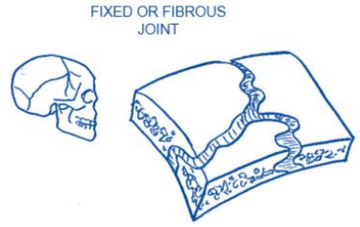
Functional Classification of Joints

Criteria for the functional classification of joints:

- Degree of movement they permit

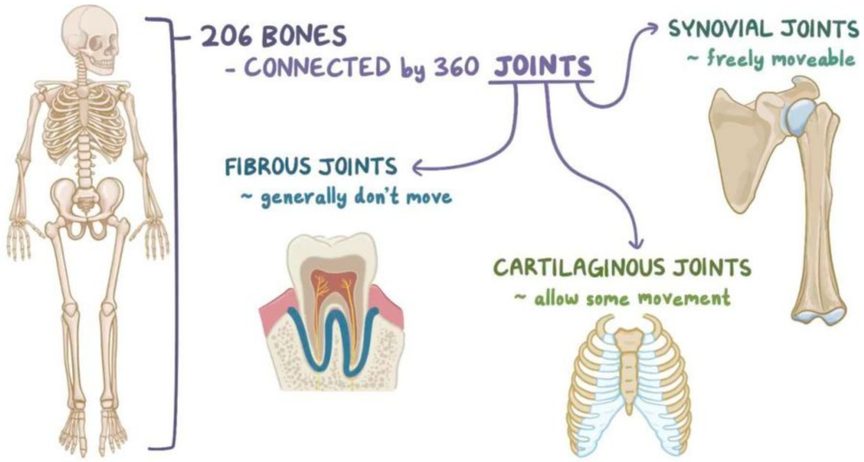
Note: all diarthroses are synovial joints; variety of shapes which permit different types of movement



Functional Types of Joints

Synarthrosis	Amphiarthrosis	Diarthrosis
Immovable	**Slightly movable**	**Freely Moveable**
Pleural (Synarthroses)	Pleural (Amphiarthroses)	Pleural (Diarthroses)

Structural Classification of Joints



2 Criteria for the structural classification of joints:

- Presence or absence of a space between two articulating bones (aka: synovial) cavity
- The type of connective tissue that holds the bones together

Structural Types of Joints

Fibrous Joints

NO synovial cavity
Bones held together by **dense connective tissue;**
Rich in **collagen fibers**

Cartilaginous Joints

NO synovial cavity
Bones held together by **Cartilage**

Synovial Joints

+ synovial cavity
United by dense irregular CT of an articular capsule and often accessory ligaments

Characteristics

- Lack a synovial cavity
- Articulating bones held closely by dense irregular tissue
- Permit little to no movement

Types of Fibrous Joints

Sutures

Syndesmoses

Gomphoses

Definition: Fibrous joint
Composition: thin layers of dense irregular connective tissue
Location: only found between bones of the skull
Advantages:

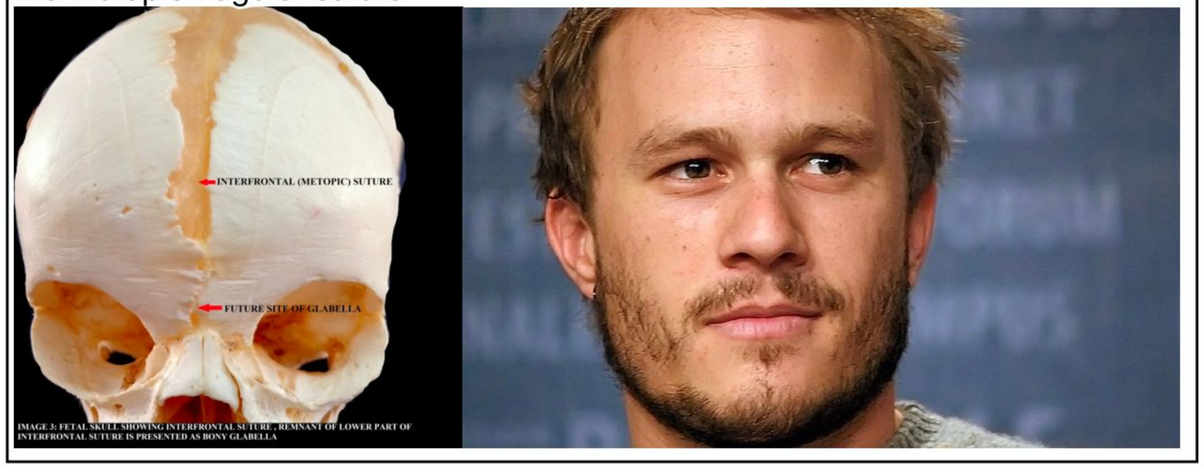
1. Interlocking edges of sutures→added strength and decrease the risk of fracture
2. Major role in shock absorption

Mobility:
Immoveable (synarthroses) slightly movable→*Adults*
Slightly movable (amphiarthroses) →*Children/Infants*

Synostosis

A suture or bony joint in which there is a complete fusion of two separate bones; often present during growth and development and replaced by bone in an adult
Classification: Synarthrosis (immoveable)

*Ex—Metopic Suture: f*ound in the frontal bone. There is often complete fusion of the L & R frontal bones by 6-8 years of age. If this suture persists it will be called the metopic ridge or suture



Characteristics
- Lack a synovial cavity
- Articulating bones held closely by dense irregular tissue
- Permit little to no movement

