

JOINTS

- *Dr. HANISHA SURISETTY*

Function of Joints

- 1. Serve as functional junctions between bones.
- 2. Bind bones, strokes, and other related tissues together.
- 3. Allow bone growth to occur.
- 4. Permit certain structures to change shapeduring childbirth (i.e. pubic symphysis).
- 5. Enable the body to have movements, leveractions, and body posture.

Classification of Joints on the Basis of Structure and Function

The point at which two or more bones meet is called a joint or articulation. Joints are responsible for movement (e.g., the movement of limbs) and stability (e.g., the stability found in the bones of the skull). There are two ways to classify joints: on the basis of their structure or on the basis of their function.

The structural classification divides joints into fibrous, cartilaginous, and synovial joints depending on the material composing the joint and the presence or absence of a cavity in the joint. The functional classification divides joints into three categories: synarthroses, amphiarthroses, and diarthroses.

- 1. According to the type of tissue at the joint:
- a) **Fibrous joint** -- uses fibrous connective tissue to articulate bones.
- b) **Cartilaginous joint** -- uses hyaline cartilage and/or fibro-

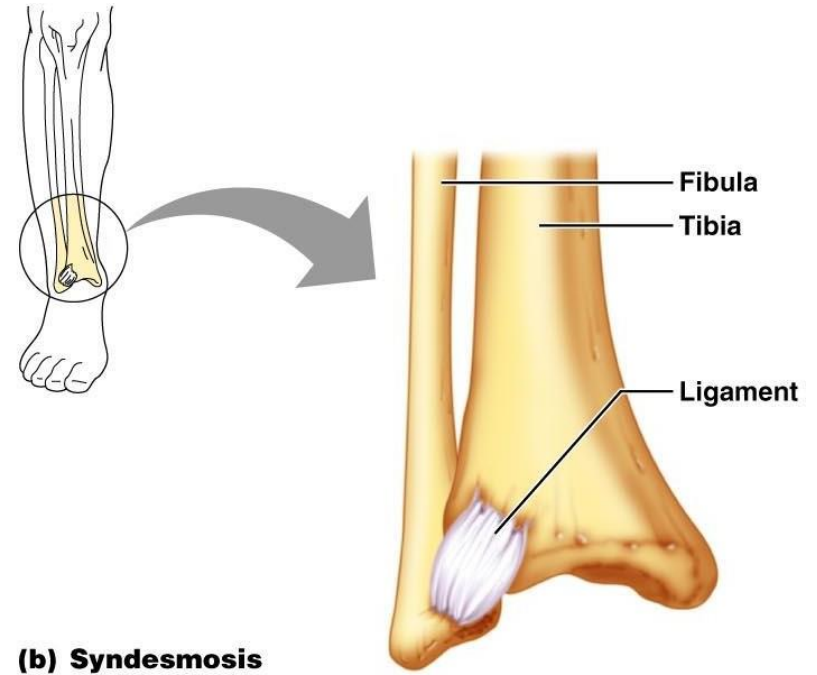
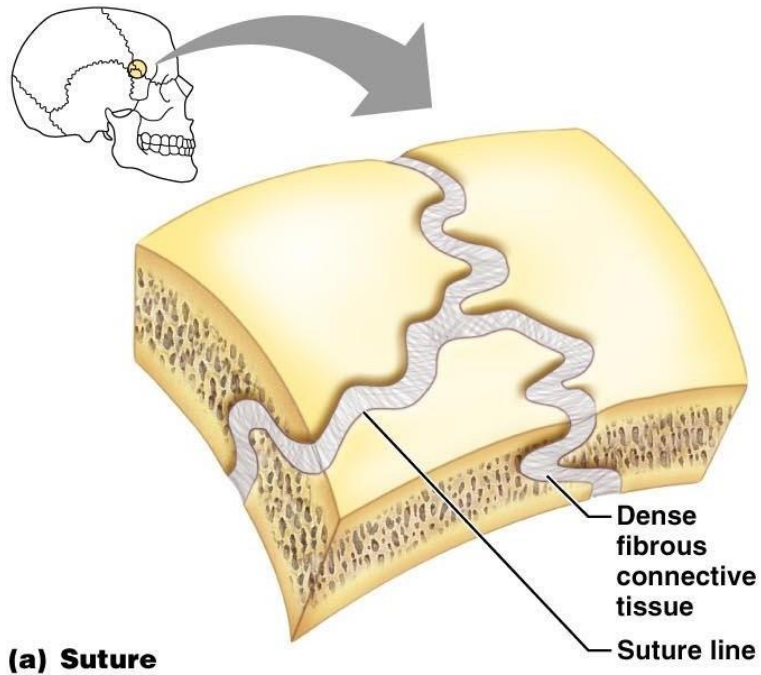
cartilage to articulate bones.

- c) **Synovial joint** -- uses auricular cartilage, synovial membrane, joint capsule, and ligaments to articulate bones.
- 2. According to the amount of movement at the joint:
 - a) **Synarthrotic joint** -- immovable joint.
 - b) **Amphiarthrotic joint** -- immovable joint.
 - c) **Diarthrotic joint** -- freely movable joint.

Fibrous Joints

- a) Occur between bones that have close case contact (e.g. cranial bones, tibia and fibula, ulna and radius).
- b) Fibrous connective tissue fastens the bones tightly.
- c) Small amount of movement (amphiarthrosis) or no movements at all is possible (synarthrosis).
- d) Subdivided into:
 - -- **Syndesmosis** = uses interosseous ligaments; amphiarthrotic (e.g. distal end of tibia and fibula).
 - -- **Suture** = uses sutural ligaments; synarthrotic (e.g. cranial sutures in the skull).
 - -- **Gomphosis** = uses periodontal ligaments; synarthrotic (e.g. joining teeth to maxilla and mandible).

