Class 3 Objectives

Upon completion of this lesson, the student will be able to:

• explain the etiological differences of OA, RA, osteoporosis, osteomyelitis and bone fracture.
• recognize common skin lesions, and determine the nurse’s role in the prevention of skin breakdown.
• differentiate between acute and chronic pain, and describe the pathophysiologic consequences of pain gone untreated.
• state the different types of burns and clinical manifestations.
• identify ways that children and elders respond to changes in environmental temperature.
• investigate the biologic basis for sleep, vision, hearing, and taste disorders across the lifespan.

Osteoporosis

• A multifactorial disorder involving < bone mass and > bone fragility as a result of a disequilibrium of osteoblastic and osteoclastic activity.
• Epidemiology: Affects 25 million females in the US.
• Etiology: Low bone density & genetically determined rapid rate of bone loss.
• African Americans have denser bones.
• Hyperparathyroidism: bone resorption is stimulated = high serum calcium levels.
Osteoporosis

- Factors promoting bone loss:
  - Family history, white race, female
  - cigarette smoking; ETOH abuse; lack of exercise
  - > amount of caffeine; > corticosteroids; < estrogen levels; aging
  - Dx: Dual photon absorptiometry and CT scans

- Clinical manifestations:
  - Fracture is the first sign; compression fractures of the spine and “kyphosis” & loss of height
  - Pain and bone deformity

- Prevention: > dietary intake of Ca+ (1 g for young women; 1.5 g PM)
  - vitamin D; wt. bearing exercise; HRT; Fosimax; Calcitonin; Raloxifene

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Minerals

**Calcium**

Food sources of calcium include dairy products, green leafy vegetables and salmon and sardines

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Skeletal muscle pulls against the bone, causing it to rebuild and become denser
Infectious Osteomyelitis

- An acute infection of the bone
  - “hematogenous”: spread of a bloodborne pathogens
    - Spread from bone to adjacent soft tissues
    - Found in infants, children, and elderly
  - “exogenous”: spread via compound fractures, puncture wound, human or animal bites, IM injection sites, and surgical sites
    - Spread from soft tissue to adjacent bone
    - Organisms: Staph aureas; Streptococci, Pseudomonas, H-flu
    - Local “Brodie” abscesses may develop
- Elderly, children; diabetics & SCD are at > risk
- S&S: Adult: fever, fatigue, malaise, wt. loss, pain
  - Child: fever, chills, reluctance to move a limb

Fractures

- A break in the continuity of bone
  - Open: damage to the tissue in addition to the fracture
  - Closed: no penetration of the skin or soft tissues
  - Comminuted: bone fragments are completely separated
- Risk factors:
  - Sport injuries; falls; MVAs; drugs & alcohol; immaturity; osteoporosis; primary or metastatic bone tumors
- Velocity: an > force greater then the bone can withstand
  - Dense bone requires more force (e.g. femur)
  - Weak ("swiss cheese") bone requires less force

Common Fractures

- Pathological: any disease process that weakens bone
  - Low velocity impact: tumors, osteoporosis, infections
- Fatigue: d/t abnormal stress or torque to a bone of normal ability to deform and recover (e.g. joggers, dancers)
- Insufficiency: a stress fracture that occur in bones lacking normal ability to deform and recover (e.g. normal WB)
- Pelvis & Femur: High-energy trauma r/t MVA or sports injuries
- Hip: falls; osteoporosis; elderly
- Tx: reduction (closed vs. open) followed by immobilization
  - traction; surgical intervention with hardware
- Outcome: most fractures heal with appropriate treatment
Bone Fracture Repair

Osteoarthritis (OA)
- Joint damage & inflammation caused by a biochemical alteration of the cartilage in one or a few joints
  - Women > 55, hand, wrist, neck, lower back joints, hip, knee, feet
  - Postmenopausal females at highest risk; or athletes
- Articular cartilage is completely destroyed and underlying bone is exposed leading to stress on the bone
  - Results in bony overgrowth; formation of bone spurs; cysts
- S & S: joint pain, stiffness in the morning, crepitus, & limitation of movement; Heberden’s or Bouchard’s nodules
- Tx: REST; ROM; acetaminophen; isometric exercises

The Effect of Osteoarthritis

Healthy Joint Diseased Joint
Rheumatoid Arthritis (RA)

A chronic systemic autoimmune disorder associated with chronic inflammation of connective tissue.

