

SUPPLEMENTAL INFORMATION FOR THE VETERINARY MANAGEMENT OF PIT VIPER ENVENOMATIONS IN THE UNITED STATES

Pit viper envenomation is a common emergency throughout a large portion of the United States. Pit vipers are snakes in the subfamily Crotalinae and include rattlesnakes, copperhead, and cottonmouths. Envenomations can range from mild to severe. Dry bites can occur, but are rare and happen in fewer than 15% of cases. This information sheet will focus on identification of pit viper bites, diagnostics, common misconceptions, contraindications, and management.

Key Points

- The most common signs of envenomation by a pit viper include puncture wounds, swelling, bruising, bleeding, and pain.
- The only way to treat the signs and prevent further tissue damage is with administration of antivenom. Three different brands are currently approved in the US.
- Steroids, Benadryl, and antibiotics are not indicated in the acute phases of a snake bite. NSAIDs are contraindicated due to risk of bleeding, gastrointestinal ulcers, and kidney injury.

Pathophysiology

- Swelling is due to cytotoxins, hemotoxins, and myotoxins that cause tissue destruction. A common misconception is that swelling is due to histamine release, but there is virtually no histamine release in pit viper envenomations. Some species of rattlesnakes' venom contain neurotoxins.
- Severe cases can go into distributive and/or hypovolemic shock. Anaphylactic shock from snake bites is extremely rare from the bite itself.
- Hemotoxins can lead to coagulopathies and thrombocytopenia (ranging from mild to severe).
- Cytotoxins and myotoxins lead to tissue and cell destruction.
- Neurotoxins can lead to tremors, fasciculations, paresis/paralysis, and mentation changes.

Clinical Signs

- Swelling, bruising, bleeding, pain, erythema, hypotension, vomiting, diarrhea/hematochezia, and tissue necrosis in later stages

Diagnostics

- CBC: Monitor for anemia and thrombocytopenia
- Chemistry if possible to monitor for signs of organ injury
- PT (Prothrombin time)/aPTT (activated Partial Thromboplastin Time), or Activated Clotting time (ACT)
- Blood film: Check for echinocytosis, which is common in snake envenomations. (Especially important if it is not immediately apparent that an envenomation has occurred.)

Treatment

- Antivenom: the only thing that can neutralize circulating venom.
 - Sometimes one vial is needed, sometimes 20 vials are needed. This depends on the severity of the bite, the patients clinical and vital signs, as well as lab work findings.
 - Typically, most cases will require 1-2 vials of antivenom, which is a good place to start.
 - In cases with more severe signs such as severe coagulopathy, bleeding and hypotension, loading doses of 4-6 vials may be indicated.
- Fluid therapy: this will help correct hypovolemia/hypotension and dehydration. This will also help keep kidneys perfused as pigmenturia is common after hemolysis and rhabdomyolysis. Starting with a fluid bolus of 10-20ml/kg can be helpful, then placing the patient on a maintenance or 1.5-2x maintenance can help prevent further hypovolemia, correct dehydration, and maintain renal perfusion.
- Opioids: Snake bites are extremely painful. Strong but reversible opioids are recommended. This should be withheld until severe signs of hypotension or bleeding are controlled.
- In severe cases, blood products such as packed red blood cells, fresh whole blood, or fresh frozen plasma may be indicated.
- Oxygen therapy if dyspnea/hypoxemia is present.
- After a patient is discharged, pain medications such as tramadol, gabapentin, fentanyl patches, and acetaminophen with codeine (not cats) is indicated.
- Wound care may be needed in cases of necrosis.

Additional important information

- NSAIDs can lead to worsening coagulopathies as they are platelet inhibitors. NSAIDs can also lead to acute kidney injury in cases of hypotension or severe hemolysis or rhabdomyolysis. They should be avoided as well to prevent GI ulceration.
- Multiple studies show that glucocorticoids are of no benefit. In some snake bites it can worsen the outcome and potentiate venom effects as well as immunosuppress. Additional considerations are that steroids can lead to GI ulceration.
- Diphenhydramine (Benadryl) is of no benefit. As stated above, the swelling is not histamine-mediated. It can also lead to altered mentation which could be dangerous in shocky patients.
- Antibiotics are not indicated unless signs of necrosis or infection are present. Snake venom kills most bacteria in the injection site, so infections are not an issue in the acute stage. If tissue necrosis occurs, antibiotics could be indicated at that time.