Types of Fibrous Joints

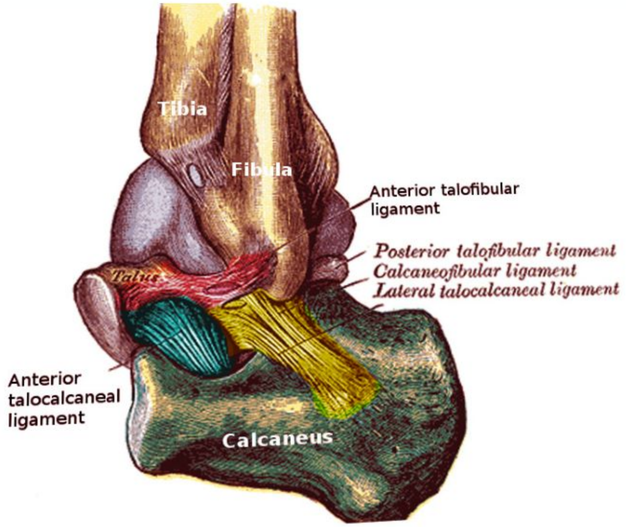
Sutures

Gomphoses

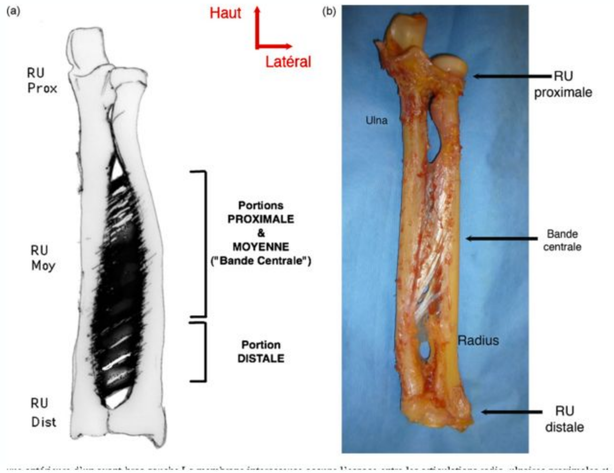
Syndesmoses

Definition: band/ligament or a fibrous joint where there is a greater distance between articulating surfaces and more dense irregular CT than in a suture.
Composition & Movement: Dense irregular CT ligament is what allows limited movement

Example 1: *Distal tibiofibular joint* [anterior tibiofibular ligament connects tibia and fibula]
Movement: limited; slight movement [amphiarthrosis: permits slight movement]



Example 1: *Interosseous Membrane*
Definition: substantial sheet of dense irregular tissue that binds neighboring long bones
Movement: amphiarthrosis (permits slight movement)
Examples:
#1: Between the radius and ulna
#2: Between tibia and fibula



Characteristics

- Lack a synovial cavity
- Articulating bones held closely by dense irregular tissue
- Permit little to no movement

Types of Fibrous Joints

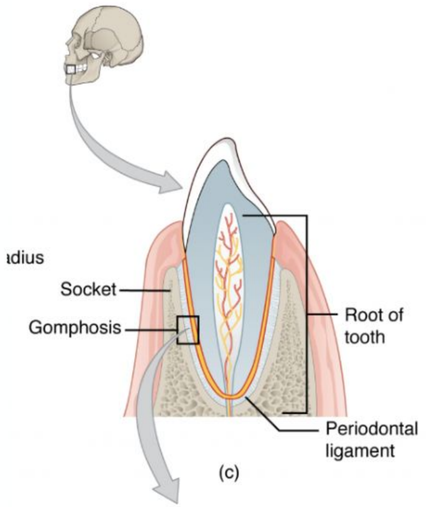
Sutures

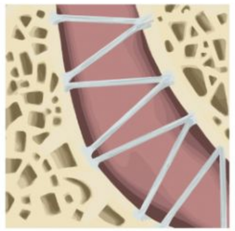
Syndesmoses

Gomphoses

Example 2: *gomphosis* [dental-alveolar joint=cone-shaped peg into a socket]-teeth and their sockets found in the maxilla/mandible. The periodontal ligament connects the tooth to the socket, permitting no **movement** [synarthrosis].

Periodontal disease: degeneration and inflammation of this ligament; may permit movement at that point (note this is not normal)





Characteristics

- Lack a synovial cavity
- Articulating bones held closely by hyaline or fibrocartilage
- Permits little to no movement

Types of Cartilaginous Joints

Synchondroses

Definition: cartilaginous joint

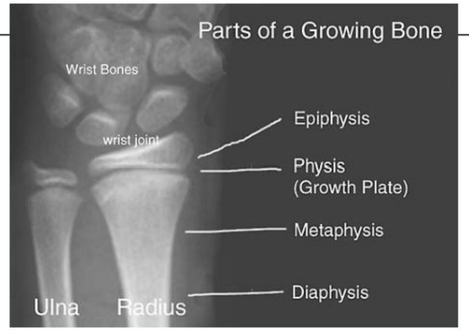
Composition: connecting material is **hyaline cartilage**

Mobility:
Immoveable (synarthroses) when bone replaces the hyaline cartilage, the synchondrosis becomes a synostosis (a bony joint)

Example 1
Epiphyseal Growth Plate

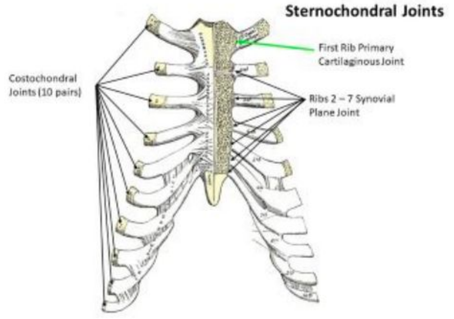
Connects the **epiphysis and diaphysis**

Functionally: immovable (synarthrosis); when bone replaces the hyaline cartilage the synchondrosis becomes a synostosis (a bony joint)



Example 2
Btw 1st rib and manubrium

Functionally*:* ossifies as an adult; becomes immovable (synostosis) or synarthrosis; becomes a bony joint.



