Bites, Stings and… Other Emergency Things

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Learning Objectives
1. Recognize spider and other insect bites and determine treatment.
2. Appropriately manage a variety of animal bites.
3. Assess and manage pit viper bites.
4. Recognize and manage acute allergic reactions.
5. Recognize and determine which toxicology emergencies require specific antidotes.

Animal Bites
1. Which of the following bites has the highest risk of infection?
   A. Cat bite to the hand
   B. Human bite to the face
   C. Dog bite to the thigh
   D. Spider bite to the arm

A. Cat Bite
   • 5 to 18% of all reported bites
   • Puncture wounds
   • 80% of bites become infected
     - 53-80% with Pasteurella multocida
     - Watch for bone and joint infection
   • RX: Amoxicillin-clavulanate

B. Human Bite
   • Watch for closed fist injury
   • High rate of infection, 26-83%
     polymicrobial
   • Copious irrigation, avoid closure
   • RX: Amoxicillin-clavulanate x 5 days
C. Dog Bite

- 80 to 90% of all reported bites (#1)
- Most common on extremities
- Only 5% of bites develop infection
  - Higher rate in hands, deep puncture, older pts.
- Pasteurella multocida S. aureus, 29%
- Bacteroides species Fusobacterium EF-4 bacteria-
  - Eikenella species, 15%
- DF-2 bacteria (Capnocytophaga sp)
- Primary closure - OK
- +/- Amoxicillin-clavulanate

Animal Bites

1. Which of the following bites has the highest risk of infection?

   - A. Cat bite to the hand (41%)
   - B. Human bite to the face (54%)
   - C. Dog bite to the thigh (2%)
   - D. Spider bite to the arm (2%)

Bites and Stings

A 40-year-old male presents with right axillary swelling over the past 3 weeks. Large, multiple lymph nodes are present, but no fever or chills. He has a cat, dog, and parrot in his home.

The most likely diagnosis is:

   A. Cat scratch disease
   B. Brown recluse spider envenomation
   C. Black widow spider envenomation
   D. Psittacosis

Cat Scratch Disease

- 22,000 cases/year, 2000 hospitalizations/year
- Regional lymphadenopathy, 10% suppurative
  - Axillary/epitrochlear nodes 46%
  - Cervical 26%, inguinal 17%
- Bartonella (Rochalimaea) henselae - small Gr (-) rod
- Diagnosis: Cat scratch and serologic testing (IFA)
- Rx: Only 1 prospective blinded study-
  - More rapid resolution of LN size with azithromycin
- Self limiting disease, 1 to 2 months
  - Do NOT I & D!!!

Parinaud Oculoglandular Syndrome
Bites and Stings

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- **B. Brown recluse spider envenomation**
- **C. Black widow spider envenomation**
- **D. Psittacosis**

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B. Brown Recluse Spider Envenomation

- Location: “South of I-80”
- Nocturnal
- May not be the only spider that causes **skin necrosis**
- Differential diagnosis is huge (see next page)
- Injury is self-limited and treatments are either:
  - a) costly, b) painful, c) potentially toxic
  - No trials proving benefit
  - Dapsone, - Glucocorticoids, - hyperbaric oxygen
  - Electric shock (stun guns), excision and grafting

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C. Black Widow Spider Envenomation

- Throughout US, except Alaska
- Most bites on extremities, by female
- Venom - No local inflammation, it is a neurotoxin
- Clinical course: pinprick
  - 20 min-1 hour: local muscle cramps, mild erythema
  - Next couple of hours: pain (cramping) spreads
  - 4 -72 hours later: general resolution
- Approximate 1% mortality rate
- Treatment: supportive (opioids, benzodiazepines)
  - Ca gluconate: NO
  - Antivenom: YES, in severe cases, (horse serum based)

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3. You receive a call that a patient of yours has sustained a Snake bite to the arm. He is camping in the Adirondacks and is 2 hours away from a hospital.

