

## ED Report Outline – Emily Joynt

### Injected Poisons: Snakes

- **Etiology/Pathophysiology**
  - Types of Snakes
    - “Red on yellow, kill a fellow, red on black venom black.”
    - Nonvenomous
    - Venomous
      - Pit Vipers – Crotalidae Family
        - Hemolytic Venom
          - Acts directly on both local tissue and systemically to cause toxicity (cytotoxicity, myotoxicity, and hemotoxicity)
          - A special mixture of hemolytic and proteolytic enzymes; the venom compound is rapidly absorbed but it is a very slow process for the body to eliminate the toxin.
          - Proteolytic enzymes cause extensive localized tissue damage; Hemolytic enzymes cause the soft tissue to swell and leads to necrosis locally while systemically it attacks the circulatory system.
          - Known effects of the compound includes pro and anti coagulation effects, platelet aggregation, edema development, inflammation and myotoxicity.
          - The attack on the circulatory system leads to changes in the coagulation pathway, increased bleeding and increase capillary membrane permeability; Leading to pulmonary edema, shock and death.
          - There is also an increased release of histamine causing an inflammatory response leading to anaphylaxis.
        - Cause the greatest number of bites and morbidity in America.
      - Coral Snakes – Elapidae family

- Decreased amount of envenomation seen as compared to the Pit Viper because of the natural need to retreat that coral vipers exhibit, but the venom is much more deadly when mishandled.
- Neurotoxic Venom
  - Enters the system through the lymphatic system in order to attack the body systemically rather than locally.
  - Block acetylcholine receptor sites in the neuromuscular transmission pathway, blocking the connections between the brain and muscles; causing direct effects on cardiac and respiratory muscles.
  - Interfering with the nerve impulses that causes an overall immobilizing effect that makes the body rigid or limp.
  - Respiratory failure is the number one cause of death.

- **On-Scene Treatment**

- Snake Appearance

- Nonvenomous Snakes
  - Rounded heads, round pupils, and no fangs
- Pit Vipers
  - Flat triangular head, thin slit eyes, with a distinguished characteristic heat sensitive pit directly between the eyes and nostrils
  - Most frequently seen rattlesnakes, cottonmouths/water moccasins and copperheads
  - Usually found in wooded marshes of southern USA; hide in leaf piles or burrow in the ground making them difficult to spot.
- Coral Snakes
  - Rounded head with black snout/nose, and round pupils
  - Distinct coloring is how to decipher between venomous and nonvenomous; the coral snake is brightly colored with alternating bands of red, yellow and black.

- Signs and Symptoms

- Nonvenomous Snake Bites

- “Dry Bites”
- No envenomation with bite but will have scratch marks.
- Not usually painful
- Mutual Signs and Symptoms Venomous Snakes
  - Puncture marks at the site of wound, usually two but can only have one or in some cases none will be visible.
  - Redness, swelling, bruising, bleeding or blistering around the bite marks.
- Venomous Snakes Specific Signs and Symptoms
  - Pit Vipers - Hemolytic
    - Immediate burning at bite site, inflammation/swelling begins within minutes; Tissue necrosis is possible over time.
    - Within 30-60 minutes can begin having numbness/tingling of lips, fingers, and toes; As well as a rubbery taste in mouth.
    - Large amounts of bruising and increased size of blood blisters and bullae.
    - The site of the bite will be incredibly painful.
    - Systemically be looking for bleeding from distal sites; complications of hemorrhage or thrombosis should be looked for in the symptoms of chest or abdominal pain, or new onset headache.
  - Coral Snakes - Neurotoxic
    - The bite effects have a rapid onset, but it may take many hours before any symptoms develop
    - Commonly seen is nausea/vomiting, slurred speech, blurred vision, weakness, tremors, drowsiness, and numbness or tingling around the face
    - Possible effects seen include progressive motor deficits such as cranial nerve issues like ptosis (upper eyelid drooping), dysphagia, dysarthria, hypersalivation, muscle weakness
    - More severe effects include labored breathing leading to respiratory arrest due to paralysis of muscles such as the diaphragm

- o Myths and What NOT to do
  - Never use a tourniquet, it will cut off distal blood supply and cause more damage.
  - No ice to the site
  - Oral or mechanical suction
- o What you should do
  - Take a picture of the snake from a safe distance, move away....dead snakes can still bite.
  - Keep bite at heart level if possible; Above the heart would increase systemic spreading, while below the heart would increase the localized swelling.
  - Attempt to remain calm and still to decrease spread of venom.
  - Clean with soap and water, then cover with dry dressing.
- **ED Treatment**
  - o Diagnostics/Testing
    - CBC, CMP, Creatine kinase, urinalysis
    - Specifically for Pit Viper will need coagulation studies (PTT, PT/INR, fibrinogen level, D-Dimer)
    - Ultrasounds may be used to assess the degree of tissue infiltration.
    - EKG
  - o Prophylactic tetanus vaccine
  - o Pressure bandages may be used in the case of wanting to slow absorption of venom through the lymphatic system, but the bandages cannot be too tight where they prevent blood flow.
  - o Pain Management
    - NSAIDs should be avoided in Pit Vipers envenomation because of the possibility to worsen the coagulation issues.
  - o Antivenin
    - Coral Snakes
      - North American Coral Snake Antivenin – NACSA
        - o IgG horse derived antibody that can be used in both children and adults.
        - o Although coral snake bites are rare in the US, they can still be deadly, so a large conflict currently is the production of

this antivenin is no longer occurring, current doses are expired; They are still approved by Poison Control for use.