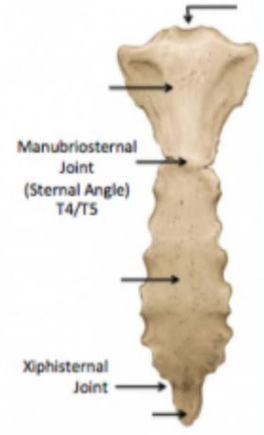
Symphyses

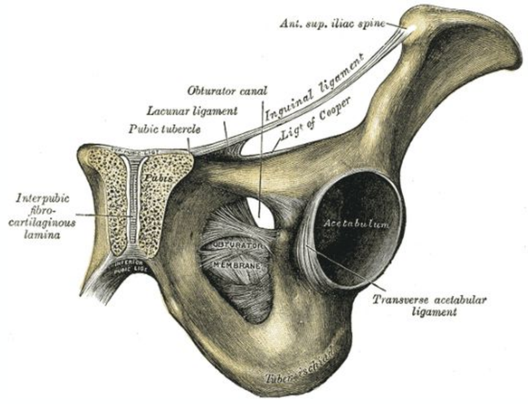
Definition: cartilaginous joint

Composition: the ends of the articulating bones are covered with **hyaline** cartilage, but a **broad, flat disc of fibrocartilage connects the bones**.

Mobility:
Slightly movable (amphiarthrosis)

Examples
Pubic Symphysis—Between anterior surfaces of the hipbones
Manubriosternal Joint—Manubrium and sternal body
Intervertebral Joints— between body of vertebrae

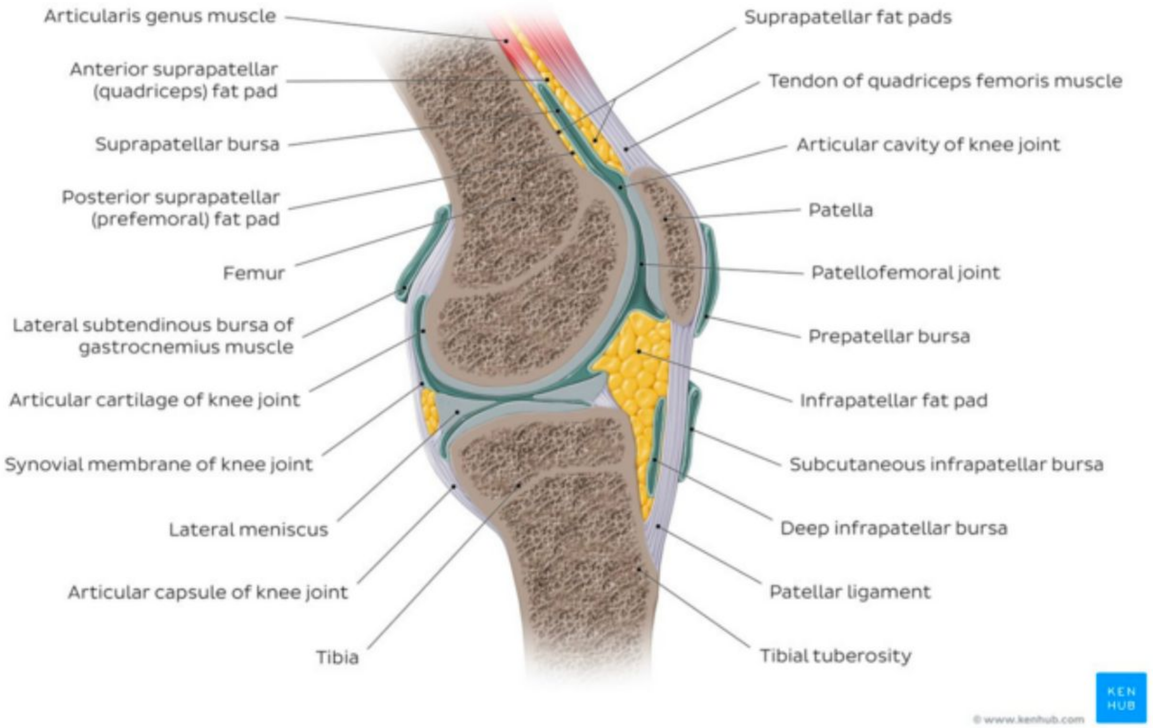




Components of Synovial Joints

Distinguishing Characteristics

- Contains a synovial cavity (joint cavity between the articulating bones)
- Allows considerable movement at a joint (all synovial joints are freely moveable=diarthroses)