You should instruct him to:

- **A. Apply a tourniquet to the arm**
- **B. Attempt to suck out the venom**
- **C. Use a pocket knife to cut into the wound and apply suction**
- **D. Elevate the arm and drive to nearest facility**
Snake Bites

- 19 of 115 snake species in US are venomous
- 45,000 bites per yr, 8000 are venomous
- Approximately 3-10 deaths/yr
- Pit vipers and Coral snakes
- Venom==> local and systemic effects (tissue necrosis, vascular permeability)

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   C. Use a pocket knife to cut into the wound and apply suction
   D. Elevate the arm and drive to nearest facility

   - 31%
   - 6%
   - 4%
   - 60% ✓

Snake Bites

- First Aid: Remember “Suction just sucks”
  - Do not apply tourniquet
  - Do elevate the extremity to decrease edema
- Remove all rings
- Treatment: Antivenom: CroFab

But who gets it?

4. A 27 yo female presents to your office with a complaint of worsening sores on her legs over 3 days, which she believes were from spider bites. You note an area of tender central fluctuance with surrounding erythema and warmth (see photo). No fever/chills.

   - A. Increasing edema
   - B. Signs of DIC
     - Platelet Ct < 100,000
     - Fibrogen level < 100
4. A 27 y/o female presents to your office with a complaint of worsening sores on her legs over 3 days, which she believes were from spider bites. You note an area of tender central fluctuance with surrounding erythema and warmth (see photo). No fever/chills.

The appropriate management is:

A. Incision and drainage, give one dose ceftriaxone (Rocephin) IM and prescribe cephalexin (Keflex) 4x day for 7 days
B. Incision and drainage, prescribe levofloxacin (Levaquin) 750mg daily for 7 days
C. Incision and drainage, prescribe trimethoprim-sulfamethoxazole (Bactrim DS) 1 tab 2x a day x 10 days
D. Admit for IV vancomycin

CA-MRSA

- Background:
  - MRSA emerged in 1960s in patients in health care settings
  - Mid to late 1990s, outbreaks of community-acquired MRSA (CA-MRSA) in close contacts
  - CA-MRSA is genetically different, produces different toxins, and has different antibiotic susceptibility
  - **USA-300**

5. A 24-year-old male presents with a 3 day history of a rash that is continuing to increase in size. The rash is not painful or tender. It is flat, oval, 14 cm x 7 cm in size, has central clearing and has no fluctuance. No associated fever/chills or systemic symptoms. No new medications. No recall of any insect bite. He recently vacationed on Martha’s Vineyard, MA.
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A. Prescribe azithromycin 500mg qd x 5 days
B. Prescribe doxycycline 100mg BID x 14 days
C. Obtain a Lyme titer, if positive treat with ceftriaxone.
D. Obtain a Lyme titer, if positive, confirm with a Western blot study and if positive treat with ceftriaxone.

Lyme Disease
- Due to spirochete: Borrelia burgdorferi
- Transmitted by: Deer tick
  - Ixodes scapularis and Ixodes pacificus


From left to right, an Ixodes scapularis larva, nymph, adult male tick, and adult female tick.

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Illustrative Examples of Culture-Confirmed Erythema Migrans.

Lyme Disease

- **Early Lyme Disease**
  - Erythema migrans: present 50-70% of cases
  - Treatment options:
    - Doxycycline 100mg BID, 10-21 days
    - Amoxicillin 500mg TID, 10-21 days
    - Cefuroxime axetil 500mg BID, 10-21 days
  - Neurologic disease:
    - Cranial neuropathy (7th nerve), radiculopathy, lymphocytic meningitis
    - Cardiac disease: think A-V block

Lyme Disease

- **Late Lyme Disease**
  - Lyme arthritis:
    - Large joints, typically knees
  - Neurologic disease:
    - Encephalopathy
    - Peripheral neuropathy
  - Post-Lyme Disease Syndromes
    - "unexplained chronic subjective symptoms following treatment…"

Other Tick-Borne Illnesses

- **HGA:** Human granulocytic anaplasmosis
  - Previously known as "ehrlichiosis"
  - Due to *Anaplasma phagocytophilum*
  - Within 3 weeks of tick bite…
    - Fever, chills and headache, with
    - Thrombocytopenia, leukopenia, elevated LFT's

Other Tick-Borne Illnesses

- **Babesiosis**
  - Malaria-like illness with intracellular protazoa
  - Hemolytic anemia, thrombocytopenia, elevated LFT's

Other Tick-Borne Illnesses

- **Rocky Mountain Spotted Fever**
  - Organism: *Rickettsia rickettsii*, transmitted by
    - The American dog tick and
    - The Rocky Mountain wood tick.
  - 90% of cases are April - September.
  - >50% of cases involve children < 15 years old
  - Symptoms: 5-10 days after tick bite:
    - Flu-like illness
    - Rash
    - Later…multisystem involvement

