

### Joints

- Sites where bones and cartilage form a connection.
- Known as an **articulation** or **arthrosis**

#### Classification of joints

**Structural** - based on the structure connects the articulating surfaces of bones.

**Functional** - based on the amount of movement between articulating bones

#### Structural Classification

##### Fibrous

- joined by fibrous connective tissue.
- Functionally are *synarthroses* or *amphiarthroses*

##### Cartilaginous

- joined by cartilage (*hyaline cartilage/fibrocartilage*)
- Functionally are *synarthroses* or *amphiarthroses*\*

##### Synovial

- joined within a fluid-filled cavity. (*most common joint*)
- Functionally are *diarthroses*

- Based on the structure of the articulating surfaces

#### Functional Classification

**Synarthrosis** - little to no movement (ex., suture of skull)

**Amphiarthrosis** - slight movement (ex., pubic symphysis, intervertebral discs)

#### Functional Classification (cont)

**Diarthrosis** - significant movement

**Three categories based on axes of motion**

1. **Uniaxial**— movement in one plane (ex., elbow)
2. **Biaxial**— movement in two planes (ex., metacarpophalangeal joints)
3. **Multiaxial**— movement in three or more planes (ex., hip)

- Based on the extent of joint

#### Fibrous Joints

##### Characteristics of Fibrous Joints

- NO joint cavity
- Held together by dense (fibrous) connective tissue

#### Fibrous Joints (cont)

##### Types

###### 1. Sutures

- Joins the bones of the skull
  - synarthroses
  - convoluted shape prevents movement between bones
  - form when skull bones completely ossify during early childhood
- ###### 2. Syndesmoses
- Joins two parallel bones using fibrous connective tissue
  - Amphiarthroses
  - Found between radius and ulna of forearm between tibia and fibula of leg
- ###### 3. Gomphoses

- Anchors teeth to maxilla
- Made of numerous short bands of dense connective tissue called *periodontal ligaments*
- Synarthroses

#### Cartilaginous Joints

##### Characteristics of Cartilaginous Joints

- Bones joined by cartilage or fibrocartilage

#### Cartilaginous Joints (cont)

##### Types

###### • Synchondroses

- Joined by hyaline cartilage
- Found in every long bone to allow increase in skeletal size
- Synarthroses (Ex., epiphyseal plates, costal cartilage)

###### • Symphyses

- Joined by fibrocartilage
- Permits strong attachment while allowing limited movement
- Amphiarthroses (Ex., pubic symphysis, intervertebral symphysis)

#### Synovial Joints

##### Characteristics of Synovial Joints

- Contains a joint cavity (Bones do not directly touch)

##### • Articular capsule

- Forms wall of cavity
- Ligaments to attach bones
- Synovial Membrane** (secretes synovial fluid to lubricate joints and nourish cartilage)
- **Articular cartilage**
- Hyaline cartilage at ends of bones
- Diarthroses



### Synovial Joints (cont)

#### Supporting Structure

##### 1. Ligaments

- Strong bands of fibrous connective tissue
- Strengthen and support joints by anchoring bone together

##### 2. Tendons

- Connective tissue structure that attaches muscle to bone

#### Cushioning Structures

##### • Articular discs and menisci

- Pads of fibrocartilage between bones.
- Provide shock absorption and help smooth movements.

##### • Bursae and tendon sheaths

- Prevent friction between bone and tendons

##### • Fat pads

- Provide cushioning

#### Pivot Joint

- Rounded portion of a bone enclosed in a ring
- Allows rotation around one axis
- Uniaxial joint
- Atlantoaxial Joint

#### Hinge Joint

- Convex end of one bone articulates with the concave end of another
- Allows bending and stretching along one axis
- Uniaxial
- Elbow, knee, ankle, and interphalangeal joints

### Synovial Joints (cont)

#### Condyloid Joint

- Shallow depression at the end of one bone articulates with rounded structure from nearby bone or bones
- Biaxial Joint
- Allows bending and straightening, anterior-posterior movements
- Metacarpophalangeal joints

#### Saddle Joint

- Both articulating surfaces have a saddle shape
- Biaxial joint
- Allows Circulating movement
- First carpometacarpal joint, sternoclavicular joint

#### Plane Joint

- Surfaces of the bones are mostly flat
- Bones slide past each other during motion
- Limited motion, but multiaxial joint
- Intercarpal joints, interatrial joints, acromioclavicular joint

#### Ball-and-socket Joint

- Rounded head of one bone fits into the bowl-shaped
- Great range of motion
- Multiaxial joint
- Hip joint, shoulder joint

### Movement at Synovial Joints

#### Flexion

- reduces the angle of the joint from

#### Extension

- returns joint to resting position

#### Hyperextension

- increases joint angle beyond

#### Lateral Flexion

- bending of neck or body toward

### Movement at Synovial Joints (cont)

#### Abduction

- moves a limb, finger, toe or thumb away from midline of body

#### Adduction

- moves a limb, finger, toe, or thumb toward midline

#### Circumduction

- movement in a circular motion
- Combination of flexion, adduction, extension, and abduction at a joint

#### Rotation

- Twisting movement

##### • Medial rotation

- moves anterior of a limb toward midline

##### • Lateral rotation

- moves anterior of a limb away from midline

#### Supination & Pronation

- movements of the forearm

##### • Supination

- moves palm toward facing posteriorly

##### • Pronation

- Moves palm toward facing anteriorly

#### Dorsiflexion & Plantar Flexion

- Movements of the ankle joint

##### • Dorsiflexion

- moves top of foot towards anterior leg

##### • Plantar flexion

- Lifts heel away from ground or points toes toward ground

### Joint Damage

#### Arthritis

- Inflammation of a joint
- Leads to pain, swelling, stiffness, and reduced mobility of the joint