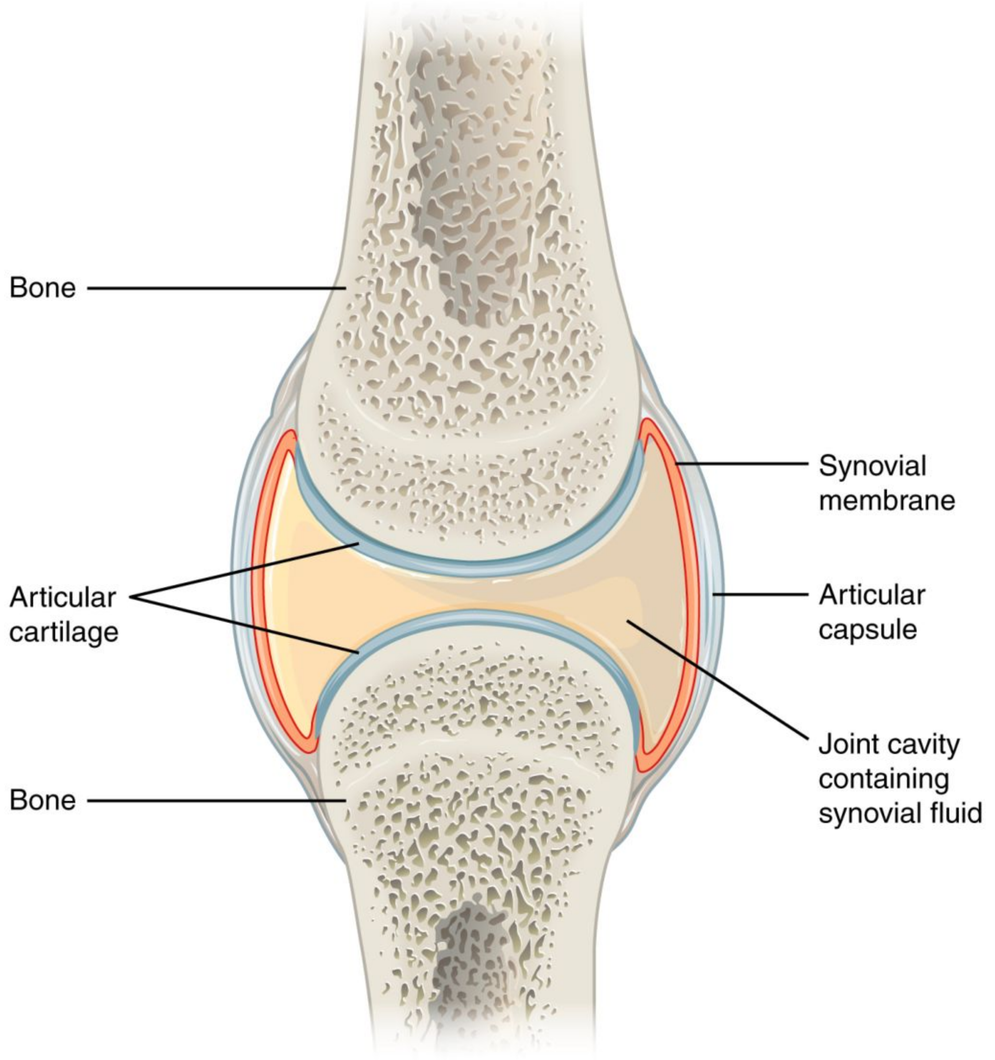
1. Articular Cartilage
2. Articular Capsule
3. Synovial Fluid
4. Accessory Ligaments
5. Articular Disc
6. Labrum
7. Nerve & Blood Supply
8. Chondrocytes

Articular Cartilage of Synovial Joints

Definition: Covered by a layer of hyaline cartilage (aka: articular cartilage)

Characteristics: covers the surface of **articulating surfaces of the bones,** with a smooth slippery surface, but does not bind them together.

Function: **reduces friction between bones** in the joint during movement **reduction of shock.**



Articular Capsule of Synovial Joints

Definition: a sleeve-like joint capsule surrounds a synovial joint; encloses the synovial cavity and unites the articulating bones.

Layers of the Articular Capsule

Fibrous Membrane (outer)

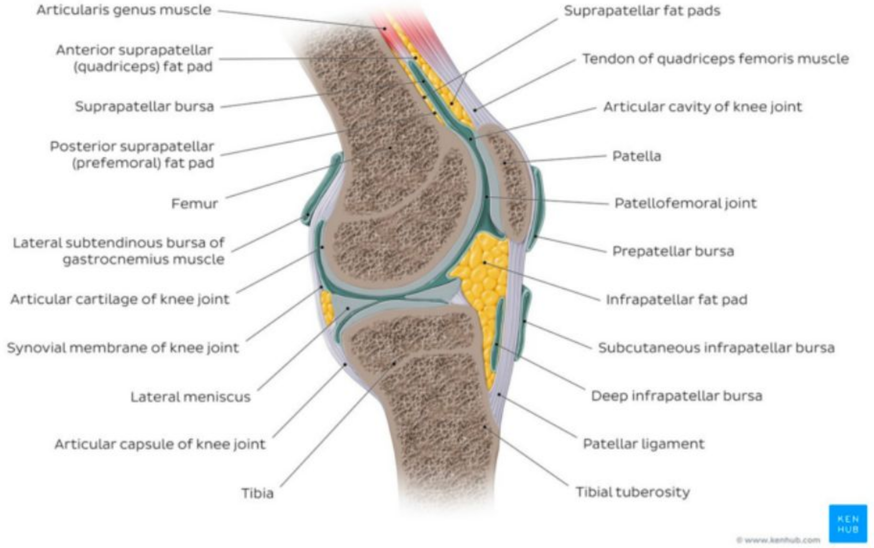
[*dense irregular connective tissue*-mostly collagen fibers; attaches to the periosteum of the bone]

