Orthopedics

The medical specialty that studies the anatomy and physiology of the skeletal and muscular systems and uses laboratory and diagnostic tests, medical and surgical procedures, and drugs to treat skeletal and muscular diseases.
Figure 8-1  The skeletal system.
The Skeletal System

- Bony framework on which the body is built
- Composed of 206 bones, as well as cartilage and ligaments
- Provides structural support for the body, works with the muscles to maintain body posture and produce movement, and protects the body's organs
- Also known as the skeletomuscular system and the musculoskeletal system
Anatomy of the Skeletal System

- **Axial Skeleton**
  - Consists of the bones of the head, chest, and back

- **Appendicular Skeleton**
  - Consists of the bones of the shoulders, arms, hips, and legs

- **Bones of the Head**
  - Cranium
  - Facial bones
Figure 8-2  Lateral view of the bones of the skull.
Figure 8-3  Frontal view of the bones of the skull.

12 bones in the face
Figure 8-4  Fontanel.
Anatomy of the Skeletal System

Other bones of the head are found in the ear and are called ossicles or the ossicular chain because they are arranged in a row:

- Malleus
- Incus
- Stapes
Figure 8-5  Bones of the chest and shoulder.

12 pairs of ribs- 7 true & 5 false
Anatomy of the Skeletal System

- The vertebral column is divided into five regions:
  - Cervical vertebrae
  - Thoracic vertebrae
  - Lumbar vertebrae
  - Sacrum
  - Coccyx (tail bone)
Figure 8-6  Bones of the vertebral column.
Figure 8-8  Lumbar vertebra.

Spinous process
Transverse process
Foramen
Vertebral body
Figure 8-9  Bones of the shoulder.

Clavicle
Acromion
Glenoid fossa
Humerus
Scapula
Figure 8-10  Bones of the upper extremity.
Figure 8-11  Bones of the hip.
Figure 8-12  Bones of the lower extremity.
Figure 8-13  Bones of the ankle and foot.

The great toe is known as the hallux.
Anatomy of the Skeletal System

- A joint, or articulation, is where two bones come together; there are three types of joints.
  - A suture joint between two cranial bones is immovable and contains no cartilage.
  - A symphysis joint, such as the pubic symphysis or the joints between the vertebrae, is a slightly movable joint and contains a fibrocartilage pad or disk.
  - A synovial joint is a fully moveable joint.
Figure 8-14  Suture joint.
Joints, Cartilage, and Ligaments

- **Two kinds of synovial joints:**
  - Hinge joints (elbow and knee).
  - Ball-and-socket joints (shoulder and hip).

- A synovial joint joins two bones whose ends are covered with articular cartilage.
Anatomy of the Skeletal System

- Joints, Cartilage, and Ligaments
  - Ligaments hold the two bones together in a synovial joint.
  - The entire joint is encased in a joint capsule, with the synovial membrane producing synovial fluid that lubricates the joint.
Figure 8-15  Synovial joint.
The Structure of Bone

- Bone or osseous tissue is a type of connective tissue.

- A long bone such as the humerus or femur has a straight shaft or diaphysis and two widened ends, the proximal epiphysis and the distal epiphysis.

- Bone growth takes place at the epiphyseal plates.
The Structure of Bone

- Along the diaphysis is a layer of dense compact cortical bone for weight bearing.

- Inside this is the medullary cavity, which is filled with yellow bone marrow that contains fatty tissue.

- In each epiphysis is cancellous bone, or spongy bone.
Figure 8-16  Structure of a bone.
Physiology of Bone Growth

- Osteocytes maintain and monitor the mineral content (calcium, phosphorus) of the bone.

- Almost all of the body’s calcium is stored in the bones, but calcium is needed to help the heart and skeletal muscles contract.

- Calcium comes from foods but is also released into the blood as osteoclasts break down old or damaged bone.
Diseases

