake head, an inadvertent puncture occurred on the right index finger followed by pain and swelling in the affected extremity necessitating antivenom administration. Care should be taken when handling deceased pit vipers due to the continued risk of envenomation.

Keywords: Crotalid, copperhead, envenomation, antivenom

Introduction

Over 14,000 copperhead (*Agkistrodon contortrix*) bites were reported to United States poison centers from 1983 to 2008, and 1809 cases were reported to poison centers in 2014.^{1,2} The true incidence is likely higher, with some individuals not seeking medical care or not reporting envenomations to poison centers. The copperhead, water moccasin (*Agkistrodon piscivorus*), and rattlesnakes (*Crotalus* and *Sistrurus* genera) are members of the family Viperidae, subfamily Crotalinae (pit vipers), named for heat-sensing loreal pit organs that allow for nocturnal hunting of prey.³ Copperheads are found in 28 states, primarily in the southeast, and envenomation rarely results in fatality, with only 1 death reported in a 25-year period.^{1,4} Typically, copperhead envenomations occur in a defensive manner

while the snake is still alive. Although envenomation from postmortem rattlesnakes has been previously reported,⁵ we report a case of clinically significant upper extremity envenomation by a deceased and decapitated copperhead.

Case report

A 23-year-old man encountered a copperhead and killed the snake by transecting the body twice, leaving the snake in 3 separate pieces (Figure 1). While holding the head of the snake, his right index finger brushed against the fang and was inadvertently punctured. Within an hour of being punctured, pain and swelling of his right index finger and hand prompted him to present to the hospital. Four vials of Crotalidae Polyvalent Immune Fab (Crofab) antivenom were initially administered, and an additional 4 vials were administered due to progressive swelling and ecchymosis of his hand. Parenteral analgesics were also administered. He was then transferred to a tertiary care hospital with concern for compartment syndrome of his hand due to swelling.

On arrival to the tertiary care hospital, physical examination was significant for a single fang mark noted

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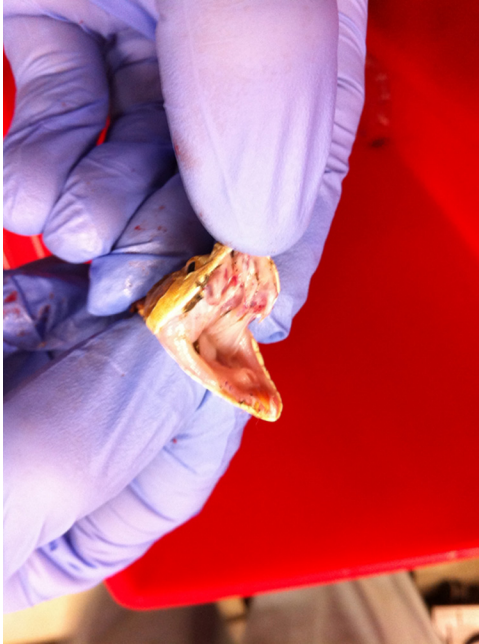


Figure 1. Deceased copperhead.



Figure 3. Hemorrhagic bulla.

on his right index finger with swelling and erythema that extended to the right elbow (Figure 2). Orthopedics was consulted and recommended stockinette elevation of the hand and agreed with the toxicology recommendation to administer an additional 2 vials of antivenom for



Figure 2. Right upper extremity swelling.

continued pain and swelling. No operative intervention was required. There was no evidence of thrombocytopenia or coagulopathy. At 1-day postvenomation, his prothrombin time was 9.9 seconds (12.3–14.8 seconds), international normalized ratio was 1.0, activated partial thromboplastin time was 21 seconds (25–36 seconds), platelets were $208 \times 10^9/L$ ($179\text{--}373 \times 10^9/L$), and fibrinogen was not evaluated. On hospital day 2, the swelling had decreased, but a 4-cm hemorrhagic bulla developed over the proximal interphalangeal joint and limited the range of motion (Figure 3). He had continued improvement in swelling and function of the affected extremity and was discharged home on hospital day 3. He was subsequently lost to follow-up.

Discussion

Our case provides further evidence that *Crotalinae* fangs are capable of producing clinically significant envenomation requiring antivenom even after the snake has been killed. This has previously been reported with rattlesnakes⁵ but has never been documented with copperheads. Living copperhead envenomations rarely result in hematologic abnormalities, and there is no neurotoxicity associated with copperhead envenomation.⁶

Suchard and LoVecchio described a series of clinically significant rattlesnake envenomations that occurred after the snake was presumed to be dead.⁵ Examples from their case series include rattlesnakes that were shot multiple times and even a rattlesnake that was

shot and then decapitated. The majority of these individuals (4 out of 5) were treated with antivenom.⁵ Griffen and Donovan described a case report of a clinically significant rattlesnake envenomation that occurred after a deceased rattlesnake was frozen for 5 weeks and then preserved in a salt and glycerin solution.⁷ Keyler and Schwitzer reported a case of a freeze-dried rattlesnake causing envenomation; the snake was purchased at a national park as a souvenir and was being used as a tie-tack when envenomation occurred.⁸

Although rattlesnakes, water moccasins, and copperheads all belong to the Crotalinae subfamily, copperhead-envenomated individuals are less systemically toxic than their counterparts.⁹ All Crotalinae contain similar anatomical structures for venom delivery. The venom glands are located in the upper postmaxillary region and are homologs to the human parotid glands. The venom duct connects the venom gland to the lumen of the fang for venom delivery.¹⁰ When striking prey, the fangs are rotated outward from their resting position to their striking position for delivery of venom. Additional fangs at various stages of development may be present in a pit viper as fangs may be shed or broken.¹¹ Unfortunately, there is no way to quantify how much venom has been injected after a snakebite; the patient must be followed clinically. In bites by venomous snakes, there may be no signs of envenomation, indicating that the snake did not inject any venom; this is termed a dry bite.¹¹

Conclusions

A deceased copperhead (*A contortrix*) remains capable of producing clinically significant envenomation that may require use of antivenom. Care should be taken when handling deceased pit vipers due to this continued risk.

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