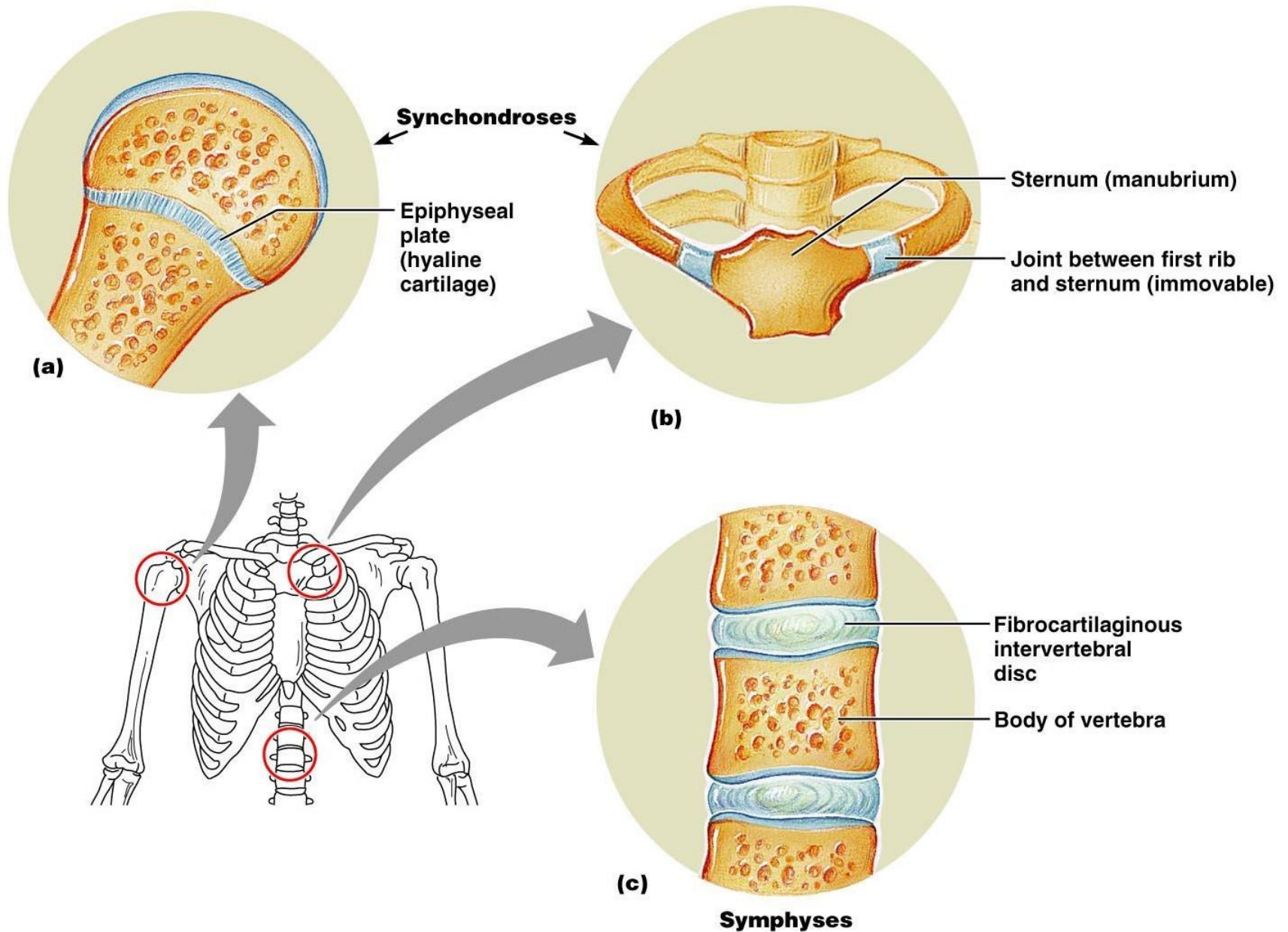
Fibrous Joints



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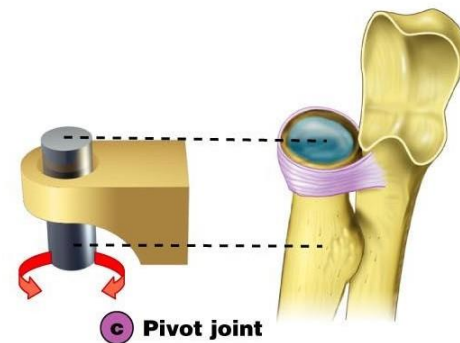
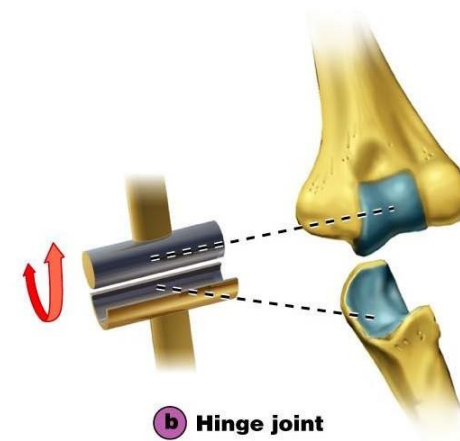
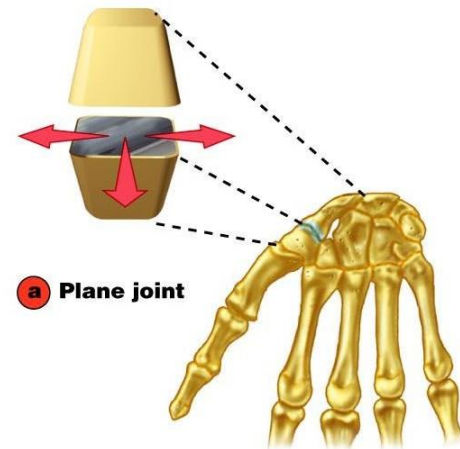
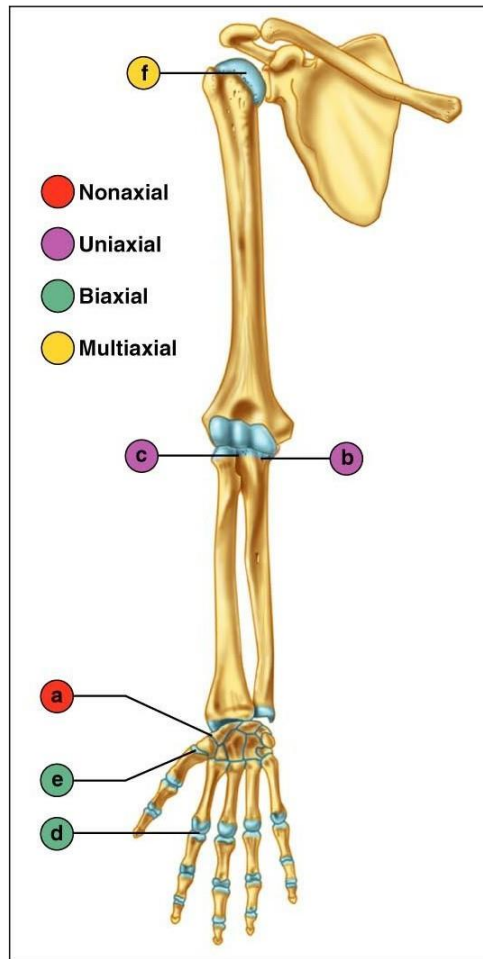
Cartilaginous joints

- a) Hyaline cartilage and/or fibro cartilage form the joint.
- b) Usually slightly movable (amphiarthrotic) and very strong.
- c) Subdivided into:
 - -- **Synchondrosis** = uses hyaline cartilage, synarthrotic (e.g. between the first rib and manubrium).
 - -- **Symphysis** = uses hyaline cartilage at the ends of bones, and a layer of fibrocartilage at the center; amphiarthrotic (e.g. intervertebral disk, pubic symphysis).

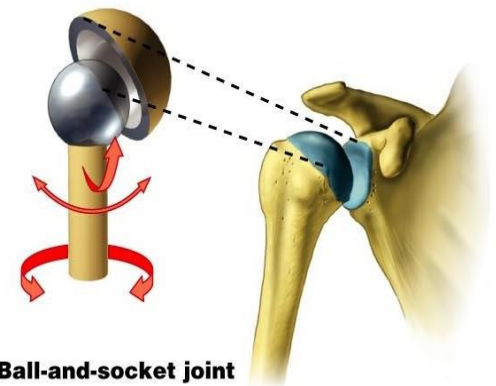
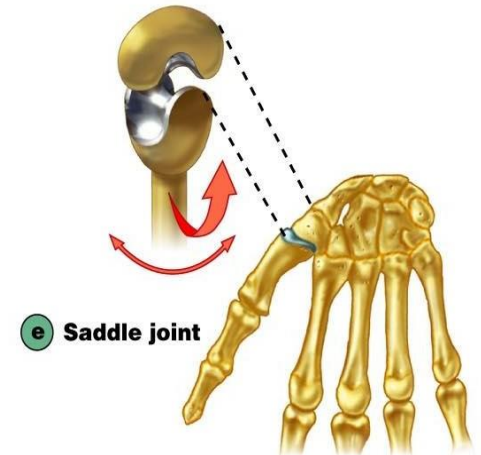
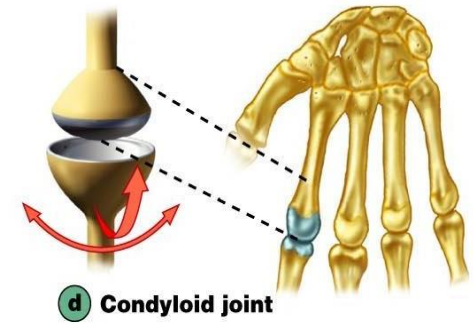
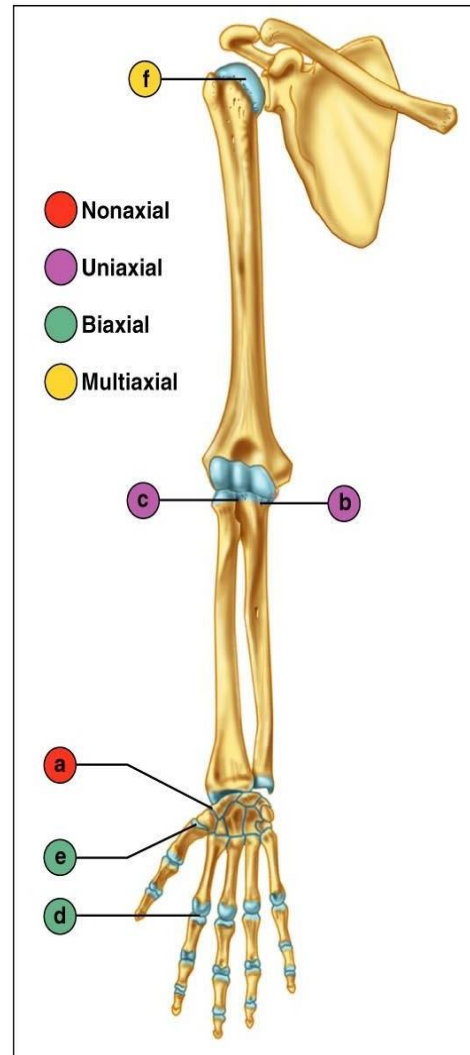


Synovial Joints

- a) Most joints are synovial joints.
- b) Usually freely movable (diarthrotic).
- c) Contain articular cartilage (at the ends of bones), joint capsule (fibrous connective tissue surrounding the joint), and synovial membrane (inner lining of the joint capsule).
- d) Subdivided into:
 - -- **gliding** = allows back and forth movement (e.g. carpals sliding onto one another during wrist movements).
 - -- **hinge** = allows folding movement (e.g. elbow joint).
 - -- **pivot** = allows rotation around an axis (e.g. between atlas and axis at the odontoid process).

