Immunological Emergencies

Pea Ridge Fire Department EMS refresher

Introduction

- Allergic reactions can result in life-threatening anaphylactic reaction.
  - Be prepared to treat acute airway obstruction and cardiovascular collapse.
  - Be able to distinguish between a regular response and an allergic reaction.

Introduction

- Immune response problems include:
  - Hypersensitivity
  - Allergic reactions
  - Anaphylaxis
  - Biphasic allergic reactions
  - Anaphylactoid reactions
  - Collagen vascular diseases
  - Transplant-related disorders

Courtesy of Carol B. Guerrero.

The Normal Immune Response

- Immune system protects body.
  - Cellular immunity: T cells attack and destroy antigens.
  - Humoral immunity: B cell lymphocytes produce antibodies to attack foreign organisms.
- Goal is to intercept foreign organisms as they enter the body.

Immune Response

- Allergen: Substance that produces allergic symptoms
- Antibody: Protein produced by the body in response to an antigen
  - IgE antibody is the primary antibody responsible for allergic reactions.

Immune Response

- Immune system's reaction to foreign substance is localized or systemic.
- Hypersensitivity
  - Inappropriate response to a substance body perceives as harmful
  - Allergic reaction, biphasic reaction, prolonged reaction, anaphylactoid reaction

Routes of Entry for Allergens

- Injection
- Absorption
- Inhalation
- Ingestion

Routes of Entry for Allergens

- No route of entry is determined in up to two-thirds of patients.
- Diseases related to allergies, or atopic diseases, include:
  - Allergic rhinitis
  - Asthma
  - Atopic dermatitis
- If possible, note route and time of exposure.

Physiology of Immune Reactions

- Body initiates a series of responses when a foreign substance enters.
- Primary response:
  - Macrophages confront and engulf invading substances.
  - Substances that cannot be identified are recorded.