Other Tick-Borne Illnesses

- **Tuleremia**
- **Bartonella**
- **Q fever**
- **Relapsing fever**
- **STARI-Masters’ Disease**
- **Colorado Tick Fever**
- **Tick paralysis**
Allergic Reactions

6. A 64-year-old male presents to the ED with diffuse pruritus and erythema along with facial and oral swelling. This occurred 15 minutes after eating peanuts. His blood pressure is 65/35 mm Hg, pulse is 120 bpm.

This patient is experiencing:

A. Urticaria
B. Angioedema
C. Anaphylaxis
D. Anaphylactoid reaction

Allergic Reactions: Types of Reactions

- Urticaria (hives)- IgE mediated
- Angioedema - may be 1) IgE mediated or 2) idiopathic (ACE-induced), not true allergy
  - Swelling of face, neck, and tongue
- Anaphylaxis - may occur within seconds to 1 hour
  - Skin rash, respiratory symptoms, hypotension, GI distress
- Anaphylactoid reactions: Non-IgE mediated release of granules from cells, not true allergy (eg, radiocontrast)
Etiologic Agents

Anaphylactic: IgE-dependent
- Food
- Medication
- Insect venom
- Latex
- Exercise

Anaphylactoid: IgE-independent
- Opioids
- ASA and NSAIDs
- Radiocontrast media

Allergic Reactions
6. A 64-year-old male presents to the ED with diffuse pruritus and erythema along with facial and oral swelling. This occurred 15 minutes after eating peanuts. His blood pressure is 65/35 mm Hg, pulse is 120 bpm.

This patient is experiencing:
- A. Urticaria (5%)
- B. Angioedema (3%)
- C. Anaphylaxis (70%)
- D. Anaphylactoid reaction (19%)

7. The 64-year-old patient with anaphylaxis in the previous case should receive which of the following medications:
- A. Epinephrine
- B. Epinephrine plus diphenhydramine
- C. Epinephrine plus diphenhydramine plus methylprednisolone
- D. Epinephrine plus diphenhydramine plus methylprednisolone plus ranitidine

Allergic Reactions: Treatment
- Vasoconstrictors: Epinephrine
  - Mild-moderate: 0.3-0.5 cc 1:1000 solution, SQ or IM
  - Severe: 1-5 cc of 1:10,000 solution, IV
  - If pt. On B-Blocker - Give Glucagon 1-5 mg IV
- H1 antagonist: diphenhydramine
- H2 antagonist: yes, H2 blocker du jour
- Steroids:
  - Do nothing for acute episode
  - May prevent recurrence

Epinephrine: How to Administer
- Children 0.01 mg/kg
- 0.2 - 0.5 ml SQ/IM 1:1000 (1 mg/mL)
- 1-5 ml IV 1:10,000 (0.1 mg/mL)

****Titrate to effect****
Allergic Reactions: Treatment

**Antihistamines: Don’t forget the H2 blocker**

Methods: 91 ED pts. with acute allergic symptoms, randomized to:

- Diphenhydramine 50mg IV
- Diphenhydramine 50mg IV + ranitidine 50mg IV
- Placebo

Results:

- Urticaria at 2 hrs: 8% 26%
- Need for additional Antihistamines: 4% 23%


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8. 57 y/o female presents to ED/office noting that upon awakening her tongue was very swollen. Denies trauma. No fever/chills.

PMHx: HTN, NIDDM. Meds: lisinopril, metformin

VS: BP=160/80, P=90, RR=24, T=98.

Exam: Massively enlarged tongue (see photo).

The most likely diagnosis is:

- A. ACE-induced angioedema
- B. Type I hypersensitivity reaction
- C. Bee sting to the tongue
- D. Scombroid poisoning

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ACE-Induced Angioedema

- **NOT** an allergic reaction
- Due to accumulation of bradykinin (?)
- Can occur months to years after ACE use
- Treatment: supportive

Can You Give an ARB to a Patient with ACE-induced Angioedema?