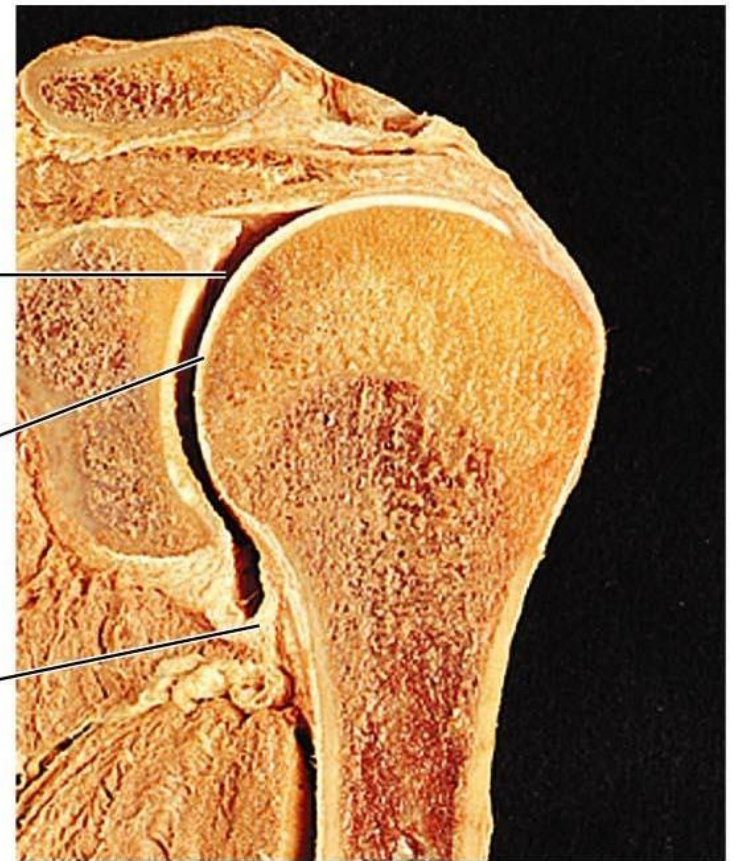
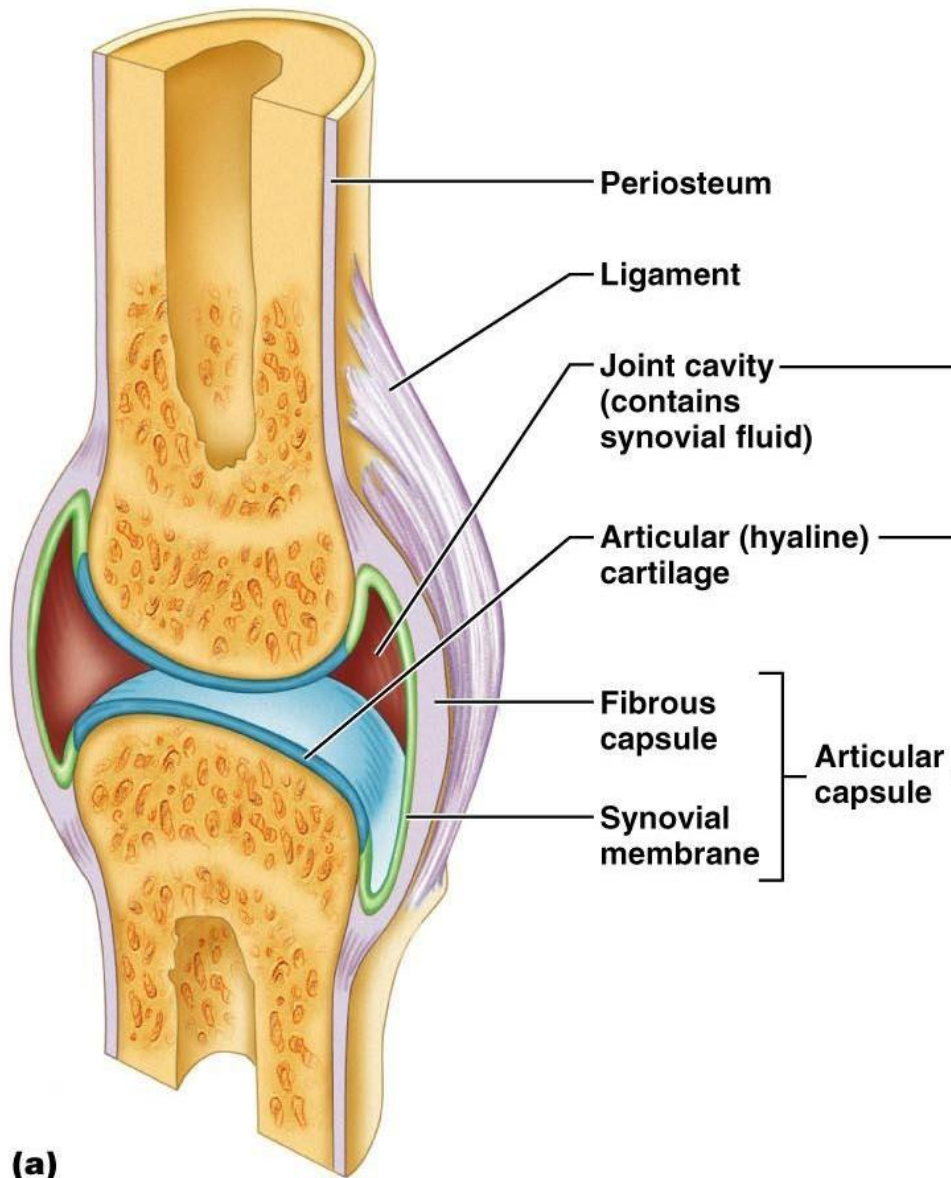


- -- **condyloid** = allows all movements except rotation (e.g. between metacarpals amid proximal phalanges).
- -- **saddle** = allows all movements except rotation (e.g. between carpals and metacarpals).
- -- **ball - and - socket** = allows all movements (e.g. shoulder joint and hip joint).

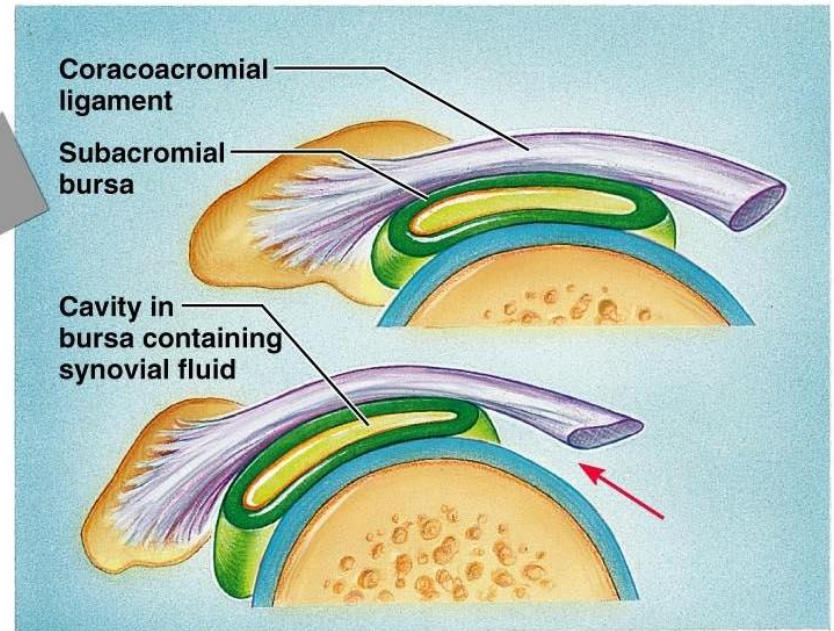
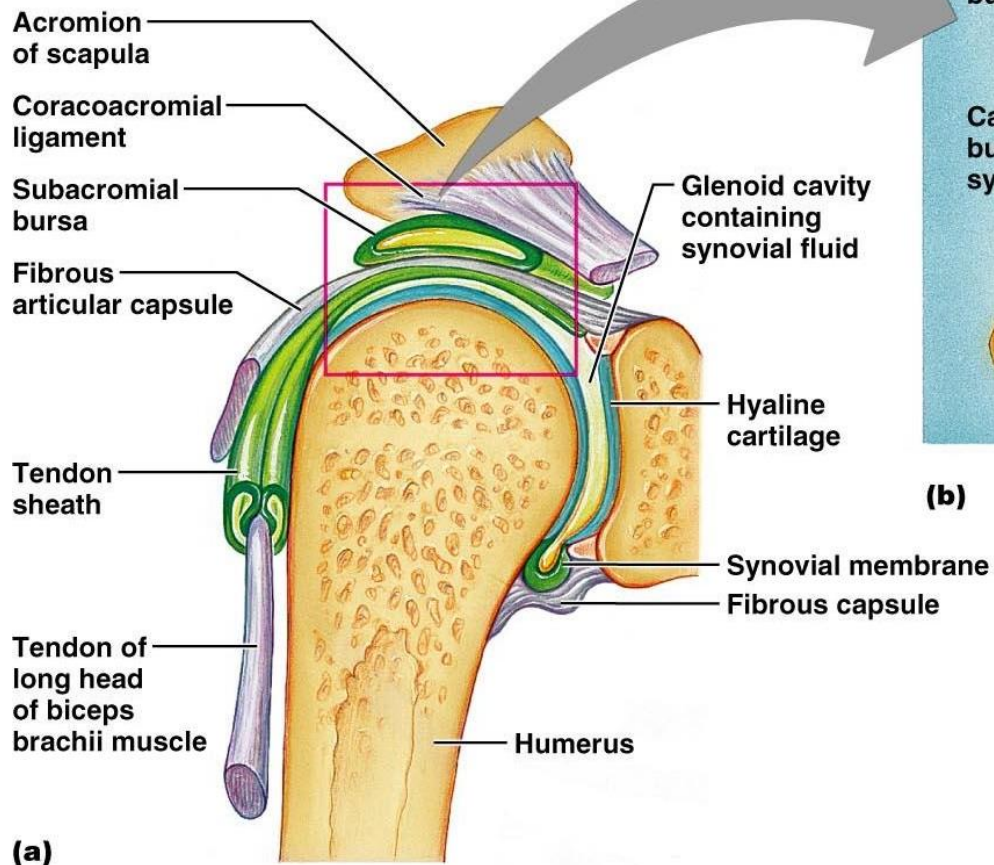


