Allergic Reactions and Anaphylaxis

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Allergy to Anaphylaxis

• Defined as a *histamine-mediated* spectrum of physiologic events that include:
  – Smooth muscle constriction
  – Vasodilatation
  – Edema

PINK → RED → GREY → DEAD
“...it is critical to remember that even apparently mild acute allergic reactions may progress to...severe systemic response, anaphylaxis and death.”

EMS Case Study

You are called to the home of a 68 yo female who just started “a urine pill” for an apparent bladder infection.

She tells you she believes she may be allergic to the medicine.

“I itch like a sunuvabitch”
EMS Case Study

Assessment

HPI: as above
ALL: PCN
MEDS: Bactrim, lisinopril, metoprolol, ASA
PMH: HTN, CAD, OA
FH: CAD
SH: smoker, lives alone
EMS Case Study

Exam

GEN: 68yo female, NAD, standing on lawn
VS: 37.6, 99, 132/78, 24, 97% RA
HEENT: NAD, MMM
PULM: CTAB
CV: Tachy, no M/R/G
DERM: irregular, diffuse rash that blanches
EMS Case Study

• The patient tells you she has taken some Benadryl
• She feels embarrassed, now, that she called
• She states she is sure that she will be OK and does not want transport to the hospital
• “I’m going to sit down right here and wait for you to get the form– I’m feeling a little dizzy”
EMS Case Study

- Thoughts?
- Re-exam:
  - GEN: 68yo female, ill-appearing
  - VS: 130, 101/60, 28, 97% RA
  - CV: Tachycardia
  - PULM: Good air entry. Diffuse wheeze
  - DERM: Rash more pronounced.
Case Study No. 1

• “I don’t feel so well”
• Patient vomits on lawn.
• You notice a change in facial appearance almost before your eyes...

• THOUGHTS?
EMS Case Study

- Interventions?
- Epinephrine 1:1000
  - Oxygen
  - IV
  - Monitor
  - Meds (if available)
    - IV Benadryl
    - Albuterol Neb
    - IVF
    - Solu Medrol
Allergy and Anaphylaxis: Incidence

- In USA - 400 to 800 deaths/year
- Parenterally administered antibiotics account for 100 to 500 deaths per year
  - But still only occurs 1:10,000 exposures (!)
- Hymenoptera stings account for 40 to 100 deaths per year
  - Sawflies, wasps, bees and ants.
Thanks to: The Mast Cell

Coated with IgE (Immunoglobulin E) receptors
Loaded with histamine and other cytokines

“Like little, ticking time bombs…”
HISTAMINE

- Smooth muscle constriction
- Capillary bed dilatation
- Increases vascular permeability
- Promotes inflammation

BRONCHOSPASM

HYPOTENSION

EDEMA
Anaphylaxis: Causes of Deaths

- Respiratory Failure (>70%)
  - Laryngospasm and edema
  - Acute (refractory) bronchospasm
- Circulatory collapse (25%)
- Other <5%
  - ICH
  - DIC
  - AMI
Anaphylaxis

- Antigens enter body by:
  - Injection
  - Ingestion
  - Inhalation
  - Absorption
Allergic Reaction

• Antigen/ activating complex
  – Drugs (antibiotics)
  – Foods (nuts, shellfish)
  – Insect venoms
  – Animal serum
  – Latex
  – Radiographic contrast material/ dye
  – Incompatible blood types
Insect Sting Hypersensitivity

- Hymenoptera (yellow jackets, honeybees, hornets, wasps, bumble bees)
  - 90%: Local hives, pruritus
  - +/- 10%: Massive local reaction, including swelling beyond two joints of extremity
  - 1%: Systemic reaction
  - 10%: have worse reaction on second sting
  - 28%: have recurrent systemic reaction
Vasodilation

- Decreased peripheral vascular resistance
- Hypotension
- Tachycardia
- Peripheral hypoperfusion
Increased Capillary Permeability

• Tissue edema, urticaria (hives), itching

• Laryngeal edema
  – Airway obstruction
  – Respiratory distress
  – Stridor

• Fluid leakage from vascular space
  – Hypovolemic shock
Smooth Muscle Spasm

- Laryngospasm
- Bronchospasm
  - Respiratory distress
  - “Tight Chest”
  - Wheezing
- GI Tract Spasm
  - Nausea, vomiting
  - Cramping, diarrhea
- Bladder Spasm
  - Urinary urgency
  - Urinary incontinence
Allergic Reactions

• Generally classified into 3 groups:
  – Mild allergic reaction
  – Moderate allergic reaction
  – Severe allergic reaction
  – Anaphylaxis/ shock
Mild Allergic Reaction