- To receive this antivenin a patient will need to be tested for reaction to horse serum, if no immediate reaction, then the antivenin is administered with subsequent doses to follow.
- If antivenin is not available or cannot be made available before a patient begins to show distress, then Neostigmine (anticholinesterase) can be given; It will work to increase acetylcholine and work against the neurotoxic effects of the venom.
- Pit Vipers
  - The level of severity and need for antivenin can be based off of four categories.
    - Dry Bites have no symptoms or envenomation, in this case they will not require antivenin.
    - Mild Levels only have local symptoms and will just be monitored without antivenin.
    - Moderate Levels have increased evidence of local symptoms meaning they have increased in size since the initial evaluation, systemic results are possible, these patients will receive the antivenin.
    - Severe Levels have progressed to life-threatening systemic complications, will require immediate antivenin administration.
  - Types of antivenins
    - Crotalidae Polyvalent Immune Fab
      - Sheep derived Fab fragment immunoglobulin from four snakes, allows the antivenin to enter tissues but also allows it to be cleared through the kidneys.
      - The same dose of 4 to 6 vials is given to both children and adults, administered slow at first to monitor for an adverse/allergic effects, if none seen then dose should be given over 1 hour.
      - Will reassess labs and patient if symptoms are controlled then can proceed to maintenance dose of 2 vials at 6, 12, and 18 hours from start, if not controlled then will need to repeat initial dose again and start the process over.

- Crotalidae Immune F(ab)<sub>2</sub>
        - Horse derived Fab fragment immunoglobulin from two snakes.
        - Only one dose usually needed, 10 vials given to both children and adults, will begin administering slowly and then give the rest over an hour.
    - Additional Management of Pit Viper Envenomation
      - Blood transfusions can be given in severe cases.
      - Surgery may be needed in cases to remove necrotic tissue, wound cleaning, and if in the case of compartment syndrome then a fasciotomy maybe needed.
      - Anticholinesterase can be used in neurotoxic cases to reverse paralysis
    - Nursing Interventions
      - Monitoring for immediate AND delayed hypersensitivity reactions
        - Signs and symptoms including but not limited to hives, itching, shortness of breath, hypotension, angioedema.
        - If any of the above symptoms occur the antivenin will be immediately stopped, and epinephrine will be given. Possible need for corticosteroids, bronchodilators, and antihistamines.
- **Role of ED Nurse**
  - Immediate
    - Assessment
      - ABCs!
      - Neurovascular checks distal to the site of envenomation
      - Skin checks for signs of bleeding such as petechiae or ecchymosis
      - Allergic reactions are not uncommon with antivenin administration therefore a need to keep Epinephrine, corticosteroids, and vasopressors within easy access.
      - Maintaining at least two peripheral IVs
    - History and Physical
      - Assess current problem, it is critical to know when the bite happened, where on the body the bite occurred; In the case of a coral snake bite the signs and symptoms may not become apparent until up to 13 hours later.

- Assess any past medical history such as current medications, any cardiovascular, renal, hematologic, respiratory problems.
  - o Over time
    - Monitoring
      - In the case of coral snakes, the patient will need to have close monitoring for a minimum of 24 hours; whereas with Pit Vipers the patient will need to be monitored for 6 to 8 hours with a dry bite or mild symptoms
    - Aware of Compartment Syndrome signs and symptoms
      - Pain, paralysis, paresthesia, nonpalpable pulse, poikilothermia, and pallor
    - Aware of signs and symptoms of Third space losses
      - Tachycardia, hypotension
    - Watching the bite site for any changes in size
- **Discharge/Prevention Instructions**
  - o Call your doctor or return to the hospital if wound grows, experience bleeding, uncontrolled pain, or edema without relief.
  - o Repeat CBC and coagulation studies; avoiding contact sports, dental work, and surgery for at least 2 weeks.
  - o Self-Monitor for Serum Sickness
    - Develops 1 to 2 weeks after exposure, symptoms include rash, fever, and joint pain.
    - Sickness itself is self-limiting but provider will need to be notified for bloodwork.
  - o Self-Monitor for Hypersensitivity Reaction
    - Signs and symptoms to look for such as rashes, urticaria, wheezing, and dyspnea.
    - Call 911 and return to the hospital.
  - o Prevention
    - Do not engage or mishandle snakes.
    - Be aware of your surroundings; avoid places where snakes tend hide such as tall grasses and dark holes.
    - Be careful when swimming, some snakes have the ability to swim.
    - Use precaution when outside at night.
    - Wear protective clothing such as high socks/boots, and long sleeves.

- Seek medical attention as soon as possible.

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