CHAPTER 8: JOINTS OF THE SKELETAL SYSTEM

OBJECTIVES:

1. Define the term *articulation*.

2. Distinguish between the functional and structural classification of joints, and relate the terms that are essentially synonymous.

3. Compare and contrast the terms synarthroses, amphiarthroses and diarthroses and give examples of each.

4. Name the three types of fibrous joints and give an example of each.

5. Identify the difference between the epiphyseal plate and an intervertebral disc.

6. Sketch a typical synovial joint labelling all structures. Then in text form, discuss the function of each of the labelled structures.

7. Name the components and functions of synovial fluid.

8. Define the terms fatty pads, articular discs, and bursae, and name a key location for each.

9. List and discuss three factors that influence the sility of a synovial joint.

10. Distinguish between the origin and insertion of a muscle.

11. Name the three general types of movements allowed by joints.

12. List the angular movements allowed by synovial joints and give examples of each.

13. Identify the special movements allowed by the joints of the radius and ulna, foot, and shoulders.

14. Name the six types of synovial joints and give an example of each.

15. Explain how an intervertebral disc can be all of the following: an amphiarthrosis, cartilaginous joint, symphyses, gliding joint, and plane joint.
CHAPTER 8: JOINTS OF THE SKELETAL SYSTEM

OBJECTIVES (continued)

16. Name all of the joint classifications that the sutures in the skull, elbows, and hip joints may satisfy.

17. Construct a le comparing the structural and functional classifications of joints, and draw arrows to show the relationships between the two.

18. Discuss some important joint disorders.
CHAPTER 8: JOINTS OF THE SKELETAL SYSTEM

Definition: Joint (articulation) = site where two bones come together.

I. Functional Classification of Joints:

A. Based on the amount of movement allowed.

B. 3 types:

1. Synarthroses = immovable joints.
   a. Example = sutures of skull.

2. Amphiarthroses = slightly movable joints.
   a. Example = intervertebral discs between vertebrae.

3. Diarthroses = freely movable joints.
   a. Examples = joints of appendicular skeleton.

II. Structural Classification of Joints:

A. Based on material which joins bones (between bones).

B. 3 types:

1. Fibrous Joints = joints composed of fibrous tissue; no joint cavity is present;
   3 types:
   
   a. Sutures = short fibrous CT fibers;
      See Fig 8.2 and Fig 8.3, page 258.

      m synarthroses.

   b. Syndesmoses = cord of fibrous tissue called a ligament;

      m synarthroses with "give" but no true movement;
      m Example = tibiofibular joint.
      See Fig 8.1, page 257.

   c. Gomphoses = tooth within its bony socket;

      m short periodontal ligament.
      m See Fig 8.4, page 259.
CHAPTER 8: JOINTS

II. Structural Classification of Joints (continued)

B. Types (continued)

2. **Cartilaginous Joints** = joints composed of cartilage; no joint cavity;
   2 types:

   a. **Synchondroses** = a plate of hyaline cartilage;
      
      m sites of bone growth during youth;
      m eventually ossify = synarthrotic;
      m Example = joint between the first rib and manubrium (fig 8.5, page 259) and the epiphyseal plate.

   b. **Symphyses** = pad or plate of fibrocartilage;
      
      m compressible "shock absorber";
      m limited movement = amphiarthroses;
      m Examples = intervertebral discs and symphysis pubis.
      m See Fig 8.6, page 260.

3. **Synovial Joints** = fluid-filled joint cavity; free movement = diarthrosis;
   a. **General Structure** = 5 distinct features:
      See Fig 8.7, page 260.
      
      m **Articular cartilage** = hyaline cartilage covers the surface of each bone;
      
      m **Joint cavity** = a potential space between the two bones, filled with synovial fluid;
      
      m **Articular capsule** = double layered capsule surrounding cavity:
      1. External, tough flexible **fibrous capsule** (continuous with periostea of the bones);
      2. **Synovial membrane** = loose CT lining of fibrous capsule, that also covers all internal joint surfaces excluding hyaline cartilage;
CHAPTER 8: JOINTS

II. B. Types of Joints (continued)

3. Synovial Joint Structure (continued)

   d. Synovial fluid = viscous lubricating fluid within cavity.

      m reduces friction between cartilages of 2 bones;
      o provides "weeping lubrication";
      o nourishes cartilage;
      o contains phagocytes.

   e. Reinforcing ligaments = ligaments that strengthen joint.

      m Definition: A ligament joins a bone to another bone across a
      synovial joint.

      o usually thickened portions of fibrous capsule (intrinsic or
      capsular);

4. Other joint features: See Fig 8.8, page 261.

   a. fatty pads (hip & knee);

   b. articular discs or menisci that separate cavity into 2 compartments
      (knee, jaw, sternoclavicular).

   c. bursae = flattened fibrous sacs with a synovial membrane and fluid
      that act as "ball bearings" to prevent friction on adjacent structures
      during joint activity;

      m cushion the movement of one body part over another;
      m located between skin and bone (where skin rubs over bone),
      and between muscle, tendons, and ligaments and bone.
CHAPTER 8: JOINTS

III. Movements Allowed by Joints:

A. Definitions:

1. **Origin** = part of muscle attached to the immovable bone;

2. **Insertion** = part of a muscle attached to the movable bone;

   * When a muscle contracts across a joint, its insertion is pulled toward its origin.

B. Three general types of movement:

1. **Gliding movements** = when flat bone surfaces glide or slide over one another.
   
a. occur at cartilaginous joints;
   b. Examples = intervertebral and sternoclavicular joints.