- **Diseases of the Bones and Cartilage**
  - *Bone tumor*  
    - a benign tumor of the bone
    - *Osteosarcoma*-cancerous tumor of the bone
  - *Chondroma*  
    - Benign tumor of the cartilage
  - *Fracture*  
    - A broken bone due to an accident, injury, or disease
Figure 8-18  Bone fracture.
<table>
<thead>
<tr>
<th>Fracture Name</th>
<th>Description</th>
<th>Illustration</th>
<th>Pronunciation/Word Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>closed fracture</td>
<td>Broken bone does not break through the overlying skin</td>
<td><img src="image" alt="Illustration" /></td>
<td>nondisplaced (non-dis-PLAYSD) The prefix non- means not. The prefix dis- means away from.</td>
</tr>
<tr>
<td>open fracture</td>
<td>Broken bone breaks through the overlying skin. It is also known as a compound fracture.</td>
<td><img src="image" alt="Illustration" /></td>
<td>displaced (dis-PLAYSD)</td>
</tr>
<tr>
<td>nondisplaced fracture</td>
<td>Broken bone remains in its normal anatomical alignment</td>
<td><img src="image" alt="Illustration" /></td>
<td></td>
</tr>
<tr>
<td>displaced fracture</td>
<td>Broken bone is pulled out of its normal anatomical alignment</td>
<td><img src="image" alt="Illustration" /></td>
<td></td>
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<tr>
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<tr>
<td>Colles’ fracture</td>
<td>Distal radius is broken by falling onto an outstretched hand</td>
<td><img src="image" alt="Colles' fracture illustration" /></td>
<td>Colles’ fracture (KOH-leez)</td>
</tr>
<tr>
<td>comminuted fracture</td>
<td>Bone is crushed into several small pieces</td>
<td><img src="image" alt="Comminuted fracture illustration" /></td>
<td>comminuted (COM-ih-nyoo-ted) comminut/o- break into small pieces -ed pertaining to</td>
</tr>
<tr>
<td>compression fracture</td>
<td>Vertebrae are compressed together when a person falls onto the buttocks or when a vertebra collapses in on itself because of disease</td>
<td><img src="image" alt="Compression fracture illustration" /></td>
<td>compression (com-PREH-shun) compress/o- press together -ion action; condition</td>
</tr>
</tbody>
</table>
Fig. 15-14. Types of fractures.
<table>
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</thead>
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<tr>
<td><strong>depressed fracture</strong></td>
<td>Cranium is fractured inward toward the brain</td>
<td></td>
<td>depressed (dee-PRESD)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>depress/o- press down</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-ed pertaining to</td>
</tr>
<tr>
<td><strong>greenstick fracture</strong></td>
<td>Bone is broken on only one side. This occurs in children because part of the bone is still flexible cartilage.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fracture Name</td>
<td>Description</td>
<td>Illustration</td>
<td>Pronunciation/Word Parts</td>
</tr>
<tr>
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</tr>
<tr>
<td>hairline fracture</td>
<td>Very thin fracture line with the bone pieces still together. It is difficult to detect except on an x-ray.</td>
<td><img src="image1.png" alt="Hairline fracture" /></td>
<td>oblique (oh-BLEEK)</td>
</tr>
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<td>oblique fracture</td>
<td>Bone is broken on an oblique angle (see Figure 8-18)</td>
<td><img src="image2.png" alt="Oblique fracture" /></td>
<td></td>
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</tbody>
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Diseases

- **Diseases of the Bones and Cartilage**
  - **Osteomalacia**
    - abnormal softening of the bone due to deficiency of vitamin D.
  - **Osteomyelitis**
    - inflammation of the bone and bone marrow
  - **Osteoporosis**
    - thinning of the bone structure
Figure 8-19  Normal bone versus bone with osteoporosis.
Diseases

■ Diseases of the Vertebrae
  - **Kyphosis**- humpback
    ■ Posterior curvature of the thoracic spine
  - **Lordosis**- swayback
    ■ Anterior curvature of the lumbar spine
  - **Scoliosis**
    ■ s-shaped curve of the spine
Figure 8-20  Scoliosis.
Diseases

Diseases of the Joints and Ligaments

- **Arthralgia** - pain in the joint

- **Gout** - caused by high levels of uric acid in the blood. The uric acid moves from the blood to the soft tissue and forms crystals. In the joints this is called Gouty Arthritis
Diseases

Diseases of the Joints and Ligaments

- **Osteoarthritis**- chronic inflammatory disease of the joints. AKA degenerative joint disease

- **Rheumatoid arthritis**- Acute and Chronic inflammatory disease of connective tissue, mostly joints. Antibodies attack cartilage and connective tissue

- **Sprain**- Overstretching or tearing of a ligament around a joint
Figure 8-22  Osteoarthritis.
Figure 8-23  Rheumatoid arthritis.
Figure 8-25  Bilateral clubfeet.
Laboratory and Diagnostic Procedures

- Laboratory Tests
  - Rheumatoid factor (RF)
  - Uric acid

- Radiology and Nuclear Medicine Procedures
  - Arthrography
  - Bone density tests
  - X-ray
Medical and Surgical Procedures

- **Amputation**- Procedure to remove all or part of an extremity

- **Arthrocentesis**- surgical puncture to remove fluid from a joint

- **Arthroscopy**- process of using an instrument to examine a joint

- **Arthroplasty**- surgical repair of a joint
Figure 8-31  Arthroscopic surgery.
Medical and Surgical Procedures

- **Bone graft** - procedure that uses whole bone to repair fractures with extensive bone loss

- **External fixation** - uses pins that are inserted into the bone and then connected to a metal frame

- **Open reduction and internal fixation (ORIF)** - Procedure to treat a complicated fracture. An internal fixation procedure is done to hold fracture in correct alignment
Figure 8-32  Hip prostheses.
Figure 8-33  Orthopedic plate and screws.