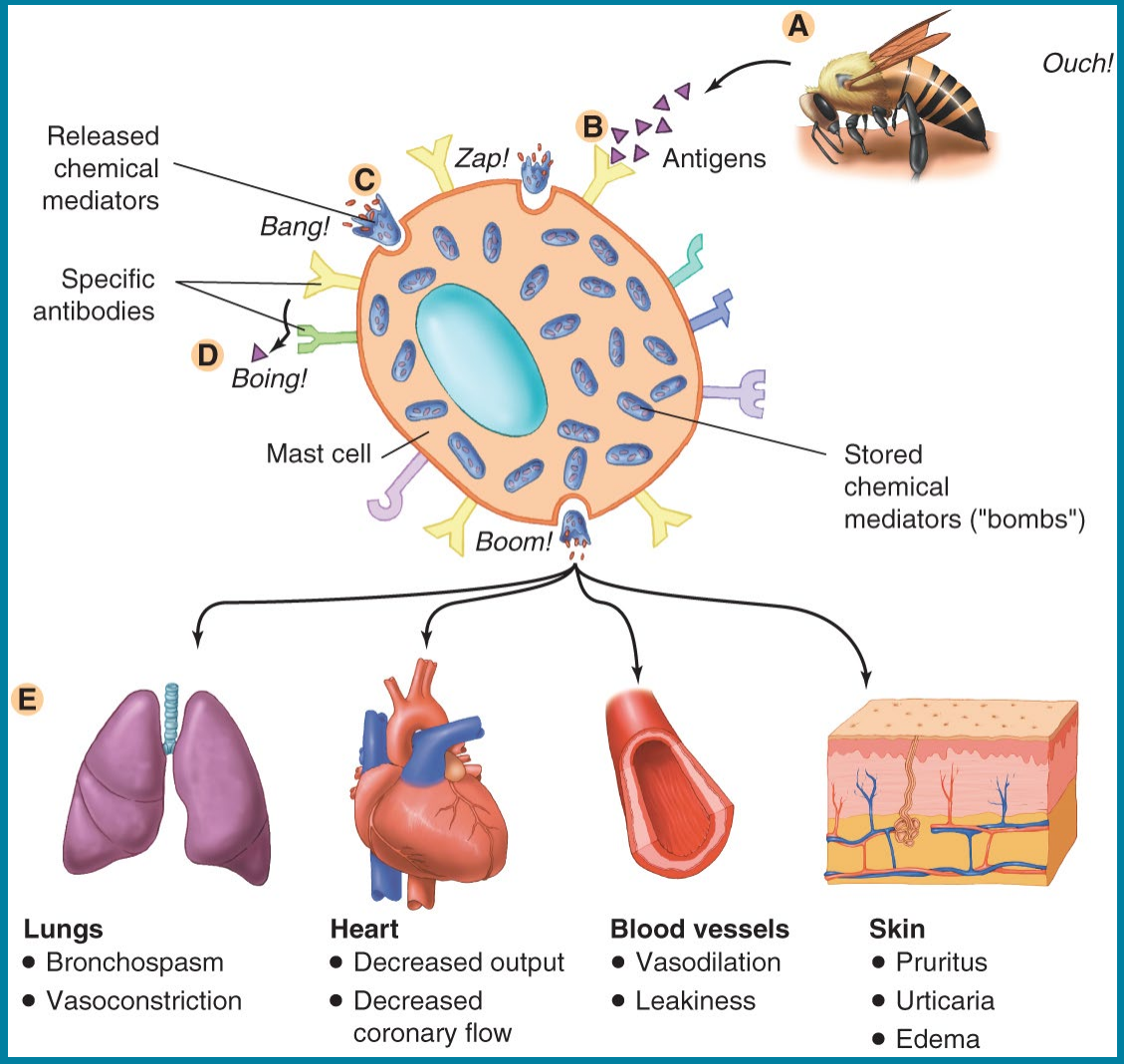
Physiology of Immune Responses

- The body develops sensitivity.
  - Ability to recognize the foreign substance when encountered again
  - Distributes details to the rest of the body by placing the antibodies on:
    - Basophils
    - Mast cells

Physiology of Immune Responses

- Basophils and mast cells produce chemical mediators to fight antigens.
  - Activated when foreign substance enters body
  - Summon white blood cells
  - Increase blood flow

Physiology of Immune Responses



Scene Size-up

- Assess the scene for safety issues.
- Determine the nature of the illness.
  - Check for potential exposure venues.

Primary Assessment

- Allergic symptoms are as varied as allergens.
- Evaluate:
  - Level of consciousness
  - Respiratory system
  - Circulatory system
  - Mental status
  - Skin

Primary Assessment

- Allergic reactions can be local or systemic.
- Categories:
  - Mild: Affecting a local area
  - Moderate: Mild signs spread through the body
  - Severe: Anaphylactic reactions

Primary Assessment

- Form a general impression.
  - Observe for indication of severity.
  - If the patient cannot speak, assess the airway.
  - Level of conscious indicates:
    - Severity of the reaction
    - Oxygen and circulatory status

Primary Assessment

- Breathing and airway
  - A noisy upper airway may be a sign of impending airway occlusion.
    - Check for stridor and hoarseness.
    - The patient may report tightness in the throat.

Primary Assessment

- Breathing and airway (cont'd)
  - Lung sounds are a predictor of severity.
  - As hypoventilation begins, there will be:
    - Diminished lung sounds
    - Silence (ominous finding)

Primary Assessment

- Circulation
  - Evaluate skin for histamine release symptoms, which may include:
    - Erythema
    - Edema
    - Pruritus
    - Urticaria
  - Recognize shock early and initiate immediate treatment.

Primary Assessment

- Transport decision
  - May include:
    - Remaining on the scene
    - Initiating treatment in the vehicle
    - Beginning immediate transport
    - Calling for air transport
  - Determine which facility to transport to.

History Taking

- Should be directed at the current complaint
- Ask about medications.
- Intervention takes precedence over identifying antigen.
  - Determine if treatment was administered

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Secondary Assessment

- Physical examinations
  - Evaluate the respiratory system.
    - Assess breathing.
    - Auscultate the trachea and chest.
    - Stridor and wheezing may be present.
    - Prolonged respiratory difficulty may lead to death.

Secondary Assessment

- Physical examinations (cont'd)
  - Assess the circulatory system.
    - Monitor for signs of hemodynamic compromise.
  - A systemic reaction may present as:
    - Rash
    - Red, hot skin
    - Altered mental status

Secondary Assessment

- Vital signs
  - Assess baseline vital signs.
  - Airway obstruction indicated by rapid, labored breathing.
  - Respiratory distress or shock indicated by rapid respiratory and pulse rates.

Secondary Assessment

- Monitoring devices
  - Cardiac monitor for dysrhythmias
  - 12-lead ECG for cardiac ischemia
  - $ETCO_2$ for bronchoconstriction
  - Pulse oximetry for oxygen saturation levels
- Consider oxygen administration

Reassessment

- Should be done en route
  - Focus on signs of airway compromise.
  - Monitor the patient's anxiety and the skin.
  - Conduct serial vital signs.
  - Reassess the chief complaint.