2. **Angular movements** = changes in angles between bones; occur only at synovial joints, except rotation.
   
a. **Flexion** = decreasing the angle between 2 bones.
      
      Example = head toward chest.

      1. **Dorsiflexion** = bringing foot closer to shin.

      2. **Plantar flexion** = pointing one’s toe (flexion toward the sole).

   b. **Extension** = increasing the angle between 2 bones.

      Example = straightening a flexed neck.

      1. **Hyperextension** = increasing the angle greater than 180°;

See Figure 8.10, page 265.
CHAPTER 8: JOINTS

III. Movements Allowed by Joints:

C. Three Types of Movements (continued)

2. Angular Movements of Synovial Joints (continued)

   c. Abduction = moving a limb away from the midline.
      m Example = raising arm or thigh laterally;

   d. Adduction = moving a limb toward the midline.

   e. Circumduction = moving a limb in a circular (cone-shaped) manner.
      See Fig 8.10, page 265 to see the above examples.

   f. Rotation = turning movement of a bone along its long axis.
      m Example = atlas over axis (i.e. "just say no").
      m Example = shoulder and hip joint.

3. Special Movements = those at specific joints

   See Fig 8.12, page 266.

   a. supination/pronation = movements of radius and ulna;
      m thumb up = supination;
      o thumb down = pronation;

   b. inversion/eversion = movement of foot;
      m sole inward = inversion;
      m sole out = eversion;

   c. elevation/depression:
      o shoulder shrug = elevation;
      m mandible in chewing = depression.
CHAPTER 8: JOINTS

IV. Classification of Joints by Specific Movements:
See Figure 8.9, page 263.

A. Plane joints = gliding cartilaginous joints;
   Example = intervertebral discs.

B. Hinge joints = permit flexion & extension only; synovial
   Examples = elbow and knee.

C. Pivot joints = permit rotation;
   Example = first intervertebral disc.

D. Condyloid joints = permit all angular motion, except rotation.
   Examples = wrists and knuckles,

E. Saddle joints = thumb;

F. Ball-and-socket joints = most freely movable joints; all angular movement;
   1. The head of one bone fits into the socket of another;
   2. Examples = hip and shoulder.
### CHAPTER 8: JOINTS OF THE SKELETAL SYSTEM

V. Comparison of Functional/Structural Classification:

<table>
<thead>
<tr>
<th>STRUCTURAL CLASSIFICATION</th>
<th>FUNCTIONAL CLASSIFICATION</th>
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<tbody>
<tr>
<td>Fibrous:</td>
<td></td>
</tr>
<tr>
<td>Sutures</td>
<td>Synarthroses</td>
</tr>
<tr>
<td>Gomphoses</td>
<td></td>
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<tr>
<td>Syndesmoses (TFJ)</td>
<td></td>
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<tr>
<td>Cartilaginous:</td>
<td></td>
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<tr>
<td>Synchondroses (Epiphyseal plate)</td>
<td>Amphiarthroses</td>
</tr>
<tr>
<td>Symphyses</td>
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<tr>
<td>Synovial</td>
<td>Diarthroses</td>
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</table>
CHAPTER 8: JOINTS OF THE SKELETAL SYSTEM

VI. JOINT SUMMARY TABLE: (Keyed on page 160 of this outline)

<table>
<thead>
<tr>
<th>NAME OF JOINT</th>
<th>STRUCTURAL CLASSIFICATION OF JOINT</th>
<th>FUNCTIONAL CLASSIFICATION OF JOINT</th>
<th>BONES INVOLVED IN ARTICULATION</th>
<th>SPECIFIC MOVEMENTS ALLOWED BY JOINT</th>
<th>CLASSIFICATION OF JOINT BASED ON MOVEMENTS ALLOWED</th>
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### CHAPTER 8: JOINTS OF THE SKELETAL SYSTEM

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</table>
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VII  Homeostatic Imbalances of Joints

A. Gout (intro on page 257)
B. Benign joint hypermobility syndrome (page 259)
C. Dislocation (page 269)
D. Joint Replacement (See CA 8.1 on page 273)
E. Joint Disorders (See CA 8.2 on pages 276-277)
F. Table 8A: Different Types of Arthritis (pages 276-277).
### SAMPLE OF JOINT SUMMARY TABLES (outline pages 156-158)

<table>
<thead>
<tr>
<th>Name of Joint</th>
<th>Hip</th>
<th>Suture</th>
<th>Symphysis Pubis</th>
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<tbody>
<tr>
<td><strong>Structural Classification of Joint</strong></td>
<td>Synovial</td>
<td>Fibrous</td>
<td>Cartilaginous (Symphysis of Fibrocartilage)</td>
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<tr>
<td><strong>Functional Classification of Joint</strong></td>
<td>Diarthrotic</td>
<td>Synarthrotic</td>
<td>Amphiarthrotic</td>
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<tr>
<td><strong>Bones Involved in Articulation</strong></td>
<td>Head of Femur With Acetabulum of Coxal</td>
<td>Skull Bones</td>
<td>Pubis Portions of Coxal Bones</td>
</tr>
<tr>
<td><strong>Specific Movements Allowed by Joint</strong></td>
<td>Flexion, Extension, Abduction, Adduction, Circumduction, Rotation</td>
<td>None</td>
<td>Gliding</td>
</tr>
<tr>
<td><strong>Classification of Joint Based on Movements Allowed</strong></td>
<td>Ball -n Socket</td>
<td>N/A</td>
<td>Plane</td>
</tr>
</tbody>
</table>