Management of Common Bites and Stings

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Objectives

• Discuss common bites, stings and envenomations:
  ✓ Bee stings
  ✓ Spider bites
  ✓ Snake envenomations

• Discuss management strategies for these bites

Hymenoptera Stings

• Stinging insects kill more people annually than do snakes
  ✓ About 40-130 deaths per year
• Hymenoptera - honeybees, yellow jackets, wasps, hornets, bumble bees, and fire ants

Case

• 29 yo man was stung by a bee while working out in the yard. Now c/o skin itching, diffuse hives, swelling of arms and legs, tightness in throat, dizziness and difficulty talking.

• What do you do?
### Types of Reactions

- Local
- Mild generalized
- Severe generalized

### Local

- Majority of cases
- Local redness, pain, swelling
- May extend > 6 inches beyond sting
- May persist > 24 hours
- Remove stinger
- Ice, elevate
- Antihistamines, steroids, tetanus prophylaxis

### Mild Generalized

- Symptoms away from site of sting – itching, hives, nausea, wheezing
- Antihistamines, steroids
- Inhaled beta-agonists for wheezing
- Consider epinephrine if wheezing
- Tetanus prophylaxis
- Local care
- Observation for 6-8 hrs
Severe Generalized

- Classically IgE-antibody mediated
- Anaphylaxis, laryngoedema, circulatory collapse, LOC
- Most deaths generally occur within 1st hour

Severe Generalized

- Admit all
- Home with Epi-Pen
- Refer for desensitization therapy

Severe Generalized

- ABCs – intubate early
- IVF – support blood pressure
- Epinephrine is drug of choice (0.1 mg/Kg of 1:1000 solution – initially given IM but may need IV drip
- Steroids
- Inhaled beta-agonists for bronchospasm
- H1/H2 blockers (Diphenhydramine and Cimetidine)

Ant Stings

- Ants sting 9.3 million people each year. Other Hymenoptera account for more than 1 million stings annually.
- Fire-ant venom is composed primarily of a transpiperidine alkaloid that causes tissue necrosis.
**Ant Stings**

- Most fire-ant stings produce blister within 24 hours, which fills with necrotic material, giving appearance of pustule.
- Despite appearance, blisters are not infected and should be left intact.

**Case**

- 41 yo male presents to ED after fishing all day at a local reservoir. Friends say he may have stuck himself with a fish hook b/c he complained of pain in hand when looking thru tackle box.
- Now with severe abdominal pain, cramping, N/V, and diaphoresis.

**Key Points: Bee Stings**

- ABC’s
- Remove Stinger
- Epi for generalized reactions
- Steroids, Benadryl, Pepcid
- Admit all severe reactions, d/c with Epi Pen

**Ohio’s Biting Spiders**

- 2 main groups of spiders; the recluse spiders and the widow spiders.
<table>
<thead>
<tr>
<th>Black Widow</th>
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</table>
| • *Latrodectus mactans*  
• Leading cause of death from spider bites in U.S.  
• Shiny black with brilliant red hourglass marking on the abdomen  
• Venom is complex protein that includes a neurotoxin | • >40,000 presumed bites reported to poison centers in last 20 years  
• Warm, dark, dry places – woodpiles, outhouses outdoors; basements, garages indoors |

**Clinical Manifestations**

- Few local symptoms associated with bite
- Generalized pain and rigidity of muscles 1-8 hrs after bite
- Pain felt in abdomen, thighs, flanks, chest
- Nausea, vomiting, urinary retention, chills
- 4-5% mortality rate, with death due to cardiovascular collapse
### Black Widow

- No cytotoxic agents
- Neurotoxins – induce symptoms by stimulating the release of peripheral and central nervous system neurotransmitters

### Management
- General supportive care - ABC’s, local wound care, tetanus prophylaxis, loosely immobilize and elevate extremity
- Benzodiazepines and/or narcotics for pain and muscle spasm
- WATCH RESPIRATORY STATUS
- Calcium gluconate no longer recommended

### Alpha-Latrotoxin

- Acts at pre-synaptic membrane of the neuromuscular junction, opening cation channels, and decreasing reuptake of acetylcholine which results in severe muscle cramping
- Can also trigger release of dopamine, norepinephrine, glutamate, GABA, and other neuropeptides