Synovial Joints

- Have **5** distinguishing features
 1. **Articular cartilage** – glassy – smooth articular cartilage covers the opposing bone surface. It resists wear and minimizes friction.
 2. **Joint cavity** – space that is filled with Synovial fluid. Synovial membrane – covers all the surface within the joint capsule and secretes synovial fluid.
 3. **Articular capsule** – the joint cavity is enclosed by a double – layered articular capsule.
 4. **Synovial fluid** – a slippery fluid that occupies all free spaces within the joint capsule.
 5. **Reinforcing ligaments** – are reinforced by a number of ligaments.



- Some synovial joints such as hip and knee have fatty pads between the fibrous capsule and the bone
- Some have discs or wedges of fibrocartilage separating the articular surface of bones (e.g. meniscus of knee)
- Some synovial joints have **bursa** which is a fluid-filled sac containing the synovial fluid.
- **Ligament:** a sheet of strong fibrous connective tissue connecting the articular ends of bones, binding them together and facilitating or limiting motion.
- **Tendon:** Fibrous connective tissue that attaches muscle to bone.



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Articulations (Joints)

Introduction:

A joint, also known as an **articulation**, is a location where two or more bones meet. Most joints contain a single articulation. Each articulation contains the **names of two bones** (or sockets). For example, the hip joint is known as the **acetabulofemoral joint** since it is where the acetabulum ("acetabulo-") of a coxal bone articulates with the head of the femur ("-femoral"). Another example is the shoulder joint, which is known as the **glenohumeral joint** since it is where the glenoid cavity ("gleno-") of the scapula articulates with the head of the humerus ("-humeral").

Some joints have more than one articulation (where more than two bones articulate with each other). These include the knee and the elbow joints. The knee includes articulation between the femur and tibia (**tibiofemoral joint**) and the femur and patella (**patellofemoral joint**). The elbow joint has three articulations: the **humeroradial joint** (articulation of the humerus and radius), the **humero-ulnar joint** (articulation of the humerus and ulna), and the **proximal radioulnar joint** (the proximal articulation of the radius and the ulna).

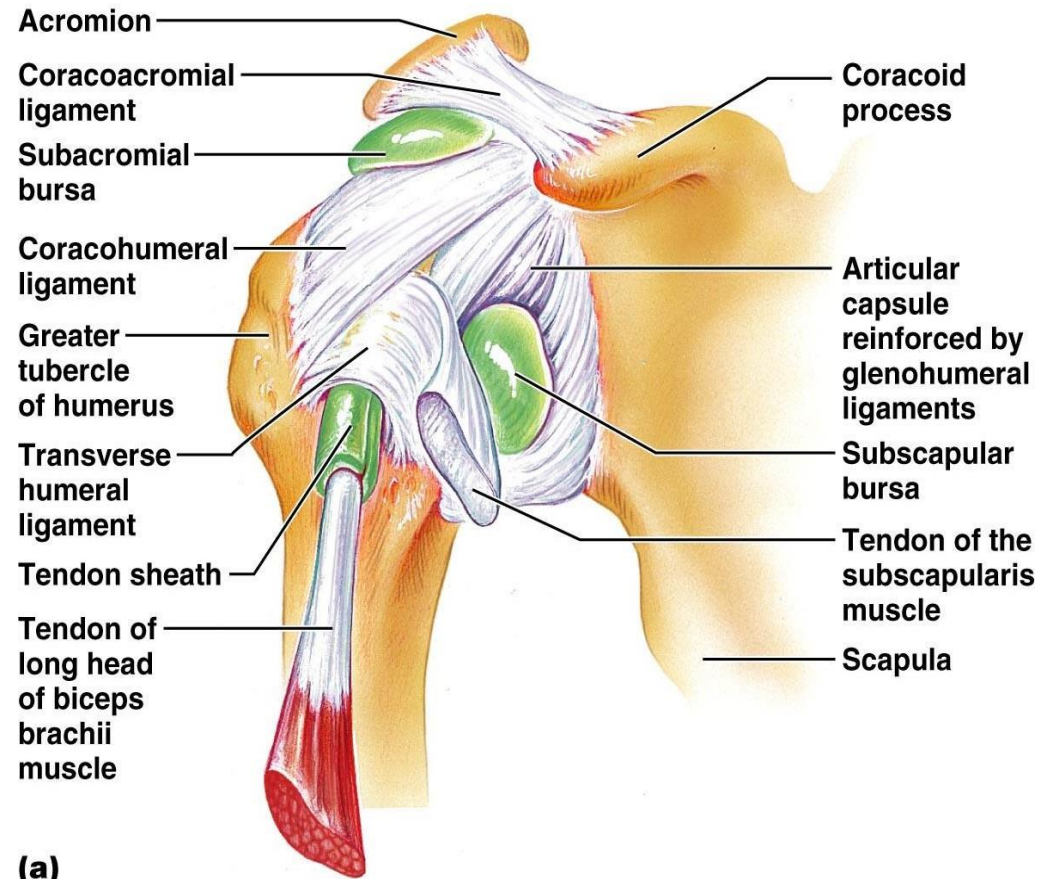
Articulations vary in the amounts of movement they allow as well as their structures. Joints are classified based on function, the amount of movement they allow, into three categories: **synarthrosis**, **amphiarthrosis**, and **diarthrosis**.

Shoulder Joint

- Ball and Socket joint
- Ligaments:
 - a) **Coracohumeral** ligament – connects the coracoid process of scapula to the greater tubercle of the humerus.
 - b) **Glenohumeral** ligament – extend from the edge of glenoid cavity to lesser tubercle of humerus
 - c) **Transverse humeral** ligament – runs between the lesser and the greater tubercles.
 - d) **Coracoacromial** ligament.
 - d) **Glenoid labrum** – attaches along the margin of glenoid cavity.

