Rattlesnake Hematoxic Neuropathy: A Case Report and Literature Review

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Background/Objectives:

- Although several thousand snakebites occur annually in US, fewer than 10 deaths occur
- Most deaths occur from envenonmation by rattlesnakes (subfamily Crotalinae) (Fig.1)
- Compartment syndrome resulting from pit viper envenomation is uncommon; however, when it does occur, early diagnosis, optimal antivenom therapy, and possible surgical decompression are primary means of preventing complications of muscle necrosis and neuropathy
- Pit viper bites can cause significant morbidity and mortality due to venom neurotoxins that block neuromuscular junction transmission and possible compartment syndrome if venom is deposited subfascially
- This is a report of envenomation by a timber rattlesnake (Crotalus horridus) to upper extremity (Fig.2)to focus attention on presentation of compartment syndrome, and potential for delayed diagnosis

Figure 1 – Infrared-sensing pit (black arrow) of pit viper (used to target prey) is clearly visible below and slightly anterior to eye (photo courtesy Mark Mannetti)

Figure 2 – Patient in case report holding skin of 6 ft long timber rattlesnake responsible for his envenomation

Methods:

- An Ovid search was conducted for years 1948-2011 with keywords "pit viper envenomation," "compartment syndrome," "fasciotomy," "peripheral neuropathy," "rattlesnake," "Crotalus," "Crotalinae", "snake," and "snakebite." Other articles were extracted from cross-referencing

Case Report:

- A 27-year-old right-handed male was bitten on his right index and long fingers by a timber rattlesnake (Fig. 2) and was seen initially at an outside hospital
- He received 6 vials of CroFab (antivenom) and transferred to our hospital
- Upon arrival to our hospital (8 hours posternvenomation) patient received 6 additional vials of CroFab
- Eleven hours posternvenomation, Plastic Surgery service was consulted at which time patient complained of localized pain and edema on his dominant index and long fingers and had obvious bite tracks on the same digits as well as bullae.
- However, his digits, hand, and forearm remained soft and he did not have pain with passive extension or any other signs suggestive of compartment syndrome
- Patient was initially treated with arm elevation to heart-level and frequent assessments
- After 4 hours of observation (16 hours posternvenomation), patient developed intense pain, especially with passive extension of digits and hand
- Ischemia developed in index and long fingers, and progressive ecchymosis extended on both palmar and dorsal surfaces of hand and forearm (See Fig.3, 4, 5,6)
- Patient was clinically diagnosed with compartment syndrome and underwent operative decompression

Methods: (cont.)

Figure 3

Figure 4

Figure 5

Figure 6

Pre-operatively (**Figs. 3,4,5,6**): Patient shown 16 hours posternvenomation demonstrating clinical symptoms and signs of compartment syndrome (e.g., edema/firmness of entire hand/forearm, pain with passive extension of digits/wrist, and ischemia of index and long digits)

Figure 10

Figure 11

Figure 12

Operation #1: Decompression of right index finger (ulnar midaxial incision) and long finger (ulnar and radial midaxial incisions) from tip to web space (**Fig. 10**). Decompression fasciotomy of dorsal right hand, wrist, and forearm(**Fig. 11**) . Decompression fasciotomy of volar wrist with release of carpal ligament and Guyon's canal (**Fig.12**). Following surgery, patient received 4 additional vials of Crofab. Six days after Operation #1, the patient received Operation #2 (not pictured): Secondary closure of fasciotomy incisions.

Results:

- Several hundred review articles pertaining to pit viper envenomation with and without compartment syndrome were initially examined
- Compartment syndrome may develop as a result of rattlesnake envenomation
- Complication of compartment syndrome may be prevented by early diagnosis, optimal antivenom therapy, and possible surgical decompression; thus, avoiding the possible complication of neuropathy
- Operative findings of case example revealed compartment syndrome involving volar and dorsal compartment
- Following release, muscles within the aforementioned compartments demonstrated good viability with no evidence of necrosis
- Following first surgery, extremity edema subsided
- Six days after ssion, fasciotomy wounds were closed
- We felt that this was possible because of early operative intervention and allowing adequate time for edema resolution
- Post-op recovery of patient was complicated by decreased sensory and motor function in ulnar distribution
- 1 year posternvenomation ulnar motor neuropathy had resolved, but ulnar sensory neuropathy had persisted

Results: (cont.)

Figure 10

Figure 11

Figure 12

1 year post-op: Patient demonstrated nearly full range of motion, but had complication of ulnar sensory neuropathy

Conclusions:

- In the US, venomous snakebites can cause substantial morbidity and mortality
- Rattlesnake bites in particular have potential for increased injury, and some patients experience severe systemic and neurologic sequelae
- Most cases of pit viper envenomation in hand do not require surgical decompression
- However, compartment syndrome can occur and patient will require emergent surgical decompression
- Neurophysiological tests and clinical examinations can be performed postoperatively to assess for peripheral neuropathy
- Earlier monitoring of subfascial pressures and using those pressures as a guide for decisions about time and dose of CroFab antivenom treatment may prevent onset of compartment syndrome, or identify need for surgical treatment
- It is uncertain if peripheral nerve neuropathy in example case was due to unrecognized compartment syndrome, administration of antivenom, or as a result of venom toxicity on nerve receptors
- It is possible that serial measurements of compartment pressures could have resulted in earlier surgical intervention.
- However, we feel that the ultimate decision for release of compartments should be clinically-based on frequent assessment of signs and symptoms of compartment syndrome

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