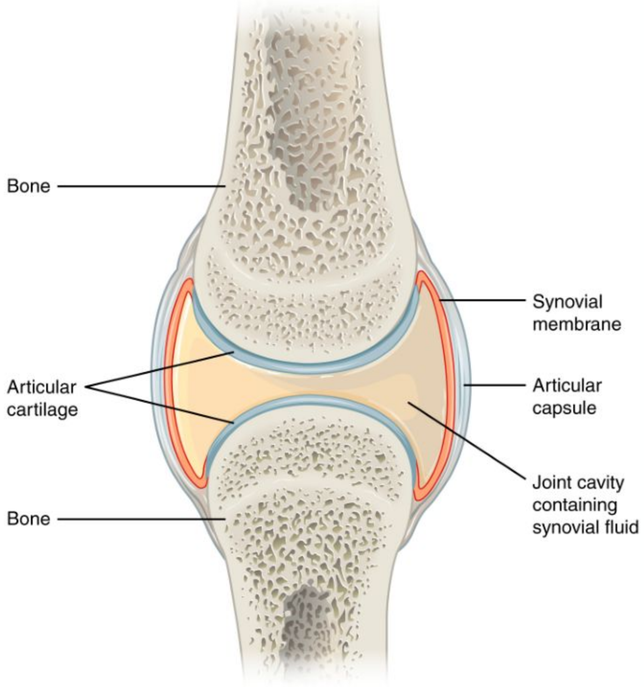
Synovial Membrane (inner)

[*areolar connective tissue with elastic fibers*]

May also include an accumulation of adipose tissue, called *"articular fat pads."*

Advantages:
1. Flexibility allows considerable movement
2. Great tensile strength, prevents dislocation
3. Resists strain d/t fibrous bundles called ligaments.





Synovial Fluid of Synovial Joints

Definition: viscous clear, pale yellow fluid. Synovial fluid consists of the following substances: hyaluronic acid (secreted by synovial cells in the synovial membrane and interstitial fluid from the blood plasma).

Synovial fluid forms a thin film over the surfaces s/in the articular capsules

Functions:
1. Reduction of friction by lubrication of the joint
2. Shock absorption
3. Supplies oxygen and nutrients to and removing Cos/metabolic wastes from chondrocytes within articular cartilage (remember, cartilage is avascular; there are no blood vessels to perform this function)
4. Contains phagocytic cells that remove microbes and debris that results from normal wear and tear in the joint.

When there is **immobility of the joint,** this **fluid** will become **gel-like and viscous**, but as the bone moves it becomes more fluid-like.

Therefore, it is beneficial for this reason to warm up before exercise to stimulate the production and secretion of synovial fluid. Within limits, more fluid means less stress on the joints.

The **cracking of joints, is theorized to be the result of expansion of the synovial cavity** when the pressure w/in the synovial cavity decreases, creating like a vacuum. The suction draws CO2 and oxygen out of the blood vessels forming bubbles in the fluid. **Increase in pressure bursts the bubbles creating a cracking/popping sound** as gases are driven back into the solution.

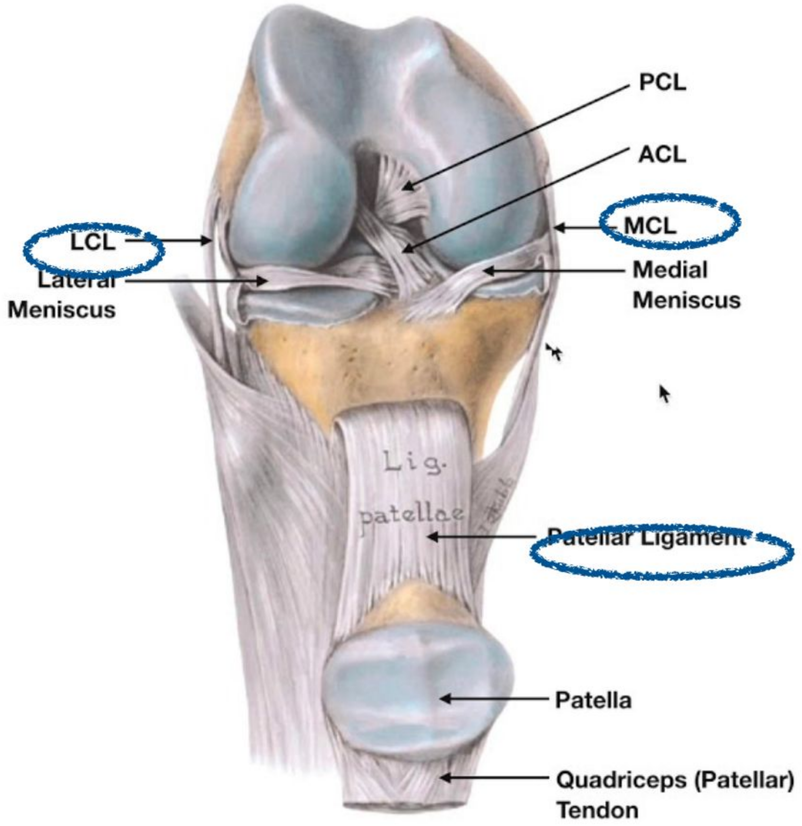
Accessory Ligaments of Synovial Joints

Accessory Ligaments

Extracapsular Ligaments

[lies outside the articular capsule.