### Black Widow

### Management
- Latrodectus antivenom-use in respiratory arrest, seizures, uncontrolled hypertension, pregnancy
- Dose is 1-3 vials
- Admit – symptomatic children, pregnant women, pts. with history of hypertension
Key Points: Black Widow

- Black Widow (lactodectus)
  - Red hourglass on ventral aspect
  - Neurotoxic
    - Muscle cramps, pain, stiffness, rigid abdomen without tenderness to palpation
    - Can see systemic symptoms: tachycardia, hypertension, sweating
    - Supportive care; May d/c in 4h if no systemic sx
    - Indications for antivenin (controversial):
      - Severe pain, severe htn, pregnant

The Brown Recluse

- Loxosceles reclusa has potential to inflict injury.
- Seen predominantly in South Central United States.
- Adult spiders are soft-bodied and yellowish-tan to dark brown.
- 1/4 to 1/2 inch long, and leg span is size of half dollar.

Case

- 2 yo girl presents to your emergency department. The child was in her car seat when she immediately started crying. Dad noticed a welt that “must be one a them spider bites”.
- You roll your eyes as you walk in the room to I&D another abscess.

Brown Recluse Territory


www.brownreclusespider.com/faq.htm
<table>
<thead>
<tr>
<th>Brown Recluse Bites</th>
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</tr>
</thead>
<tbody>
<tr>
<td>• Distinguishing characteristic is the violin-shaped marking on the dorsal cephalothorax.</td>
<td>• Bites are rare even in houses that are heavily infested with spiders.</td>
</tr>
<tr>
<td><img src="image1.png" alt="Spider Image" /></td>
<td>• For this reason, a diagnosis of a recluse bite is unlikely in areas that lack significant populations of Loxosceles spiders.</td>
</tr>
<tr>
<td><img src="image2.png" alt="Spider Image" /></td>
<td></td>
</tr>
<tr>
<td>• Incidents usually occur in summer months.</td>
<td>• In 2005, 2236 exposures called into poison centers</td>
</tr>
<tr>
<td>• The spider prefers dark, dry, and undisturbed locations, such as woodpiles, the underside of rocks, and storage areas in garages, attics, basements, and linen closets.</td>
<td>• 464 victims less than 19 years of age</td>
</tr>
<tr>
<td><img src="image3.png" alt="Spider Image" /></td>
<td>• Dark environments in house – attics, basements, boxes, closets</td>
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Brown Recluse Bite Progression

Clinical Manifestations

• Bite is usually innocuous
• Spectrum is from minor local reaction to severe necrotic arachnidism
• Mild to moderate pain 6 hrs after bite; erythema develops with central blister or pustule; subcutaneous discoloration spreading over 3-4 days; ulceration

Brown Recluse Venom

• Cytotoxic enzymes cause destruction of local cell membranes:
  ✓ Alkaline phosphatase
  ✓ 5-ribonucleotide phosphohydrolase
  ✓ Esterase
  ✓ Hyaluronidase
  ✓ SPHINGOMYELINASE D
Brown Recluse Bites

- <10% of envenomations result in severe skin necrosis.
- Wounds destined for necrosis usually show signs such as bullae formation, cyanosis, and hyperesthesia, within 6-12 hours.


“The Old Red, White and Blue”

- Central blistering surrounded by a ring of blanched skin that is surrounded by large area of asymmetric erythema leads to typical "red, white, and blue" sign of a recluse bite.
- Usually by 48-72hrs.
Brown Recluse Bites

• In this patient, the bite area turned blue and dark red by the evening of the first day.

Cutaneous necrosis: bulla develops at center of affected area and becomes necrotic.

• Areas with increased adipose tissue are more prone to severe necrosis than bites occurring at other sites.

Systemic Reaction or Loxoscelism

• Fever, chills
• Arthralgias/myalgias
• Malaise, weakness
• Nausea, vomiting
• Morbilliform eruption with petechiae
• Intravascular hemolysis, hematuria, renal failure

Brown Recluse Bite Diagnosis

• No specific serologic, biochemical or histologic test
• PCR
• Vigorous supportive care
• Labs – cbc, platelets, UA, BUN, creatinine
• Once large areas have demarcated – surgical excision and skin grafting
Brown Recluse Bite Treatment

- First Line:
  - RICE
  - Aspirin and Antihistamines
  - Tetanus Update
  - Antibiotics if tissue breakdown

