Chapter 9: Joints

Chapter Objectives

JOINT CLASSIFICATION
1. List the three functional classifications of joints.
2. Describe the three structural classifications of joints.
3. Discuss the general features of the fibrous joints and name the three types of fibrous joints.
4. Describe the structure and degree of movement of a suture and their location in the body.
5. Describe the structure and degree of movement of syndesmosis joints in the body and give examples.
6. Describe the structure and degree of movement of gomphosis joints and give examples.
7. Discuss the general features of the cartilaginous joints and name the two types of cartilaginous joints.
8. Describe the structure and degree of movement of synchondrosis joints and give examples.
9. Describe the structure and degree of movement of symphysis joints and give examples.

SYNOVIAL JOINTS
10. Discuss the general features of synovial joints.
11. Describe the structure and function of the articular capsule.
12. Discuss the nature of synovial fluid and its function.
13. Discuss the structure and function of the bursae and tendon sheaths.
14. Describe the structural features for each of the types of synovial joints.
15. Describe all the types of movements at synovial joints and give examples. Know which joints exhibit which movements.

KNEE
16. Describe the knee joint with respect to the bones that enter into their formation, ligaments and other structural components.
17. Describe the causes and results of knee injuries.

ARTHRITIS
18. Describe the causes of arthritis (rheumatoid, osteo-, and gouty).

Chapter Lecture Notes

Joints = Articulations
Articulation = a point of contact between bones, between cartilage and bone, or between teeth and bone

Arthro = joint

Arthritis - inflammation of joints

Arthrology = study of joints

Functional Classification

Functional classification - how much movement is permitted (Table 9.2)

Synarthrosis - immovable joint

Amphiarthrosis - slightly movable

Diarthrosis - freely movable

Structural Classification

Structural Classification - based on kind of connective tissue that binds joints together and/or a space called a joint cavity

Fibrous - no joint cavity; bones held together with fibrous connective tissue (Fig 9.1)

Sutures - held together with thin dense fibrous connective tissue

Unites skull bones

Synarthrotic in adults and Amphiarthrotic in children

Syndesmosis - more fibrous connective tissue than in a suture; fibrous connective tissue forms an interosseous membrane or ligament

distal articulation between tibia and fibula

intersosseus membrane between radius and ulna

intersosseus membrane between tibia and fibula

Amphiarthrotic

Gomphosis - (nail) - specialized syndesmosis joint in which pegs (teeth) fit into sockets (alveoli); periodontal ligament hold teeth in sockets; teeth are in the alveoli of the maxilla and mandible
Synarthrotic

Periodontal disease - accumulation of plaque and bacteria that destroys periodontal ligament; leading cause of tooth loss in US

Cartilaginous - no joint cavity; bones connected with cartilage (Fig 9.2)

Synchondrosis - connecting cartilage is hyaline cartilage

epiphyseal plate - connects diaphysis and epiphysis; synarthrotic
costal cartilage - connects ribs to sternum; amphiarthrotic

Symphysis - fibrocartilage is connecting cartilage

pubic symphysis; amphiarthrotic
intervertebral disc; amphiarthrotic

Synovial - space between articulating bones; freely movable; diarthrotic (Fig 9.3)

Synovial cavity space between articulating bones

Articular Capsule - joint capsule consisting of 2 layers:

Outer layer (Fibrous capsule) - dense irregular connective tissue that is continuous with fibrous layer of periosteum

Inner layer (Synovial membrane) - loose connective tissue with elastic fibers that secretes synovial fluid; lines cavity except over articular cartilage

Ligaments may be outside fibrous capsule (ex. collateral ligaments of knee)

Ligaments may be inside articular capsule but excluded from synovial cavity because ligaments are covered with synovial membrane (ex. cruciate ligaments of knee)

Synovial Fluid (ova = egg) - consistency of egg white

lubricates joint
nourishes articular cartilage
contains phagocytic cells to remove debris from joint
Articular Cartilage - hyaline cartilage that covers ends of bone but does not bind bone together

Bursa - Sacs lined with synovial membrane that reduce friction between body parts:

Bursas are found between skin and bone; tendons and bone; muscle and bone; ligaments and bones (Fig 9.12)

Tendon sheaths - synovial membrane wrapped like hot dog bun

Types of Synovial Joints

Planar – intercarpal and intertarsal, sternoclavicular, acromioclavicular, sternocostal, and vertebrocostal (Fig 9.10)

Hinge – knee, elbow, ankle and interphalangeal

Pivot – atlanto-axial, radioulnar

Condyloid – wrist and metacarpophalangeal (2-5)

Saddle – carpometacarpal in thumb

Ball and Socket – shoulder and hip

Types of Movements at Synovial Joints (Table 9.1)

Gliding – planar (Fig 9.4)

Flexion and Extension (Fig 9.5)

Lateral flexion – intervertebral joints (Fig 9.5)

Hyperextension (Fig 9.5)

Abduction and Adduction (Fig 9.6)

Circumduction (Fig 9.7)

Rotation – lateral and medial (Fig 9.8)

Elevation and Depression (Fig 9.9)

Protraction and Retraction (Fig 9.9)

Inversion and Eversion (Fig 9.9)

Dorsiflexion and Plantar Flexion (Fig 9.9)
Supination and Pronation (Fig 9.9)

Opposition (Fig 9.9)

Knee

Largest and most complex of synovial joints; ligaments strengthen joint (Fig 9.15 & 9.16)

Patellar ligament - continuation of Quadriceps femoris tendon and inserts into tibial tuberosity

Oblique popliteal ligament - connects lateral condyle of femur to the medial margin of the head of tibia

Tibial Collateral (medial collateral) ligament - broad flat ligament that connects medial condyle of femur to medial condyle of tibia

Fibular Collateral (lateral collateral) ligament - rounded ligament on the lateral surface of joint that extends from lateral condyle of the femur to the lateral side of the fibula

Intra-articular ligaments - Ligaments within the joint help prevent displacement of articulating surfaces = cruciate ligaments

Cruciates named according to tibial attachment site

Anterior cruciate ligament - originates anterior to intercondylar eminence of tibia and extends posterior and laterally to medial side of lateral condyle of femur

ACL is stretched or torn in about 70% of all serious knee injuries

Posterior cruciate ligament - originates on the posterior intercondylar area of the tibia and extends anteriorly and medially to the medial surface of the medial condyle of the femur

Medial and lateral menisci (fibrocartilage) - semilunar cartilage - wedge shaped fibrocartilage that attaches to condyles of tibia and serves to deepen condyles of tibia for articulation with condyles of femur

Medial meniscus - C shaped - medial meniscus is anchored to tibial collateral ligament and is less mobile and more frequently ruptured during injuries from twisting of flexed knee

Lateral meniscus - more circular
Most sports injuries involve lateral blow to knee so anterior cruciate, tibial collateral and medial meniscus are injured

Arthritis

Inflammation of joints

Rheumatoid arthritis - inflammation of the synovial membrane and can progress to fusion at joint

- autoimmune disease - strikes small joints and is likely to be bilaterally symmetrical

Osteoarthritis - more common than rheumatoid arthritis and less damaging; usually affects only articular cartilage and not membrane as in rheumatoid arthritis; strikes big joints like knee and hips; "wear and tear" arthritis

Gouty arthritis - Uric acid is a product of purine metabolism of DNA and RNA and is usually excreted in urine; person has accumulation of sodium urate in cartilage at joints