- In theory....YES
- Data: Very limited… (on pts. switched to ARB)
  - 3/39 pts. (7.7%) developed AE (CHARM trial)\(^1\)
  - 2/26 pts. (8%) developed AE\(^2\)

\(^1\) Lancet 2003  \(^2\) Arch Intern Med 2004

Bites, Stings and Other Things

C. Bee Sting to the Tongue

- **Complex venom**
  - Enzymes,
  - Proteins,
  - Serotonin
  - Acetylcholine
  - Histamine
- 2 groups:
  - **Vespids**
    - yellow jackets
    - wasps
    - hornets
  - **Apid**
    - honey bees
    - bumble bees

Bee Stings: 4 Potential Reactions

- **Local reaction:** common
- **Toxic reactions:** often > 10 stings at once
  - => N/V/D, lightheaded, syncope, headache
- **Delayed reaction** - 10-14 days later, serum-sickness-like
  - => malaise, headache, polyarthralgias
- **Anaphylaxis** - IgE mediated

Allergic Reactions: **Back to Medical School**

- **Type I (immediate hypersensitivity):** antigen attaches to IgE and IgG4 on mast cells and Basophils
  - => degranulation release mediators (increased vascular permeability, smooth muscle constriction, etc...)
- **Type II** - IgG and IgM Ab’s react to Ag on cell surfaces
  - Eg. blood transfusion rnx, ITP, hemolytic anemias
- **Type III** - (immune complex) Ag-Ab complex triggers complement system
  - => eg, post strep GN, serum sickness
- **Type IV (delayed hypersensitivity):** T Cell-mediated
  - eg, PPD, poison ivy

Scombroid Poisoning: **“Pseudo” Fish Allergy**

- Mimics allergic reaction - facial flushing, diaphoresis, hives, edema, diarrhea, peppery taste
- Occurs minutes to 1-2 hours after eating contaminated fish
- Classically tuna and mackerel (Scombridae family), can occur in others
- Histidine in muscle converted by bacteria to histamine.
- RX: H1 and H2 blockers
- Self-limiting: 4-6 hours
Environmental Injuries:
Cold-related Injuries

• Chilblains (or pernio): is an abnormal vascular response to cold resulting in inflammatory skin condition with pruritus and/or painful erythematous to violaceous acral lesions
• Frostnip: superficial freeze injury characterized by lack of extracellular ice crystal formation => pale, painful tissue
  – Resolves with rewarming; no tissue loss

Rapid rewarming in circulating water, 104-108°F (40-42°C)

Environmental Injuries:
Heat-related Illness

• Heat exhaustion: nonspecific symptoms
  – Dizziness, weakness, malaise, N/V, HA, diaphoresis
  – Temp: normal - 104°F (40°C), normal neuro exam
• Heat stroke: Classic triad
  – Hyperpyrexia
  – Anhidrosis
  – CNS dysfunction

Risk factors:
1) Exogenous heat gain,
2) Increased heat production
3) Decreased heat dispersion
   a. Dehydration
   b. CV disease
   c. Extreme of age
   d. Obesity
   e. Improper clothing
   f. Skin disease
   g. Drugs

Treatment for Heat stroke:
“evaporate cooling”
Note: antipyretics don’t work

Toxicology

9. A 21-year-old college student presents to the ED with friends who report the student swallowed “a whole bottle” of acetaminophen 1.5 hours before arrival. They also note the patient has been drinking alcohol. The patient is awake but appears intoxicated.

At this point, you should:
A. Administer syrup of ipecac
B. Perform a gastric lavage
C. Administer activated charcoal
D. Administer N-acetylcysteine (Mucomyst)

Toxicology Emergencies
Gastric Decontamination

• Syrup of ipecac - No, No, No!!!!!!!
  - AAP says do not keep in home (Pediatrics, Nov 2003)

• Gastric Emptying - 36-40 Fr tube
  - Possibly helpful if used within 60 min
  - Risk for iatrogenic injury (aspiration, esophagus)

• Charcoal (best option)
  - If given < 30 min, decreases absorption by 70%
  - If given 30-60 min, decreases absorption by 30%
  - Dose: 1-2 gm/kg (max 100gm)

