

## Chapter 9

### Articulations/Joints

- Joints hold bones together but permit movement
- Point of contact
  - between 2 bones
  - between cartilage and bone
  - between teeth and bones

#### Classification of Joints

- Structural classification based upon:
  - presence of space between bones
  - type of connective tissue holding bones together
    - collagen fibers
    - cartilage
    - joint capsule & accessory ligaments
- Functional classification based upon movement:
  - immovable = synarthrosis
  - slightly movable = amphiarthrosis
  - freely movable = diarthrosis

#### Fibrous Joints

- Lack a synovial cavity
- Bones held closely together by fibrous connective tissue
- Little or no movement (synarthroses or amphiarthroses)
- 3 structural types
  - sutures
  - syndesmoses
  - gomphoses

#### Sutures

- Thin layer of dense fibrous connective tissue unites bones of the skull
- Immovable (synarthrosis)
- If fuse completely in adults is synostosis

#### Syndesmosis

- Fibrous joint
  - bones united by ligament
- Slightly movable (amphiarthrosis)
- Anterior tibiofibular joint and Interosseous membrane

#### Gomphosis

- Ligament holds cone-shaped peg in bony socket
- Immovable (amphiarthrosis)
- Teeth in alveolar processes

## Cartilaginous Joints

- Lacks a synovial cavity
- Allows little or no movement
- Bones tightly connected by fibrocartilage or hyaline cartilage
- 2 types
  - synchondroses
  - symphyses

### Synchondrosis

- Connecting material is hyaline cartilage
- Immovable (synarthrosis)
- Epiphyseal plate or joints between ribs and sternum

### Symphysis

- Fibrocartilage is connecting material
- Slightly movable (amphiarthroses)
- Intervertebral discs and pubic symphysis

## Synovial Joints

- Synovial cavity separates articulating bones
- Freely moveable (diarthroses)
- Articular cartilage
  - reduces friction
  - absorbs shock
- Articular capsule
  - surrounds joint
  - thickenings in fibrous capsule called ligaments
- Synovial membrane
  - inner lining of capsule
  - secretes synovial fluid containing hyaluronic acid (slippery)
  - brings nutrients to articular cartilage

### Example of Synovial Joint

- Joint space is synovial joint cavity
- Articular cartilage covering ends of bones
- Articular capsule

### Other Special Features

- Accessory ligaments
  - extracapsular ligaments
    - outside joint capsule
  - intracapsular ligaments
    - within capsule
- Articular discs or menisci

- attached around edges to capsule
- allow 2 bones of different shape to fit tightly
- increase stability of knee - torn cartilage
- Bursae = saclike structures between structures
  - skin/bone or tendon/bone or ligament/bone

#### Planar Joint

- Bone surfaces are flat or slightly curved
- Side to side movement only
- Rotation prevented by ligaments
- Examples
  - intercarpal or intertarsal joints
  - sternoclavicular joint
  - vertebrocostal joints

#### Hinge Joint

- Convex surface of one bones fits into concave surface of 2nd bone
- Uniaxial like a door hinge
- Examples
  - Knee, elbow, ankle, interphalangeal joints
- Movements produced
  - flexion = decreasing the joint angle
  - extension = increasing the angle
  - hyperextension = opening the joint beyond the anatomical position

#### Flexion, Extension & Hyperextension

#### Pivot Joint

- Rounded surface of bone articulates with ring formed by 2nd bone & ligament
- Monoaxial since it allows only rotation around longitudinal axis
- Examples
  - Proximal radioulnar joint
    - supination
    - pronation
  - Atlanto-axial joint
    - turning head side to side “no”

#### Condyloid or Ellipsoidal Joint

- Oval-shaped projection fits into oval depression
- Biaxial = flex/extend or abduct/adduct is possible
- Examples
  - wrist and metacarpophalangeal joints for digits 2 to 5

### Saddle Joint

- One bone saddled-shaped; other bone fits as a person would sitting in that saddle
- Biaxial
  - Circumduction allows tip of thumb travel in circle
  - Opposition allows tip of thumb to touch tip of other fingers
- Example
  - trapezium of carpus and metacarpal of the thumb