- Genetic predisposition: HLA subtypes (DR4 & DRB1)
- Epstein Barr virus may be implicated as the antigen
- Synovitis: inflammation of the synovial membrane is present
- Ankylosis: fusion of the joint which causes immobilization

- Fingers, feet, wrists, elbows, ankles, and knees are affected

Rheumatoid Arthritis (RA)

Signs and symptoms:
- First: Fatigue, weakness, poor appetite, low grade fever, anemia and ESR
- Diagnostic criteria established by the American Rheumatism Association
  - Morning stiffness, joint pain or tenderness, swelling of at least two joints, structural changes upon x-ray and subcutaneous nodules
  - Positive rheumatoid factor agglutination test
  - Ulnar deviation, Swan-Neck or Boutonniere deformity

Integumentary Disorders & Burns
**Cellulitis**

- A diffuse inflammation of the dermis & subcutaneous tissue
  - Generally in the extremities, but can occur other places
  - **Cause:** bacterial infection of the skin
  - **Staph aureas** or **Beta-hemolytic strep**
  - **Predisposing factors:**
    - Problems with venous or lymphatic drainage
    - Previous injury to the limb (trauma, break in skin, surgery)
    - Athletes foot, obesity, pregnancy, diabetes, alcoholism
  - Inflammation fails to contain the infecting organism
  - **Manifestations:** redness, swelling, warmth, drainage

**Pressure Ulcers**

- Ischemic ulcers as a result of shearing force and/or pressure
  - **Factors:**
    - Immobilized elders in SNF are @ > risk
    - Incontinence, lying on an O.R. table for long periods
    - > length of hospital stay, spinal cord injuries
  - **Stages:**
    - One = nonblanchable erythema of intact skin
    - Two = partial-thickness skin loss (epidermis and/or dermis)
    - Three = full-thickness skin loss involving damage or necrosis of subcutaneous tissue
    - Four = full-thickness skin loss with extensive destruction, tissue necrosis, damage to muscle, bone, or supporting structures

**Skin Cancer**

- Most common:
  - basal cell & squamous cell: high cure rate
  - malignant melanoma: most lethal skin cancer
- **Risk factors:** UVB light; scarring; ulcerations
  - Squamous cell may metastasize
    - Firm, elevated, granular-appearing tumors that bleed easily
  - Malignant melanoma: malignant neoplasm from melanocytes
    - "ABCD" criteria
Skin Cancer Treatment

- Basal Cell: simple excision
- Squamous Cell: excision & possibly radiation therapy
- Malignant Melanoma: excision, surgical removal of surrounding tissue, & lymph node biopsy.
  - Radiation, chemotherapy, or immune therapy may be used.

Karposi Sarcoma

- HHV-8 is the viral infection underlying the development of Karposi Sarcoma (KS)
  - Pathogenesis is complex and involves the process of infection with HHV-8 and the production of inflammatory cytokines, as well as the process of angiogenesis
  - The use of antiangiogenesis compounds may prevent Karposi Sarcoma
  - Interferon may work by inhibiting angiogenesis

Burns

- An injury to the skin & possibly to deeper tissues d/t direct contact with heat, chemicals, electricity, radiation
  - 1.25 million people/year in the US
  - At risk: elderly; handicapped; children; occupational hazard
- Thermal: exposed skin or mucous membranes to direct flame, hot liquids, or radiant energy
- Chemical: skin or mucous membranes have direct contact with chemical spills or inhalation of toxic gases
- Electrical: passage of electrical current through the body to the ground
  - lightning; high-voltage sources; electrical devices
**Burns**

**Local & Systemic Responses:**
- minor burns heal with inflammatory response
- larger wounds heal with scar tissue formation
- loss of normal skin function; stress response; release of > cytokines; dysrhythmias (v-fib); damage to the alveolar -capillary membrane d/t inhalation of toxins; all body systems are affected

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**Burn Classification**

<table>
<thead>
<tr>
<th>First</th>
<th>Second: Superficial Partial thickness</th>
<th>Third: Full thickness</th>
<th>Fourth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidermal cells only</td>
<td>Epidermis &amp; partial dermis</td>
<td>Epidermis, dermis, &amp; subcutaneous layer</td>
<td>Muscle, bone, and internal tissues</td>
</tr>
<tr>
<td>Erythema</td>
<td>Extreme pain &amp; blisters immed.</td>
<td>Sensory neurons are destroyed</td>
<td>No pain generally</td>
</tr>
<tr>
<td>Sunburn</td>
<td>Barrier function is lost in both types of second degree burns</td>
<td>White</td>
<td>Looks like a 3rd degree</td>
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</tbody>
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**Burns**

**Fluid Imbalances:** during post-burn period the capillaries reach their maximal dilation and permeability d/t release of histamine, prostaglandins, and kinins

- Intravascular fluid shifts into interstitial space
  - fluids are loss through evaporation 10 times normal rate

**Hypovolemic shock** (“burn shock”) results
- manifests as < cardiac output, hypotension, tachycardia, oliguria, massive edema ( watch out for airway !)
- treat with large doses of isotonic fluid (Ringer’s Lactate)
Burns

- **Prevention:** Smoke detectors in homes & public buildings; educate the elderly and children
- **Treatment:** fluid resuscitation is immediate priority in major burns; titrate fluids according to cardiac output & urine output once the capillaries have sealed off
- Renal function may need support of dialysis
- Burn wound will require cleaning & debridement
- **“Rule of Nines:”** assessment tool to assist with estimation of total burn surface area.

References