Reassessment

- Recheck the interventions.
  - What was the effect?
  - Is patient's condition improving?
  - Identify and treat any changes in condition.
- Call in the patient report and include:
  - The patient's status
  - Interventions completed
  - The patient's responses

Emergency Medical Care

- How much distress is patient experiencing?
  - Early epinephrine administration is a priority for anaphylactic reaction.
  - Severe reactions require ventilatory support and/or fluid resuscitation.
  - Milder reactions may require only supportive care.
  - Transport the patient for further evaluation.

Anaphylactic Reactions

- Pathophysiology
  - Immune system becomes hypersensitive.
  - Identifies harmless substances as a threat

Anaphylactic Reactions

- When an invading substance enters the body, mast cells release chemical mediators.
  - White blood cells help engulf and destroy the antigen.
  - In anaphylaxis, the effect involves more than one body system.

Anaphylactic Reactions

- Histamine causes:
  - Vasodilation
  - Vascular permeability
  - Smooth muscle contraction
  - Decreased effects of the heart

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Anaphylactic Reactions

- Leukotrienes compound effects of histamine:
  - Respiratory system becomes more dire.
  - Coronary vasoconstriction
  - Increased vascular permeability

Anaphylactic Reactions

- Clinical symptoms of anaphylaxis
  - Patient experiences three types of shock:
    - Cardiogenic
    - Hypovolemic
    - Neurogenic

Table 25-4 Signs and Symptoms of Anaphylaxis*

System	Signs and Symptoms
Skin	▪ Warm ▪ Flushed ▪ Itching (pruritus) ▪ Swollen, red eyes ▪ Swelling of the face and tongue ▪ Swelling of the hands and feet ▪ Hives (urticaria)
Respiratory	▪ Dyspnea ▪ Tightness in the throat and chest ▪ Stridor ▪ Hoarseness ▪ Lump in throat ▪ Wheezes ▪ Crackles ▪ Coughing ▪ Sneezing
Cardiovascular	▪ Dysrhythmias ▪ Hypotension
Gastrointestinal	▪ Abdominal cramping ▪ Nausea ▪ Bloating ▪ Vomiting ▪ Abdominal distention ▪ Profuse, watery diarrhea
Central nervous	▪ Headache ▪ Dizziness ▪ Confusion ▪ Anxiety and restlessness ▪ Sense of impending doom ▪ Altered mental status ▪ Syncope

*Dyspnea, hypotension, and tachycardia are considered key indicators.

Anaphylactic Reactions

- Assessment
  - Rapidly differentiate between anaphylaxis and other conditions
  - Do not delay treatment for a more complete diagnosis.

Anaphylactic Reactions

- Management
  - Patients with allergic reaction signs but no respiratory distress:
    - Diphenhydramine (Benadryl)
    - Monitor for changes
    - Most will recover with no further problems.

Anaphylactic Reactions

- Management (cont'd)
  - Patients who are not stable, deteriorating, or have history of deterioration:
    - Remove the offending agent.
    - If possible, separate patient from situation.

Anaphylactic Reactions

- Management (cont'd)
  - Maintain airway.
    - Be prepared to assist breathing as needed.
    - Assess for stridor and hoarseness.
    - Administer supplemental oxygen.
    - Early administration of epinephrine should be a priority.

Anaphylactic Reactions

- Management (cont'd)
  - Administer epinephrine.
    - IM in thigh is route of choice.
    - Do not delay administration.
    - Patient may carry EpiPen.

Anaphylactic Reactions

- Management (cont'd)
  - Maintain circulation.
    - Use large-bore IV catheter to give isotonic solution.
    - If IV access is not available, use IO access.
    - Be prepared to repeat doses in hypotensive patient.
    - Consider administering a vasopressor in conjunction with fluid administration.
    - Avoid fluid overload, especially in the cardiac patient.

Anaphylactic Reactions

- Management (cont'd)
  - Initiate pharmacologic therapy.
    - High-flow oxygen, epinephrine, antihistamines, anti-inflammatory and immunosuppressant agents, and vasopressor
    - Administer antihistamine *only*:
      - For mild reaction
      - After epinephrine administration

Anaphylactic Reactions

- Management (cont'd)
  - Emotional support is crucial.
  - Even if reaction is stopped and patient begins to recover, patient should be observed in medical facility.

Autoimmune Disorders and Collagen Vascular Diseases

- In an autoimmune disorder:
  - Immune system inappropriately attacks its own host tissue.
- In collagen vascular diseases:
  - Body perceives its own collagen tissue as a dangerous invader and attacks that tissue.
  - The attack can be chronic, causing long-term inflammation, or even fatal.