### Ball and Socket Joint

- Ball fitting into a cuplike depression
- Multiaxial
  - flexion/extension
  - abduction/adduction
  - rotation
- Examples
  - shoulder joint
  - hip joint

### Bursae and Tendon Sheaths

- Bursae
  - fluid-filled saclike extensions of the joint capsule
  - reduce friction between moving structures
    - skin rubs over bone
    - tendon rubs over bone
- Tendon sheaths
  - tubelike bursae that wrap around tendons at wrist and ankle where many tendons come together in a confined space

### Summary of Movements at Synovial Joints

- Gliding
    - no change in angle of joint
  - Angular movements
    - increase or decrease in angle between articulating bones
      - flexion, extension, hyperextension
      - adduction, abduction
      - circumduction is a combination of above movements
  - Rotation
    - bone revolves around its own axis
  - Special movements
    - uniquely named movements for jaw, hand and foot
- ### Circumduction
- Movement of a distal end of a body part in a circle
  - Combination of flexion, extension, adduction and abduction
  - Occurs at ball and socket, saddle and condyloid joints

### Rotation

- Bone revolves around its own longitudinal axis
  - medial rotation is turning of anterior surface in towards the midline
  - lateral rotation is turning of anterior surface away from the midline
- At ball & socket and pivot type joints

### Special Movements of Mandible

- Elevation = upward
- Depression = downward
- Protraction = forward
- Retraction = backward

### Special Hand & Foot Movements

- Inversion
- Eversion
- Dorsiflexion
- Plantarflexion
- Pronation
- Supination

### Shoulder Joint

- Head of humerus and glenoid cavity of scapula
- Ball and socket
- All types of movement

### Glenohumeral (Shoulder) Joint

- Articular capsule from glenoid cavity to anatomical neck
- Glenoid labrum deepens socket
- Many nearby bursa (subacromial)

### Elbow Joint

- Hinge joint
  - trochlea notch of ulna and trochlea of humerus
  - flexion and extension of elbow
- Pivot joint
  - head of radius and capitulum of humerus
  - supination and pronation of forearm

### Articular Capsule of the Elbow Joint

- Radial annular ligament hold head of radius in place
- Collateral ligaments maintain integrity of joint

### Hip Joint

- Head of femur and acetabulum of hip bone
- Ball and socket type of joint
- All types of movement possible

### Hip Joint Capsule

- Dense, strong capsule reinforced by ligaments
  - iliofemoral ligament
  - ischiofemoral ligament
  - pubofemoral ligament
- One of strongest structures in the body

### Tibiofemoral Joint

- Between femur, tibia and patella
- Hinge joint between tibia and femur
- Gliding joint between patella and femur
- Flexion, extension, and slight rotation of tibia on femur when knee is flexed

### Tibiofemoral Joint

- Articular capsule
  - mostly ligaments & tendons
- Lateral & medial menisci = articular discs
- Many bursae
- Vulnerable joint
- Knee injuries damage ligaments & tendons since bones do not fit together well

### External Views of Knee Joint

- Patella is part of joint capsule anteriorly
- Rest of articular capsule is extracapsular ligaments
  - Fibular and tibial collateral ligaments

### Intracapsular Structures of Knee

- Medial meniscus
  - C-shaped fibrocartilage
- Lateral meniscus
  - nearly circular
- Posterior cruciate ligament
- Anterior cruciate ligament

### Temporomandibular Joint

- Synovial joint
- Articular disc
- Gliding above disc
- Hinge below disc
- Movements
  - depression
  - elevation
  - protraction
  - retraction

#### Atlanto-occipital joints

- Atlas and occipital condyles
- Condylod Joint
- Flexion
- Extension
- Slight lateral tilting

#### Intervertebral Joints

- Between bodies and intervertebral discs
  - symphysis
- Between vertebral articular processes
  - synovial
- Flexion
- Extension
- Lateral flexion

#### Elbow Joint

- Trochlea of humerus, trochlear notch of ulna & head of radius
- Pivot and hinge types
- Flexion, extension, pronation & supination

#### Radiocarpal Joint

- Articular disc
- Condylod type
- Flexion, extension, abduction & adduction