Shoulder Joint

- **Rotator cuff:** muscles that encircle the shoulder joint.
- made up of 4 muscles:
- subscapularis
- supraspinatus
- infraspinatus
- teres minor



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Elbow joint

- Hinge joint
- ligaments:

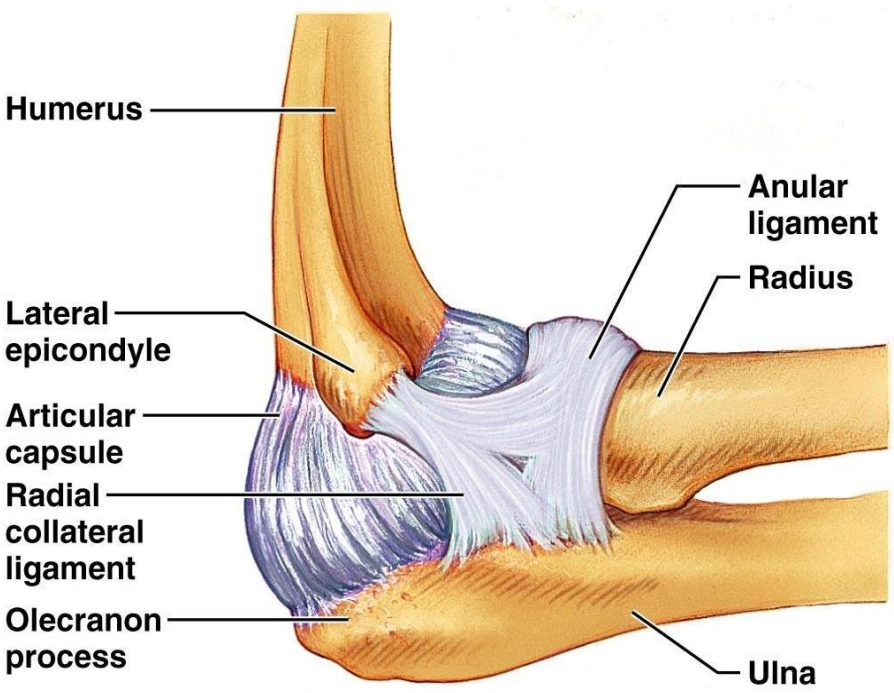
Annular ligament: surrounds the head of radius, and attaches to the trochlear notch of ulna

Ulnar collateral ligament:

* Ant. end of ligament connects the medial epicondyle of humerus to the medial margin of the coronoid process of the ulna

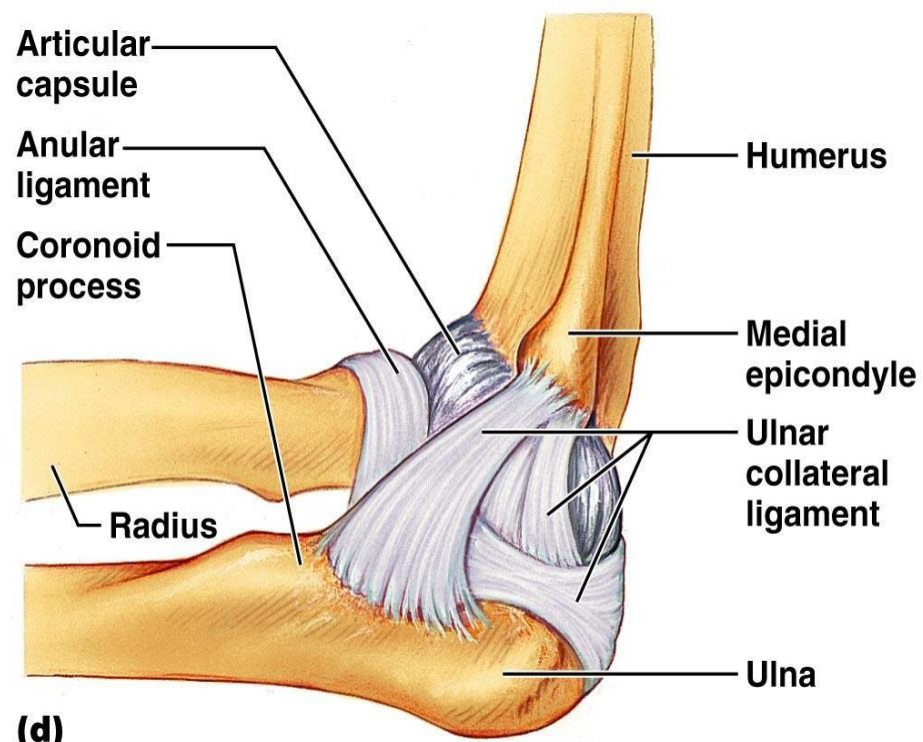
- *Post. end – attaches the medial epicondyle of humerus to the olecranon process of the ulna.
- **Radial collateral ligament:** extends between lat. Epicondyle of humerus and the annular ligament of the radius.

Elbow



(b)

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(d)

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Knee Joint

- largest synovial joint
- Hinge joint
- Ligaments – associated with joint capsule:

Patellar ligament – is continuation of the tendon of quadriceps femoris muscle; extends from patella to tibial tuberosity.

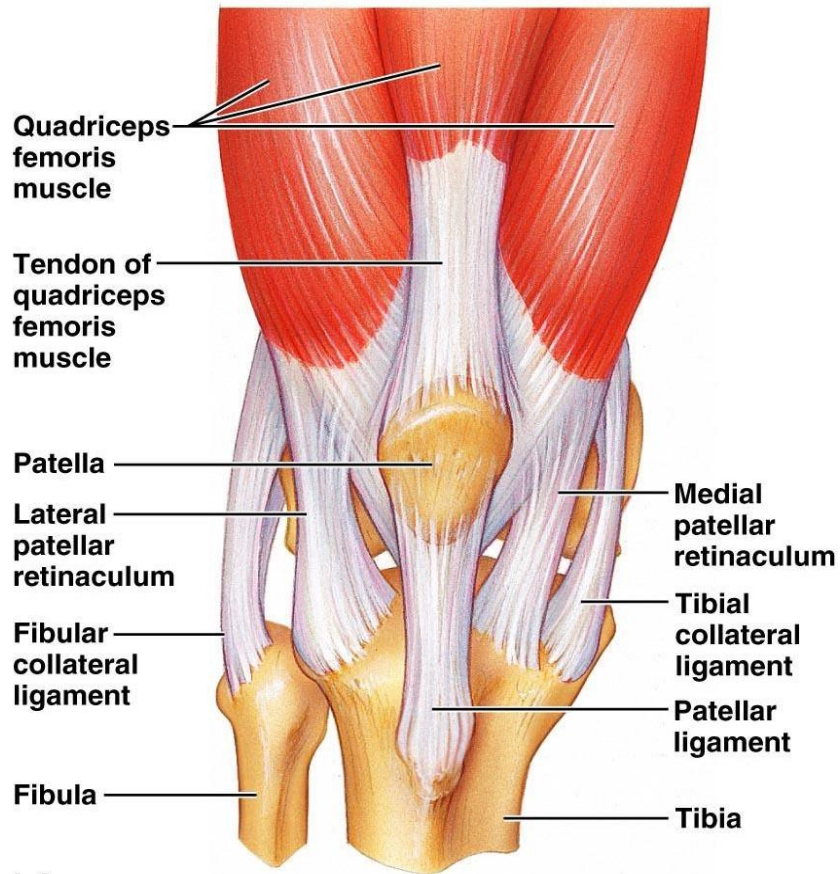
Oblique popliteal ligament – is continuation of the tendon of semi-membraneous muscle crossing the posterior knee joint. This ligament connects the lat. condyle of the femur to head of tibia.

Arcuate popliteal ligament – extends from lat. Condyle of femur to head of fibula.

Tibial collateral ligament (medial collateral ligament) - connects medial condyle of femur to the medial condyle of tibia.

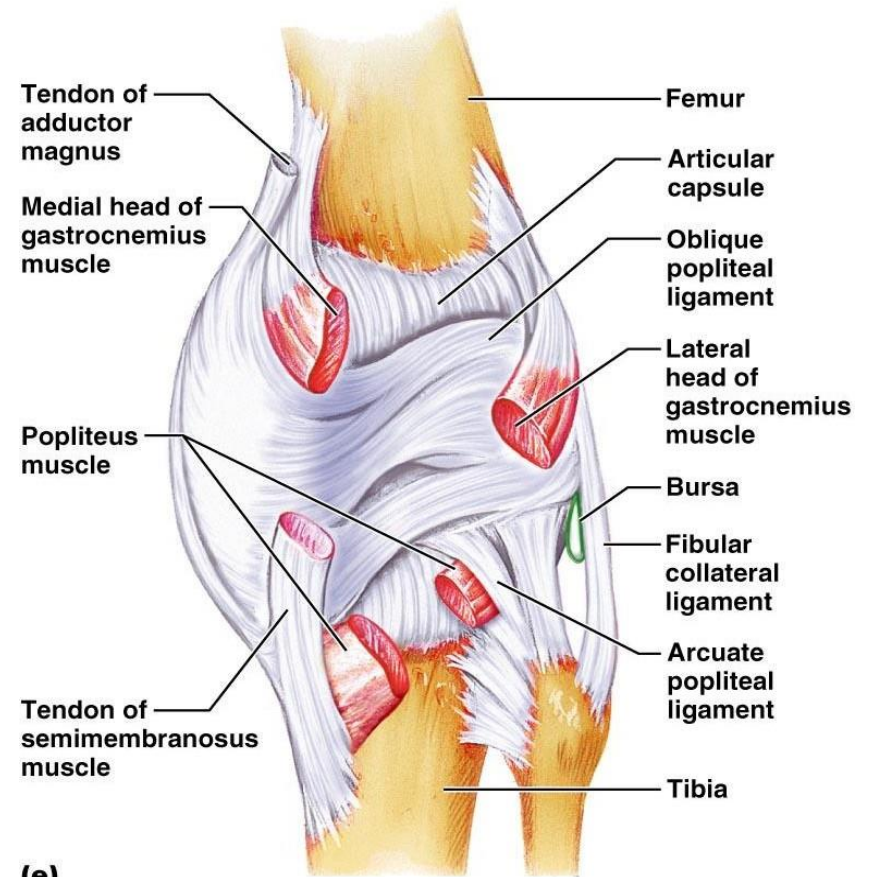
- **Fibular collateral ligament** (lateral collateral ligament) – connects lateral condyle of femur to head of fibula.