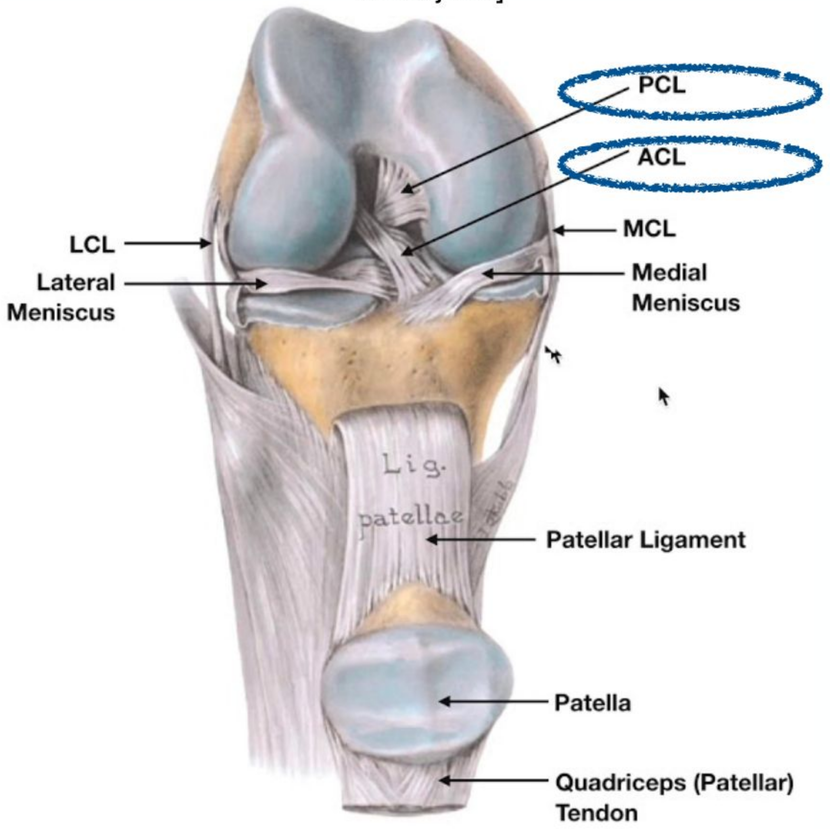
[***Examples***: fibular & tibial collateral ligaments]



Intracapsular Ligaments

[lie inside the articular capsule, but outside of the synovial cavity by folds in the synovial membrane.

Examples: Anterior & Posterior cruciate ligaments of the knee joint]



Cruciate Ligaments of Synovial Joint

Lie inside the articular capsule, but outside of the synovial cavity by folds in the synovial membrane.

Cruciate Ligaments

Anterior Cruciate Ligament

Origin: Anterior Intercondylar area of the tibia; extends superiorly, posteriorly and laterally

Insertion: on the posterior part of the medial side of the lateral femoral condyle

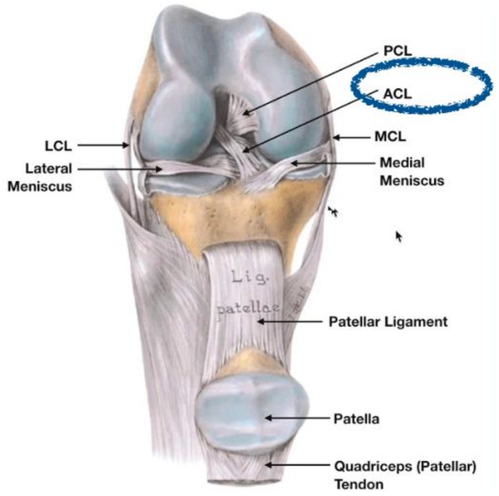
Function: Prevents posterior displacement of the femur on the tibia; prevents knee hyperextension

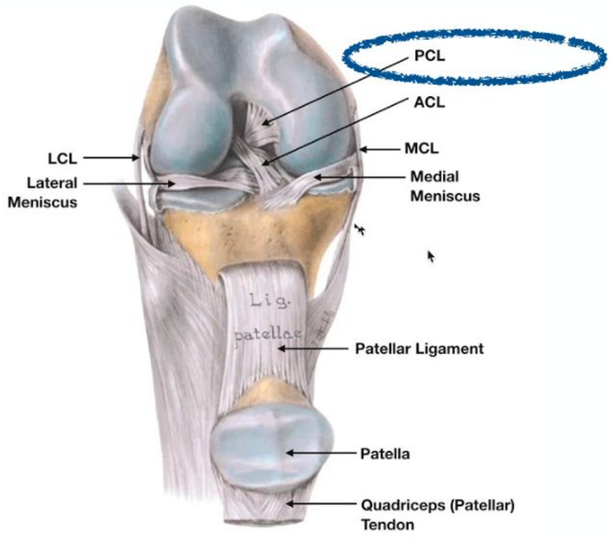
Posterior Cruciate Ligament

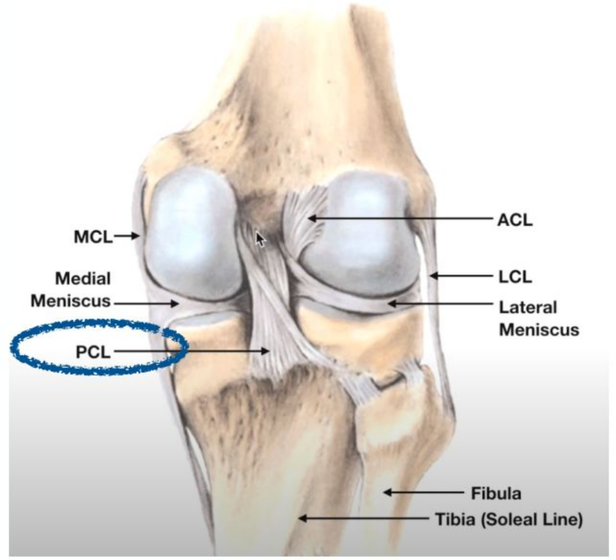
Origin: Anterior part of the lateral side of the medial condyle of the femur; passes superiorly & anteriorly on the medial side of the anterior cruciate ligament.