Autoimmune Disorders and Collagen Vascular Diseases

Table 25-5 Autoimmune Disorders and Conditions

- Addison disease
- Cardiomyopathy
- Celiac disease (also called *gluten-sensitive enteropathy* or *nontropical sprue*)
- Chronic active hepatitis
- Chronic persistent hepatitis
- Crohn disease
- Demyelinating neuropathies
- Endometriosis
- Glomerulonephritis
- Graves disease
- Guillain-Barré syndrome
- Hemolytic anemia
- Lyme disease
- Meniere disease
- Multiple sclerosis
- Myasthenia gravis
- Myositis
- Narcolepsy
- Neutropenia
- Peripheral neuropathy
- Psoriasis
- Raynaud phenomenon
- Restless legs syndrome
- Rheumatic fever
- Rheumatoid arthritis
- Thrombocytopenic purpura (TTP)
- Ulcerative colitis
- Scleroderma
- Systemic lupus erythematosus
- Type 1 diabetes mellitus
- Vasculitis

Data from: Autoimmune and Autoimmune-related diseases. American Autoimmune Related Diseases Association website. https://www.aarda.org/autoimmune-information/list-of-diseases/. Accessed April 7, 2017.

Autoimmune Disorders and Collagen Vascular Diseases

- Systemic lupus erythematosus (SLE or lupus)
  - Multisystem autoimmune disease that affects entire body
  - Monitor for life threats.
  - Patients may be on immunosuppressive medications.

Autoimmune Disorders and Collagen Vascular Diseases

- Pathophysiology
  - Scleroderma
    - Connective tissue disease that causes fibrotic changes to skin, blood vessels, muscles, and internal organs
    - Damage to the heart muscle is a major complication.

Autoimmune Disorders and Collagen Vascular Diseases

- Assessment
  - Rule out life threats.
  - Avoid attributing complaints to chronic conditions.
- Management
  - Treat any life threats.
  - Monitor for signs of infection.

Organ Transplant Disorders

- Pathophysiology
  - Immune system tries to reject the organ.
  - Patients are given antirejection medications.
  - Address priorities in caring for specific transplanted organs.

Organ Transplant Disorders

- Heart transplant
  - The recipient's heart is usually removed and replaced with donor heart.
  - Atropine is not indicated.
  - Sympathomimetic drugs work well.

Organ Transplant Disorders

- Heart transplant (cont'd)
  - Signs and symptoms of infection may include:
    - Fever
    - Shortness of breath
    - Hypotension pressure
    - Poorly controlled hypertension
    - A new dysrhythmia

Organ Transplant Disorders

- Liver transplant
  - The loss of function causes rapid deterioration.
  - Watch for infection.
  - Observe for jaundice and palpate for tenderness over the site.
  - Monitor for hyperkalemia caused by immunosuppressive drugs.

Organ Transplant Disorders

- Kidney transplant
  - Infection is a major concern.
  - Recipients tend to develop hepatitis C and later liver disease.
  - Your assessment should include:
    - Observation of the site for infection
    - Auscultation for the development of a bruit
    - Evaluation for other signs of infection

Organ Transplant Disorders

- Lung transplant
  - Three types of lung transplants are performed:
    - Bilateral
    - Unilateral
    - Lobar
  - Signs of rejection may include:
    - Cough
    - Dyspnea
    - Rales, rhonchi
    - Decrease in oxygenation

Organ Transplant Disorders

- Pancreas transplant
  - More complications and a lower survival rate at 1 year than other transplants
  - Exocrine component is usually drained into the intestine or bladder
  - Infection and rejection are common problems.

Organ Transplant Disorders

- Assessment
  - Be aware of subtle signs and symptoms.
  - Signs and symptoms vary.
  - Consider calling the transplant center for any questions.
  - Monitor cardiac rhythm for hyperkalemia.

Organ Transplant Disorders

- Management
  - Priorities:
    - Organ transplanted
    - Medications
    - Recognition of infection or rejection
    - Transport to the most appropriate facility

Organ Transplant Disorders

- Management (cont'd)
  - Understand how medications will interact and how they will be metabolized.
  - Monitor for infection or organ rejection.
  - Transport to the transplant facility when possible.
  - Infection is the greatest threat to survival.

Patient Education

- Anaphylaxis
  - Avoid the antigen.
  - Notify all health personnel.
  - Wear identification tags or bracelets.
  - Carry an anaphylaxis kit.
  - Report symptoms early.
  - Explain possibility of biphasic reaction.

Patient Education

- Collagen vascular diseases
  - Encourage self-monitoring.
  - Consult a physician before taking a new medication.
  - Comply with the immunosuppressive regimen.
  - Know who to contact.
  - Know the signs of life-threatening concerns.

Patient Education

- Organ transplants
  - Encourage self-monitoring.
  - Consult a physician before taking a new medication.
  - Comply with the immunosuppressive regimen.
  - Know who to contact.

Thank You

Please continue to the next section