Knee Joint



(c)

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(e)

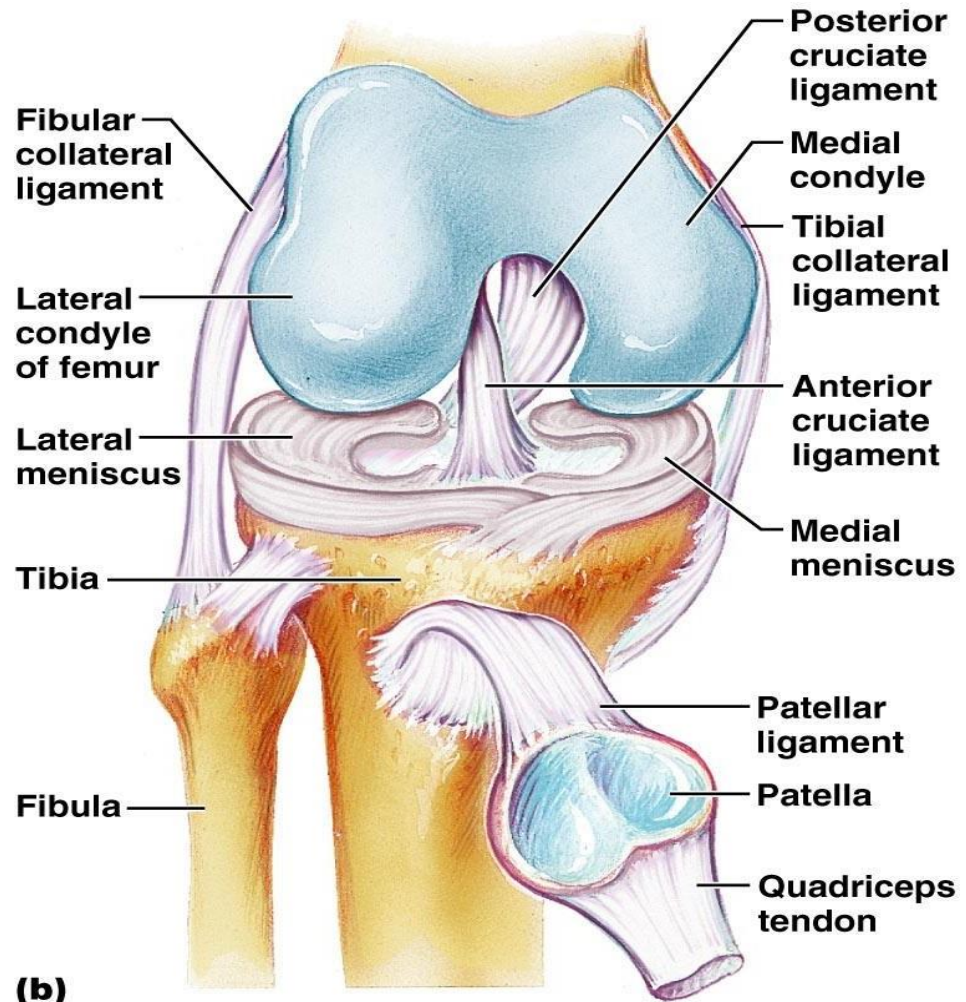
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- **Intercapsular ligaments:** are within the joint and include the **Anterior & Posterior Cruciate ligaments.**

* Ant. cruciate: extends from the ant. intercondylar area of tibia to lat. condyle of femur

* post. cruciate: extends from the post. Inter-condylar area of tibia to the medial condyle of femur.

- **Menisci** – Interarticular fibrocartilage separating the articular surfaces of tibia and fibula.



(b)

Hip Joint

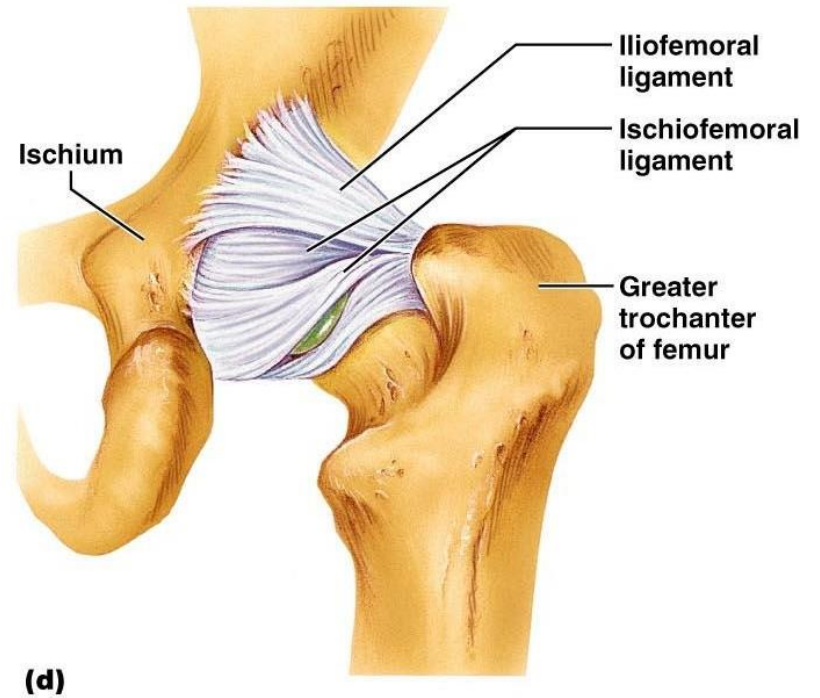
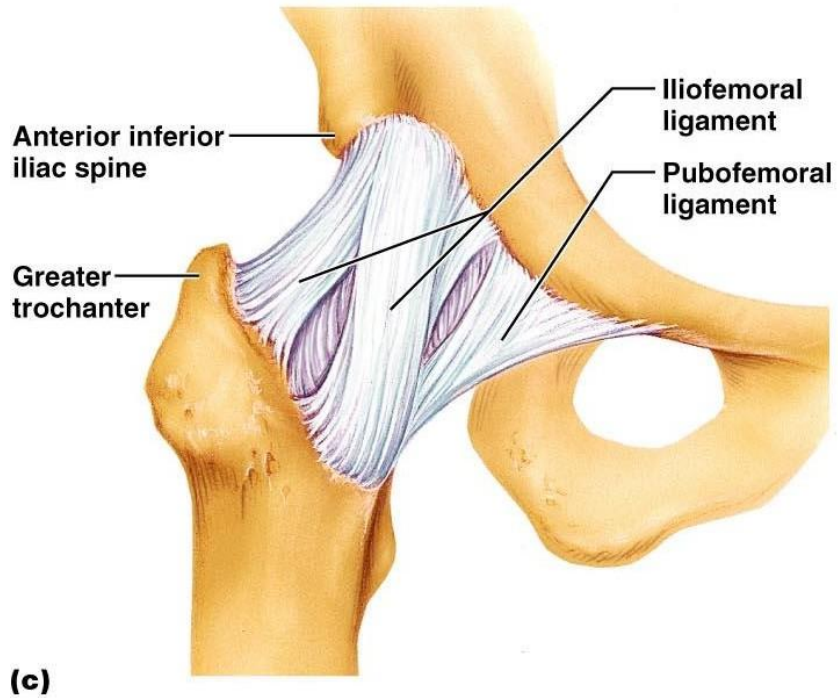
- Ball and socket joint
- Ligaments:

Iliofemoral ligament – connects the Anteriorinferior iliac spine to intertrochanteric line between lesser and greater trochanter).

Pubofemoral ligament – extends between thesuperior portion of pubis and the iliofemoral ligament.

Ischiofemoral ligament – extends fromischium to the joint capsule itself.