Insertion: on the posterior part of the medial side of the intercondylar area of the tibia

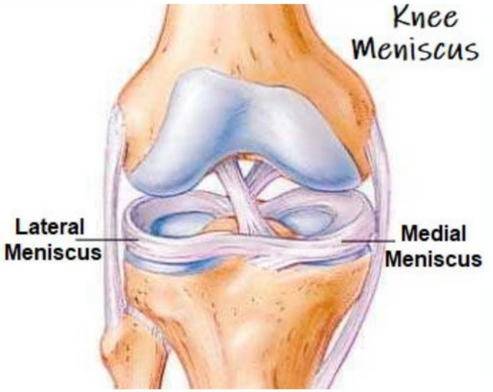
Function: Prevents anterior displacement of the femur on the tibia; or prevents posterior displacement of the tibia. Primary stabilizer of a flexed knee







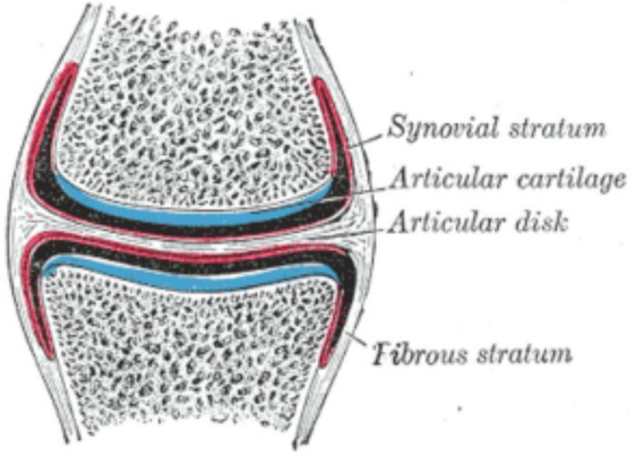
Articular Disc of Synovial Joints



Articular Discs (menisci; singular meniscus): crescent-shaped pads of fibrocartilage that lie between the articular surface of bones and attached to the fibrous capsule.
Examples: Medial and lateral meniscus (knee joint)

The discs divide the synovial cavity into two spaces, allowing movements to occur in each space. This will also happen (different movements in compartments of the temporomandibular joint)

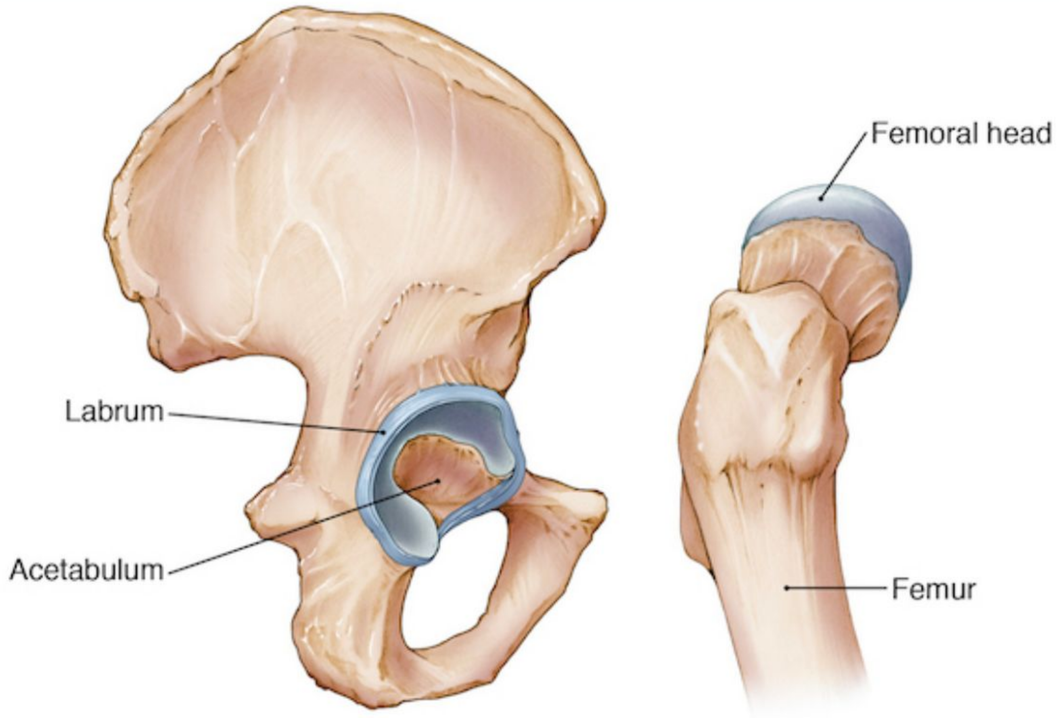
Functions of menisci (not completely understood)
1. shock absorption
2. a better fit between bony surfaces
3. provides adaptable surfaces for combined movements
4. weight distribution over a greater contact surface
5. distribution of synovial lubricant across articular surfaces of the joint



Labrum of Synovial Joints

Fibrocartilaginous lip that extends from the edge of the joint socket.

Location: in ball and socket joints (shoulder and hip)
Function: helps deepen the joint socket and the ball-like surface of the head of the humerus or femur



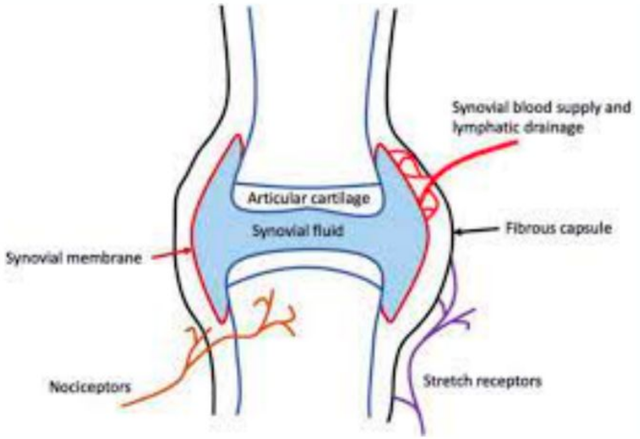
Nerve & Blood of Synovial Joints

Nerve Supply

Nerves that supply the joint are the same that supply the skeletal muscles that move the joint.

