Cutting Edge Surgical Medical Group "Snakebite" Crotalid Envenomation Protocol (Southwestern United States)

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Summary—Focus of Attention

Snakebite/Crotalid Envenomation *should be considered a* ***medical emergency*** *and promptly triaged. Patient management focuses heavily on two principles:*

1. ***Prompt administration of antivenom***
2. ***Aggressive supportive care***

Clinical Presentation—General

Crotalid Envenomation

- Causes local tissue injury; “bite” location is often painful
- Local paresthesia is common
- Coagulopathy and severe systemic effects—less common
  - Hemorrhagic tissue necrosis and systemic coagulopathy

Venom—every bite is unique (volume and potency)

- About 20-25% of venomous snakebites are “dry”
- Venom metalloproteases cleave cell-cell junctions
- Weakens vascular walls—increases capillary permeability
  - Significant third-spacing of fluid
  - Possible tissue hemorrhage

Clinical Presentation—Coagulopathy

Crotalid coagulopathy clinical presentations

- Gingival bleeding
- Epistaxis
- Gastrointestinal hemorrhage
- Intracranial bleeding (very rare)
- Severe systemic effects
  - Hypotension
  - Cardiovascular and neurological toxicities

Field Management

NOT Recommended

- Tourniquets—increase in local tissue necrosis
- Wound incisions—iatrogenic tissue damage
- Application of ice—increase in local tissue necrosis

Limited supportive evidence as safe initial maneuvers

- Immobilization
- Elevation
- Gentle affected limb compression

Antivenom therapy

- Most effective within the first four hours after insult
- Medical attention should be immediately prioritized
  - Entirely asymptomatic patients may receive observation only

Initial Hospital Management

If the patient demonstrates **any signs** of a **local tissue reaction, coagulopathy, or severe systemic effects** immediate action should be undertaken:

- **CroFab (FabAV) should be promptly ordered, prioritized, and obtained**
- **IV access** should be obtained; the local reaction should be outlined with a marker and the time listed; Tetanus vaccine should be administered
- **Full set of labs** should be drawn, most importantly CBC, PT/INR/PTT, Fibrinogen, and Fibrinogen Split-Products
- **Narcotics** should be utilized for pain control (NSAIDS historically avoided)

Administering CroFab (FabAV)

Screen for possible anaphylactoid reactions to antivenom, but there is **no absolute contraindication to antivenom treatment**

Antivenom should be administered with IV fluid

- Four to six vials diluted in 250 mL normal saline, given over one hour
- Pediatric doses are similar to adult doses—address toxin, not patient size

All labs should be repeated one hour after initial infusion of antivenom

Admission to the ICU is generally recommended

Early Hospital Wound Treatment

Closely monitor the wound for clinical progression of the local tissue reaction

Wide range of presentations

- Mild: tissue edema
- Severe: compartment syndrome with hemorrhagic tissue necrosis

Affected limb should usually be elevated to facilitate venous and lymphatic return

Edema will likely progress proximally

Local paresthesia is common and often directly related to the site of envenomation

Prophylactic fasciotomies are not recommended

Rare circumstances may warrant fasciotomy for profound compartment syndrome

Tissue edema often stabilizes or improves with antivenom treatment

Early Hospital Systemic Treatment

Systemic effects (induced coagulopathy) should be closely monitored

Initial labs

CBC, PT/INR/PTT, Fibrinogen, and Fibrinogen Split-Products

Presence of Fibrinogen Split-Products on presentation is about 90% sensitive and 70% specific for the development of an associated coagulopathy

Attention should be directed at identifying any coagulation cascade derangements and/or thrombocytopenia.

Thromboelastogram (TEG) may help direct treatment

Lab values should be repeated one hour after antivenom infusion

Ongoing Hospital Treatment

Laboratory studies should be considered every six to eight hours

- Hemoglobin, Platelets, Coagulation Panel, and Fibrinogen
- Low utility to trend Fibrinogen Split-Products
- Creatinine Kinase may have some clinical utility to trend in specific cases

Hospital Treatment of Severe Envenomation

Blood product resuscitation should be considered in cases of severe or continued coagulopathy despite antivenom infusion

- Fresh frozen plasma, cryoprecipitate, and platelets may be clinically considered
- Pharmacological adjuncts such as desmopressin and/or tranexamic acid may have utility in specific indicated circumstances

Hospital Treatment—Additional CroFab

If **labs** do not improve or **clinical presentation** significantly **worsens**, additional administration of antivenom is indicated:	Consider additional administrations of four to six vials of antivenom until response is achieved • In limited instances, greater than 20 vials of antivenom may be required for treatment
"Severe Envenomation" patients	**Initial eight to 12 vials** of antivenom should be given

Treatment of Recurrence

Established phenomenon of **recurrence** warrants continued close clinical and biochemical monitoring	Treatment for recurrence

• "Occurrence of any venom effect following resolution of that abnormality"
  • Prolonged venom resorption
  • Disassociation of the venom-FabAV complex
  • May occur in up to half of patients, especially those with coagulopathy at presentation
	• Additional four to six vials of antivenom, as needed
	• May occur greater than 24-36 hours after initial treatment

Allergic Reactions to Antivenom

In cases of allergic reaction, the antivenom infusion should be terminated and epinephrine/antihistamines should be administered

Serum sickness may occur one to four weeks after antivenom treatment

Discharge and Follow-up

The hospital observation period should be sufficient to ensure resolution of all coagulopathy and systemic effects

- Local reactions should be stable or improving
- Patient should be outside the recurrence window
  - At least 18-36 hours after initial CroFab treatment
- Prophylactic antibiotics at discharge are **not** recommended
  - 3% risk of wound infection after snake bite

Patients should be advised to return to the hospital if:

- Increase/recurrence of pain or swelling
- Signs of bleeding (gingival bleeding or epistaxis)

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