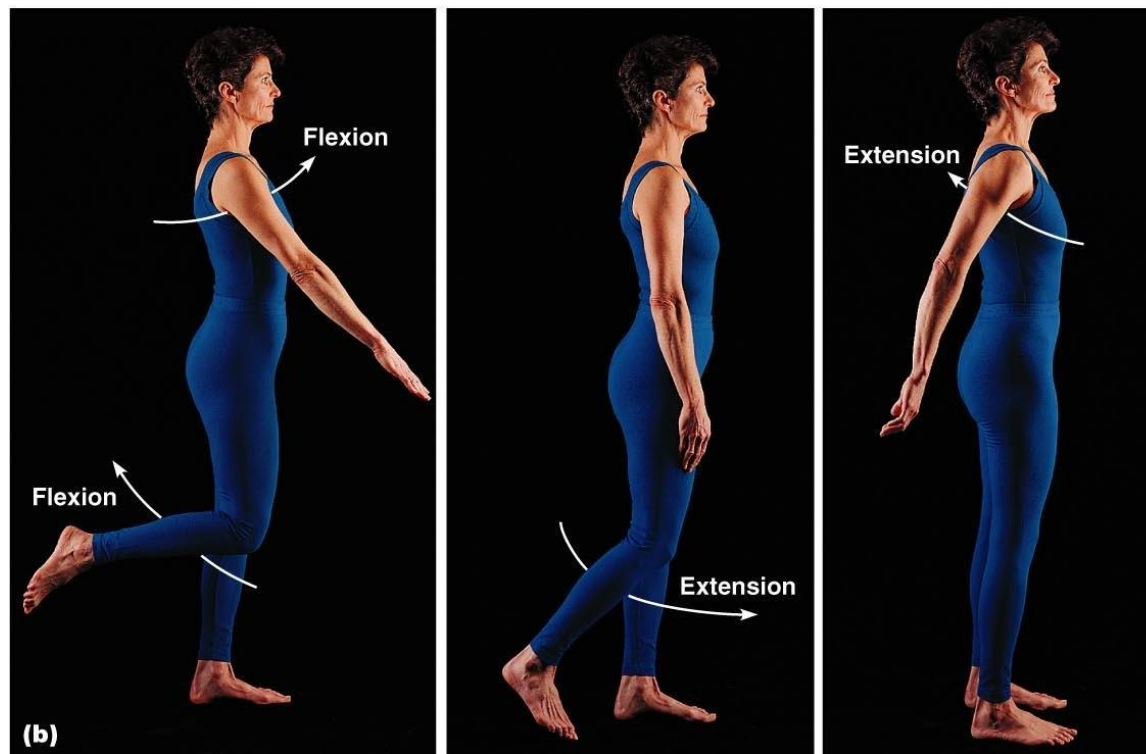
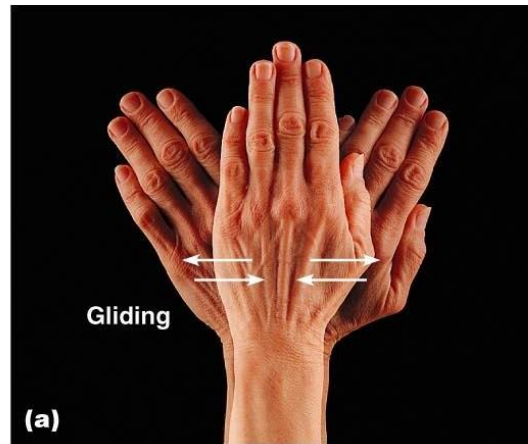
Hip Joint

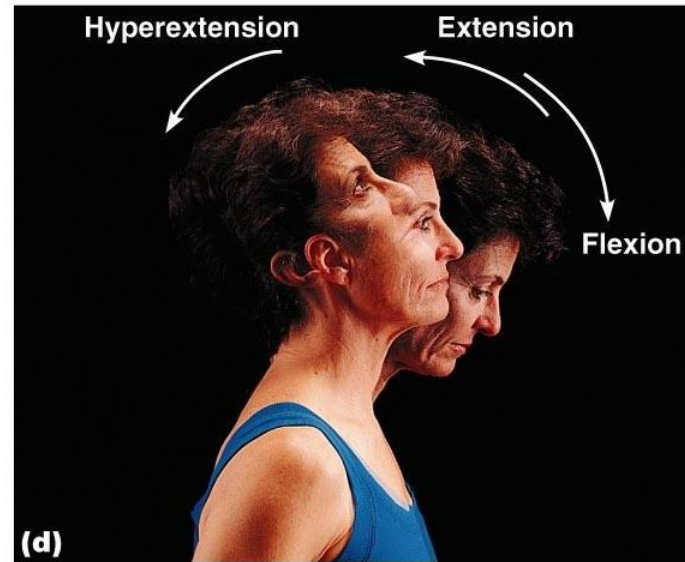
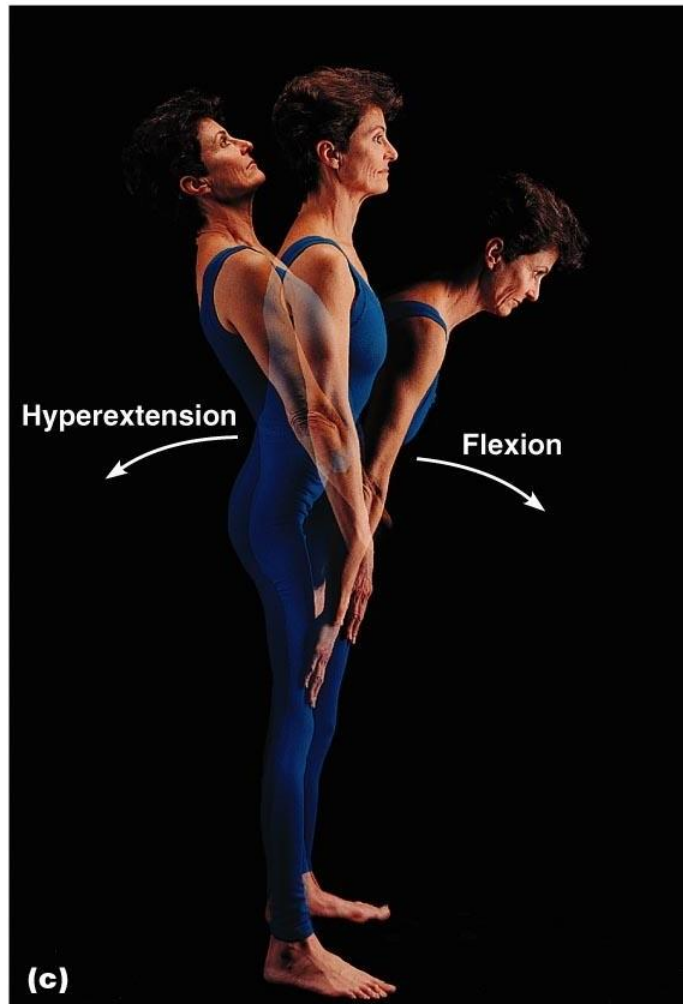