Bite Management Summary

- RICE: Rest, Ice, Compression and Elevation of extremity, loose immobilization
- Tetanus status
- If necrosis – debridement, grafting (typically 6-8 weeks after bite).
- Admit – if systemic symptoms, evidence of coagulopathy, hemolysis, hemoglobinuria

Brown Recluse Bite Treatment

- Steroids (efficacy is up for debate)
- Colchicine
- Hyperbaric oxygen therapy (conflicting results)
- Electric shock therapy
- Dapsone (moderate to severe or rapid disease, never in children)

Brown Recluse Bite Outcomes

- Prognosis for recluse bites is good, and most patients show excellent outcome.
- In most, pain subsides within 1 week, and reduction in size of the necrosis is evident.
- Healing may be slow, but all recluse wounds heal, usually with a minimum of scar tissue.
**Key Points: Brown Recluse**

- Brown Recluse (Loxosceles)
  - Violin on dorsum
  - Tissue toxicity
  - Dapsone helps counteract the effects of the venom?? (controversial)
    - Contraindicated in G6PD deficiency
  - Observe for 6h for systemic symptoms

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**Case**

- 18 month male transferred from Kentucky
- Bit on hand by baby copperhead snake
- Hospitalized locally
- Transferred due to progressive swelling and ecchymosis and concern about compartment syndrome
Snake Bites

Families in the U.S.
- Viperidae
- Crotalinae (pit vipers)
- Elapidae (coral snakes)

Snake Bites

Crotalinae Genera
- Crotalus (rattlesnakes) – 15 species
- Agkistrodon – includes cottonmouth and copperhead
- Sistrurus – includes pygmy rattlesnake and massasauga
Ohio Poisonous Snakes

• Northern Copperheads
  ✓ Widely scattered throughout most of unglaciated Ohio.
  ✓ Prefer rocky, wooded hillsides of southeastern Ohio.
  ✓ Stay away from well settled areas.

• Eastern Massasauga
  ✓ "Swamp rattler" and "black snapper" are other names given to small rattlesnake.
  ✓ Massasauga swamp rattlers are widely scattered.
  ✓ Colonies still persist in bogs, swamps, and wet prairies within glaciated Ohio.

Ohio Poisonous Snakes

• Timber Rattlesnake
  ✓ Timber rattlers are one of the most dangerous snakes in northeastern America.
  ✓ May be in excess of 6 ft, but average 3-4 ft.
  ✓ Timber rattlers most numerous in more remote areas of Zaleski, Pike, Shawnee, and Tar Hollow state forests.

Snake Bites

Statistics
• Crotalinae – 99% of venomous snakebites in U.S.
• 65% - rattlesnakes
• 25% - copperheads
• 10% - cottonmouths
### Snake Bites

#### Statistics
- 2005 – 2900+ bites reported to poison centers (8000/yr is average)
- 116 < 6 years of age
- 542 6-10 years of age
- 6 deaths
- 171 – life-threatening

#### Epidemiology
- Incidence – 3.74 bites/100,000 population
- 90% of envenomations occur between April and October
- 50% of bites occur from 2-9 PM
- Male:Female ratio 9:1
- At least 40% of bites occur when a snake is purposely handled

### Snake Bites

Children have more clinical severity:
- Smaller limbs
- Less subcutaneous tissue
- Smaller body mass
- Receive more venom per kg body wt
Crotaline Venom

- Components cause direct tissue injury, capillary leakage, coagulopathy, and neurotoxicity
- Tissue damage at the site of the bite – the most common complication following envenomation
- Local reactions – increased blood vessel permeability and direct tissue necrosis

Snake Bites

Thrombocytopenia

- Platelet destruction may be mediated by action of phospholipases which damage platelet membranes
- Platelets may also be sequestered in local microvasculature and released after antivenin treatment

Snake Bites

Hematologic Abnormalities

- Coagulopathies in over 60%
- Hypofibrinogenemia in 49%
- Thrombocytopenia in 33%

Snake Bites

Crotalocytin

- Found in Timber Rattlesnake venom
- Causes platelet aggregation
- At least partially responsible for thrombocytopenia – common and often severe
### Snake Bites

- Venom of cottonmouth produces less severe local and systemic pathology
- Copperhead envenomations cause significant soft tissue edema but usually not significant coagulopathy, systemic symptoms, or extensive tissue destruction

### Signs and Symptoms

- 1 or more fang marks, pain, edema, erythema, or ecchymosis. Bullae may appear.
- Systemic effects: AMS, tachycardia, tachypnea, resp distress, hypotension, coagulopathy, renal failure, hemolysis.

