Chapter 8: Joints

Classification

• Joints are classified by their freedom of movement
  – diarthrosis (freely movable)
  – amphiarthrosis (slightly movable) and
  – synarthrosis (little or no movement)
• Joints are also classified by the connecting material - fibrous, cartilaginous and synovial

Fibrous joints have collagen fibers spanning the space between bones
• Sutures: immovable fibrous joints that bind skull bones together.
  – Include: coronal, sagittal & lambdoid sutures
• Gomphoses: Fibrous attachment of a tooth to its socket
• Syndesmoses: Joint where two bones are bound by a ligament (interosseus membrane) Most movable of fibrous joints. Examples: radius to ulna and tibia to fibula

Cartilaginous joints have 2 bones bound to each other by cartilage
• Synchondroses: Bones are joined by hyaline cartilage Examples: rib attachment to sternum, epiphyseal plates
• Symphyses: Bones joined by fibrocartilage. Examples: pubic symphysis and intervertebral discs. Only slight amount of movement is possible

Synovial joints are separated by a fluid-filled space called a joint (or synovial) cavity and most are freely moving.

General Anatomy of Synovial Joints
• Articular capsule
  – fibrous (dense irregular connective tissue) capsule lined by synovial membrane
  – continuous with periosteum
• Synovial fluid
  – viscous slippery fluid rich in albumin similar to egg white
• Articular cartilage
  – hyaline cartilage covering the joint surfaces
• Meniscus is fibrocartilage pad in jaw, wrist, knee & sternoclavicular joints
  – absorbs shock, guides bone movements & distributes forces
• Tendon attaches muscle to bone
• Ligament attaches bone to bone
• Bursa is saclike extension of joint capsule that extends between nearby structures allowing them to slide
• Tendon sheaths are cylinders of connective tissue wrapped around a tendon and lined with synovial membranes.

Types of synovial joints

Ball-and-Socket
• Smooth hemispherical head fits in a cuplike depression
  – head of humerus into glenoid cavity of scapula
  – head of femur into acetabulum of hip bone

Hinge Joints
• One bone with convex surface that fits into a concave depression on other bone
  – ulna and humerus at elbow joint
  – femur and tibia at knee joint
  – finger and toe joints

Saddle Joints
• Each articular surface is shaped like a saddle, concave in one direction and convex in the other
  – trapeziometacarpal joint at the base of the thumb
  – more movable than a condyloid or hinge joint forms opposable thumb

Pivot Joints
• One bone has a projection that fits into a ring-like ligament of another
• First bone rotates on its long axis relative to the other
  – atlantoaxial joint (dens and atlas)
  – proximal radioulnar joint allows the radius during pronation and supination

Gliding Joints
• Flat articular surfaces in which bones slide over each other
• Limited monoaxial joint
• Considered amphiarthroses

Condyloid (ellipsoid) Joints
• Oval convex surface on one bone fits into a similarly shaped depression on the next
  – radiocarpal joint of the wrist
  – metacarpophalangeal joints at the bases of the fingers
Movements permitted by synovial joints:

1) Flexion, Extension & Hyperextension
   • Flexion decreases the angle of a joint – bending elbow or wrist
   • Extension straightens a joint and returns a part to the anatomical position
   • Hyperextension is extension of a joint beyond 180 degrees

2) Abduction & Adduction
   • Abduction is movement of a part away from the midsagittal line - raising the arm to the side
   • Adduction is movement towards the midsagittal line

3) Elevation and Depression
   • Elevation is a movement that raises a bone vertically – mandibles are elevated during biting & clavicles during a shrug
   • Depression is lowering the mandible or the shoulders

4) Protraction & Retraction
   • Protraction is movement of a bone anteriorly in a horizontal plane – thrusting the jaw forward, shoulders or pelvis forward
   • Retraction is movement of a bone posteriorly

5) Circumduction
   • Movement in which one end of an appendage remains stationary while the other end makes a circular motion
   • Sequence of flexion, abduction, extension & adduction – baseball player winding up for a pitch

6) Lateral and Medial Rotation
   • Movement of a bone turning on its longitudinal axis – rotation of trunk, thigh, head or arm
   • Medial rotation turns the bone inwards
   • Lateral rotation turns the bone outwards

7) Supination & Pronation
   • Occurs in the forearm and foot
• Supination
  – rotation of forearm so that the palm faces forward
• Pronation
  – rotation of forearm so the palm faces to the rear

8) Opposition & Reposition
• Opposition is movement of the thumb to approach or touch fingertips
• Reposition is movement back to the anatomical position

9) Dorsiflexion & Plantar Flexion
• Dorsiflexion is raising of the toes as when you swing the foot forward to take a step (heel strike during goose step)
• Plantarflexion is extension of the foot so that the toes point downward as in standing on tiptoe

10) Inversion & Eversion
• Inversion is a movement in which the soles are turned medially
• Eversion is a turning of the soles to face laterally

Arthritis
• Arthritis is a broad term for pain & inflammation
• Osteoarthritis results from years of joint wear
  – articular cartilage softens and degenerates
  – accompanied by crackling sounds called crepitus
  – bone spurs develop on exposed bone tissue causing pain
• Rheumatoid arthritis is autoimmune attack on joints (autoimmune = self-inflicted injury)
  – antibodies attack synovial membrane, enzymes in synovial fluid degrade the articular cartilage, bones ossify
  – remissions occur, steroids & NSAIDs (aspirin, ibuprofen & naproxen) may control inflammation.
• Arthroplasty is replacement of diseased joint with artificial device called prosthesis