Acetaminophen Toxicity

• Max daily dosing: 4 gm per day, toxic dose=150mg/kg
• 2nd most common cause of liver transplantation in US, however, only 4% of those with hepatotoxicity develop liver failure
• 4 clinical phases:
  - Phase 1 (0-24hrs): asymptomatic, nausea/vomiting
  - Phase 2 (18-72hrs): RUQ abd pain, N/V, rising LFT’s
  - Phase 3 (72-96 hrs) Abd pain, N/V, jaundice, encephalopathy, renal failure, death
  - Phase 4 (4-14 days) resolution
• Acetaminophen levels: drawn at 4 hours after ingestion, treatment based on Rumack/Matthew nomogram
• Treatment: N-acetylcysteine (NAC)
Toxicology Emergencies

**Agent**
- Acetaminophen
- Aspirin
- B-blocker
- Ca Channel blocker
- Digitalis
- Heparin
- Isoniazid (INH)
- Opiates
- Organophosphates
- TCA

**Antidote**
- N-Acetylcysteine (Mucomyst)
- Alkaline diuresis
- Glucagon
- Glucagon
- Fab antibodies (Digibind)
- Protamine Sulfate
- Pyridoxine (Vit B6)
- Naloxone (Narcan)
- Atropine
- NaHCO3

Common Toxicodromes

#1. Anticholinergic

**Presentation:**
- Hot as Hades: Hyperthermia
- Blind as a Bat: Mydriasis
- Dry as a Bone: Thirst, decreased salivation
- Red as a Beet: Flushing, vasodilation
- Mad as a Hatter: Delirium, agitation, confusion

**Etiology:** Antihistamines, Antiparkinson, Antipsychotics, Antiemetics (phenothiazines), Antidepressants (TCA), Antispasmodics

Common Toxicodromes: #2. Serotonin Syndrome

**Presentation:**
- Cognitive-behavior: agitation, anxiety, drowsy, delirium, headache, seizures
- Autonomic dysfunction: tachycardia, arrhythmias, hyperthermia, HTN, diaphoresis, diarrhea, nausea
- Neuromuscular: restlessness, tremor, hyperreflexia, dysarthria, ataxia, myoclonic jerks/twitching

**Etiology:**
- Most common: SSRI's, MAO's
- Especially if combined with: meperidine, cocaine, dextromethorphan, venlafaxine, amphetamine

Serotonin Syndrome: Presentation

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Serotonin Syndrome: Differential Dx

Differences Between Serotonin and Anticholinergic Syndromes

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<th>Skin</th>
<th>Muscular Tone</th>
<th>Reflexes</th>
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<tr>
<td>Serotonin Syndrome</td>
<td>Diaphoretic</td>
<td>Increased</td>
<td>Hyperreflexia</td>
</tr>
<tr>
<td>Anticholinergic</td>
<td>Dry</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Neuroleptic</td>
<td>Diaphoretic, pallor</td>
<td>“Lead pipe&quot; rigid</td>
<td>Bradyreflexia</td>
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10. Treatment for the serotonin syndrome is:

A. Dantrolene (Dantrium)
B. Bromocriptine (Parlodel)
C. Venlafaxine (Effexor)
D. Cyproheptadine (Periactin)
10. Treatment for the serotonin syndrome is:

A. Dantrolene (Dantrium) 100%
B. Bromocriptine (Parlodel) 0%
C. Venlafaxine (Effexor) 0%
D. Cyproheptadine (Periactin) 9%

Cyproheptadine, an antihistamine with antiserotonergic properties, has been shown in animal studies and case reports to reduce the symptoms of SS. 4-8 mg PO tid is a typical dosage range.

Final Topic: BLS and ACLS

Take Home Messages:
- (no longer A-B-C, except in children!!!)
- Compressions: "push hard, push fast"
- V fib/V tach - know your algorithm (see next pg.)
  - Defibrillate once (not x3) and return to compressions
  - Amiodarone over lidocaine
- Other ACLS meds:
  - SVT meds: adenosine over Ca++ channel blocker
  - Just say "No" to NaHCO3.

V Fib/Pulseless V Tach

<table>
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<td><strong>Defibrillate x 1</strong></td>
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<td>5 cycles of CPR, if shockable rhythm</td>
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1) Defibrillate again (x1) and
2) Give vasopressors (epi or vasopressin)
5 cycles of CPR, if shockable rhythm

1) Defibrillate again (x1) and
2) Give antiarrhythmic (lidocaine or amiodarone)

Answers

1. A
2. A
3. D
4. C
5. B
6. C
7. D
8. A
9. D
10. D