### Signs and Symptoms

- Common reaction is impending doom. Fear may cause N/V/D, fainting, tachycardia, and cold clammy skin.
- Local findings in 30-60 minutes. May see edema w/in 10 min. Pain usually evident within 5 minutes.

### Grades of Envenomation

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<thead>
<tr>
<th>Grade</th>
<th>Description</th>
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<tbody>
<tr>
<td>0</td>
<td>No envenomation – 25%</td>
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<tr>
<td>I</td>
<td>“Mild” envenomation</td>
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</tbody>
</table>

- Fang marks
- Pain and edema at site
- Local ecchymosis
- Blistering
- Necrosis
- Minimal to no spread of edema proximal to site
### Moderate
- 56% of bites
- Severe pain
- Spreading edema beyond site of bite
- Systemic signs – nausea, vomiting, paresthesias, muscle fasciculations, mild hypotension

### Severe
- Marked swelling of extremity that occurs rapidly
- Subcutaneous ecchymosis
- Systemic symptoms – coagulopathy, hypotension, altered mental status

### Snake Bites
**Management**
- Maintain vital signs (ABC’s)
- Reduce venom effects
- Prevent complicated sequelae
- Minimize tissue damage

**Immediate First Aid**
- Get away from the snake
- Stay calm
- Immobilize the bitten extremity at a position of heart level or just below
- Apply a constricting band, not tourniquet
- May apply suction device
- TRANSPORT TO MEDICAL FACILITY
Snake Bites

Don’ts
- Do not incise the bite
- Do not ice the bite
- Do not remove constricting band

ED Management
- Notify Regional Poison Center
- ABC’s
- At least 1 IV line, draw labs while starting
- If no signs of envenomation, may observe for further progression
- Measure circumference of limb
- If signs of envenomation, antivenin admin.

Baseline Labs
- CBC with diff, plts
- Electrolytes, BUN, creatinine
- CPK
- Coagulation studies
- Type and cross
- Urinalysis

Antivenin
- Polyvalent Crotalinae antivenin
- Available in U.S. since 1947
- Mainstay of medical management
- Horse serum derived
- Dosing varies according to severity
- Production discontinued in 2002
### Snake Bites

**Ovine Fab Antivenin (CroFab)**
- 4-6 vials
- Additional 4-6 vials until control achieved
- Scheduled 2-vial doses at 6, 12, and 18 hr
- Initial dose given slowly for first 10 min
- Rest of dose over 1 hr
- Dosages appear safe in pediatric population

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### Compartment Syndrome

- Pain out of proportion to injury
- Hypesthesia
- Pain on passive stretch of muscles
- Tenseness of compartment on palpation
- Weakness of muscles in the compartment
- All are toxic effects of venom
- Need to measure compartment pressures

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### Snake Bites

**Other Management**
- Cleanse wound thoroughly
- Tetanus prophylaxis
- General supportive care
- Antibiotic prophylaxis is controversial
- ANALGESICS - opioids

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### Compartment Syndrome

**At Risk Patients**
- Patients treated with cryotherapy
- Patients with delayed or inadequate administration of antivenin
- True intramuscular injection of venom
Compartment Syndrome

Protocol
- Elevate limb
- Mannitol 1-2 gm/kg IV
- CroFab 4-6 vials
- Remeasure pressures
- Fasciotomy if pressure still elevated

Snake Bites

Complications
- Some patients premedicate with alcohol, marijuana or other drugs – respond more intensely to envenomation and may need larger doses of antivenin

Key Points: Snake Bites

- Snakes
  - Crotalinae
    - Grade the bite according to presence of systemic toxicity
      - Mod/severe bites have systemic toxicity or are rapidly progressive
    - Use antivenin for mod/severe bites
    - Observe dry bites for 8-12h; admit all others
- Serous sickness (type III hypersensitivity) – can occur up to 3 weeks after antivenin
- Fever, chills, arthralgias, diffuse rash
- Rx – steroids, antihistamines
References

- Pediatr Infect Dis J (2003) 22(10) 931-932
- Brown Recluse Spider Bite Manifestations and Management: Slideshow, MedScape from WebMD Emergency Medicine.