• Characteristics
  – Urticaria (hives), itchy
  – Erythema (redness)
  – Rhinitis
  – Conjunctivitis
  – Mild bronchoconstriction (faint wheeze)

• No SOB or hypotension/hypoperfusion

• Often self-treated at home
Urticaria (Hives)
Moderate Allergic Reaction

• Characteristics
  – Mild signs/symptoms with any of following:
    • Dyspnea, possibly with wheezes
    • Angioneurotic edema (facial, tongue swelling)

• No hypotension/hypoperfusion
Severe Allergic Reaction (Anaphylaxis)

• Characteristics
  – Mild and/or moderate signs/symptoms plus
  – Shock / hypoperfusion
Clinical Manifestation

• Dependent on:
  – Degree of hypersensitivity
  – Quantity, route, rate of antigen exposure
  – Pattern of mediator release
  – Target organ sensitivity and responsiveness

Typically impossible to definitively determine prehospital
Clinical Manifestation

- Severity varies from mild to fatal
- Most reactions are respiratory, dermatologic
- Less severe early findings may progress to life-threatening over a short time
- Initial signs/symptoms do NOT necessarily correlate with severity, progression, duration of response
- Generally, quicker symptoms = more severe reactions
Clinical Manifestation

• First manifestations involve **skin**
  – Warmth and tingling of the face, mouth, upper chest, palms and/or soles, or site of exposure
  – Erythema
  – Pruritus (itching) is **universal** feature
  – May be accompanied by generalized flushing, urticaria, nonpruritic angioedema
Clinical Manifestation

- May progress to involvement of respiratory system
  - cough
  - chest tightness
  - dyspnea
  - wheezing
  - throat tightness
  - dysphagia
  - hoarseness
Clinical Manifestation

• Other Signs and Symptoms
  – lightheadedness or syncope caused by hypotension or dysrhythmia
  – nasal congestion and sneezing
  – ocular itching and tearing
  – cramping abdominal pain with nausea, vomiting, or diarrhea
  – bowel or bladder incontinence
  – decreased level of consciousness
Assessment

• Physical Exam findings may include
  – urticaria, angioedema, rhinitis, conjunctivitis
  – tachypnea, tachycardia, hypotension
  – laryngeal stridor, hypersalivation, hoarseness, angioedema
Management

• Treatment depends upon severity of reaction and signs/symptoms of its presentation
Management

• Optimal management requires
  – Early diagnosis
  – AGGRESSIVE Pharmaceutical intervention
    • Epinephrine early…and maybe repeat
    • Antihistamines do not treat anaphylaxis and have no life-saving capacity – if an anaphylactic reaction is occurring, give epinephrine immediately
  – Observation
  – Appropriate disposition
Management

1. Prepare for the worst: “O-M-I”
   - Oxygen
   - Monitor
   - IV

2. Meds immediately at hand

3. Airway plan and equipment at hand

4. Early notification of Med Ctrl.
Mild Allergic Reaction

- Epinephrine 1:1000
- Diphenhydramine 25 - 50mg PO/IM/IV
  - IV is preferred
- If stinger present, flick it away with credit card or fingernail
- May consider (if available and indicated):
  - inhaled beta-agonists
  - corticosteroids
  - cimetidine or ranitidine (H2 blocker)
Moderate Allergic Reaction

- Epinephrine 1:1,000
- High flow oxygen
- IV NS
  - Titrated to systolic BP 90 mm Hg
- ECG monitor
- Beta agonists
  - Nebulized albuterol
- Diphenhydramine 25-50 mg IM or IV
- Methylprednisolone 125 mg IV
- Transport
Anaphylaxis

- **Airway and Breathing**
  - High concentration oxygen
  - Ventilations, ETT
  - Consider inhaled beta agonists

- **Circulation**
  - Large bore IV NS X 2
  - Quickly titrate fluids to perfusion with bolus therapy
  - ECG monitor

- **Treat as pre-arrest patient**

Intubate EARLY or prepare to get comfortable with Quick-Trach™
Medications

• Epinephrine 0.5 - 1.0 mg 1:10,000 IV
  – Hypotension unresponsive to fluids and epinephrine ➔ consider dopamine ~10 mcg/kg/min
• Diphenhydramine 50 mg IV
• Methylprednisolone 125 mg IV
• Rapid transport
EMS Case Study

- Repeat exam demonstrates SBP of 82.
- You administer... Epinephrine
- ...and drive like the wind...
- 10min after Epi, patient reports she can breathe better, you notice lessening of rash
EMS Case Study

• Repeat VS show BP 108/78
• Patient continues to improve
• Evaluated in ED, admitted to ICU for observation
• Complete recovery.
Patient is sick

YOU DO THE THING

Patient is healthy