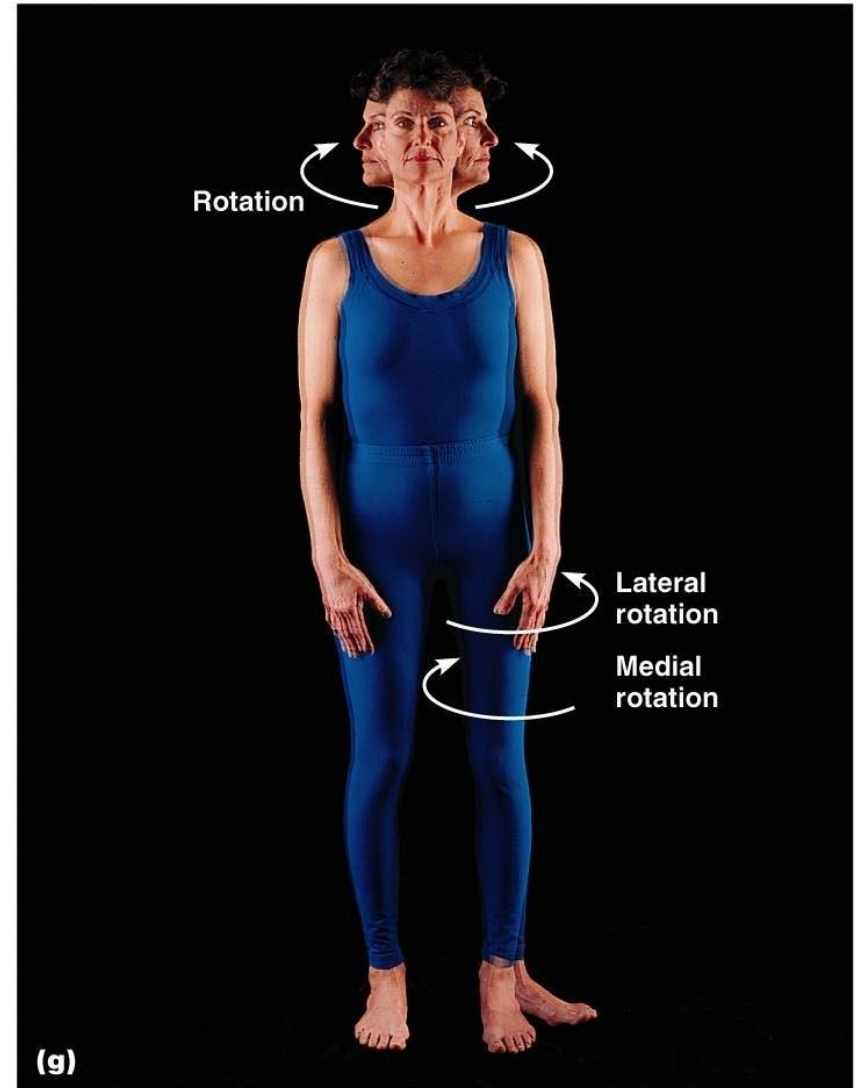
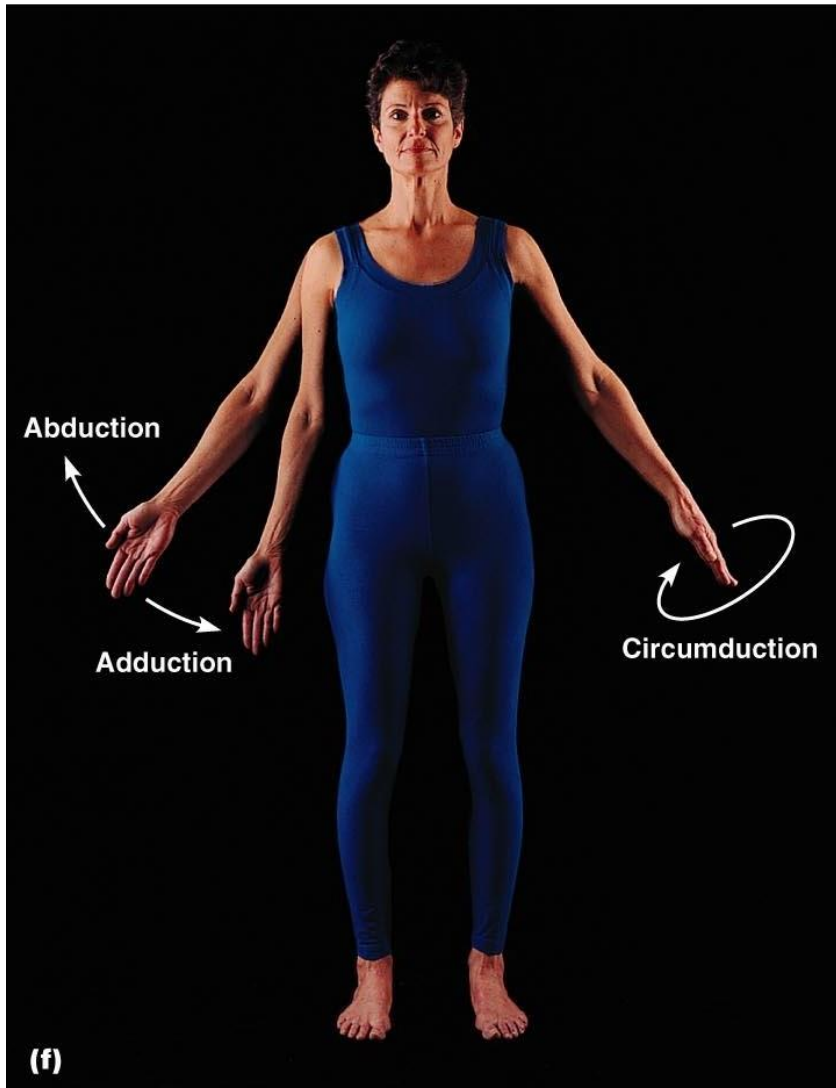
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Joint Motion

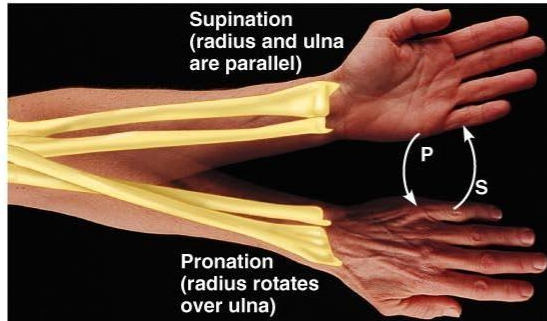
1. Types of joint movements should be studied in the following diagrams.
2. For each movement, the definition and an example should be learned.
3. One way to remember these movements is by their opposite direction.
 - Flexion vs. Extension
 - Abduction vs. Adduction
 - Supination vs. Pronation
 - Dorsiflexion vs. Plantar flexion
 - Eversion vs. Inversion
 - Protraction vs. Retraction
 - Elevation vs. Depression



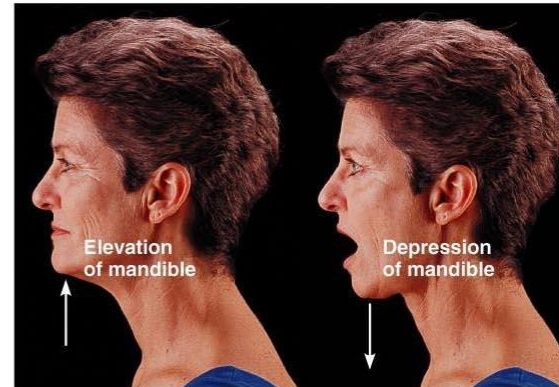




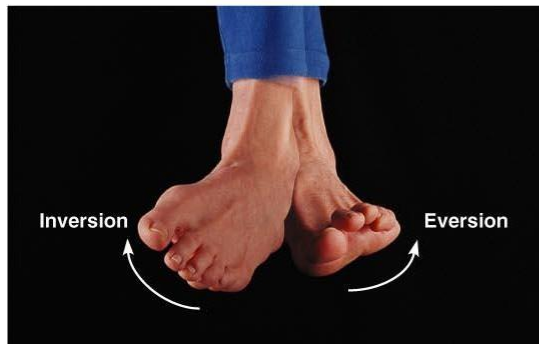
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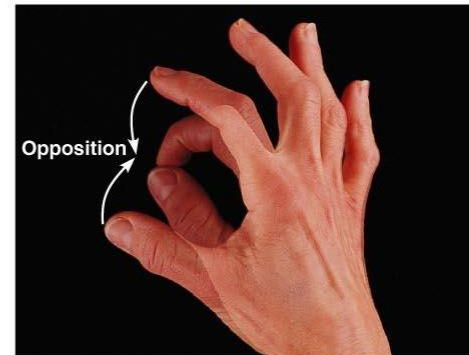
(a) Supination (S) and pronation (P)



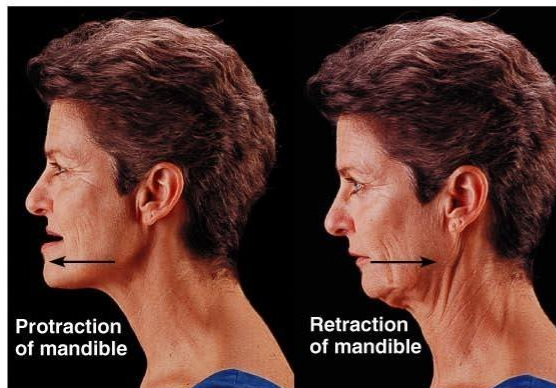
(d) Elevation and depression



(b) Inversion and eversion



(e) Opposition



(c) Protraction and retraction

Disorders of Joints

1. **Dislocation** = displacement of articulating bones of a joint, as a result of a fall or unusual body movements.
2. **Sprain** = results of overstretching or tearing of the connective tissue ligament, or tendon at a joint.
3. **Bursitis** = inflammation of the bursa (a sac filled with synovial fluid at the synovial joint) caused by excessive use of a joint.
4. **Arthritis** = inflammation of a joint that causes swelling and pain (rheumatoid arthritis is an **autoimmune** disease where white blood cells attack the joint tissues; while osteoarthritis is a natural degeneration of joint tissues).

Clinical Terms

- **Arthroscopic surgery**: removal of damaged cartilage from the joint.
- **Dislocation**: bone out of alignment at a joint.
- **Subluxation**: partial dislocation.
- **Bursitis**: inflammation of bursa caused by trauma or excessive friction.
- **Arthritis**: inflammatory or Degenerative Joint Disease (DJD) that damage the joints.
- **Osteoarthritis**: non-inflammatory arthritis, mostly seen in elderly.
- **Rheumatoid arthritis**: an autoimmune disease involving severe inflammation of joints, very painful.
- **Sprain**: result from overstretching or tearing of connective tissues, ligaments, and tendons associated with a joint.