Contain many nerve endings distributed to the articular capsule and associated ligaments

Functions:
1. Convey pain info from joint to spinal cord and brain
2. Sends impulses through different nerves to mm to adjust body movements



Blood Supply

Arterial

Mostly avascular, arteries in the vicinity send out numerous branches that penetrate ligaments and articular capsule to deliver oxygen and nutrients.

Branches from several different arteries generally merge around a joint before penetrating the articular capsule.

Venous

Remove CO_2 and wastes from joints

Note: Chondrocytes in articular cartilage of a synovial joint **receive oxygen and nutrients from synovial fluid derived from blood.** All other joints are supplied directly by capillaries.
CO_2 + H_2O pass from chondrocytes of articular cartilage → synovial fluid → veins.
CO_2 & Wastes from all other joint structures → directly into veins.

Types of Movement at Synovial Joints

Angular Movements

There is an increase or decrease in the angle between articulating bones.

Major movements are in respect to anatomical position:

Flexion — [Decrease in the angle between articulating bones; most movement along the sagittal plane]

Extension — [increase in the angle between articulating bones; most movement along the sagittal plane]
VIDEO: Flexion & Extension

Lateral flexion — [movement of the trunk (waist) or head, sideways to the left or right; movement along frontal plane]
VIDEO: Lateral Flexion

Hyperextension — [continuation beyond the anatomical position] [example: backbend]
VIDEO: Hyperextension of the hand

ABduction --[movement away from the midline of the body]

Adduction — [movement toward the midline of the body]
VIDEO: ABduction & ADduction

Circumduction — [movement of the distal part of the body in a circle]
VIDEO Circumduction

Gliding

Back & Forth or ***side to side*** movement
There is no alteration in the angle of the bones
Can be combined with rotation
(Examples: Intercarpal/Intertarsal Joints)
VIDEO

Rotation

A bone revolves around its own longitudinal axis; All are relative to the midline
Ex: atlanto-axial joint (Turning the head from side to side)
Ex: Turning trunk from side to side (intervertebral joints)

VIDEO
Medial (internal rotation): Anterior surface of the bone of the limb is turned toward the midline

Lateral (External rotation): Anterior surface of the bone of a joint is turned away from the midline. VIDEO

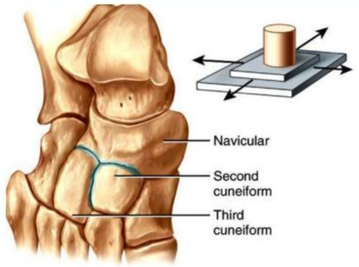
Special Movements (VIDEO)

Elevation: (movement of a body part superior: ex: shrugging shoulders)
Depression: (inferior movement of a body part ex: opening the mouth or depression of the mandible)
Protraction: (movement of a body part anteriorly in the transverse plane: ex: protraction of the mandible)
Retraction: (movement of a protracted body part back to the anatomical position)
Inversion: (movement of the sole medially at the intertarsal joints)
Supination (inversion + plantar flexion)
Eversion: (movement of the sole laterally at the intertarsal joints)
Pronation: (eversion + dorsiflexion)
Dorsiflexion: (bending of the ankle or talocrural joint (between tibia, fibula and talus) in the direction of the talus)
Plantarflexion: (bending of the foot at the ankle joint in the direction of the plantar or inferior surface-standing on toes)
Supination: (movement of the forearm and distal radioulnar joints in which the palm is turned anteriorly. Palm facing up)
Pronation: movement of the forearm at the proximal and distal radioulnar joints in which the distal end of the ulna and palm is turned posteriorly.
Opposition: movement of the thumb at the metacarpal joint in which the thumb moves across the palm to touch the fingers of the

Characteristics

- + Synovial Cavity (joint cavity between articulating bones)
- Allows considerable movement at a joint. (All synovial joints are freely mo

Types of Synovial Joints



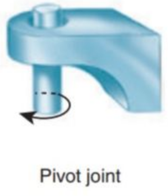
Planar Joints

Description: articulated surfaces (flat or slightly curved)
Function Classifications:
Biaxial diarthrosis (freely movable)
Movement: back and forth; side to side
Some Triaxial diarthroses:
Movement: back and forth; side to side; rotation


Hinge joint

Hinge Joints

Description: Convex surface fits into concave surface
Functional Classification(s): Uniaxial diarthrosis (flexion-extension)
Example: Knee (modified hinge), elbow, ankle and interphalangeal joints


Pivot joint

Pivot Joints

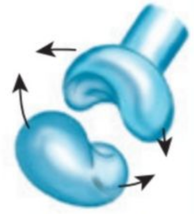
Description: Rounded or pointed surface fits into a ring formed partly by bone and partly by ligament
Functional Classification: uniaxial diarthrosis (rotation)
Example: atlanto-axial ad radio-ulnar joints

Condyloid Joints

Description: oval-shaped projection fits into oval-shaped depression
Functional Classifications: biaxial diarthrosis:
flexion-extension, abduction-adduction
Example: radiocarpal & metacarpophalangeal joints

Saddle Joints

Description: articular surface of one bone is saddle-shaped; articular surface of the other bone "sits" in the saddle
Functional Classification: biaxial diarthrosis: flexion-extension, abduction-adduction
Example: Carpometacarpal joint between trapezium and metacarpal of the thumb


Saddle joint

Ball & Socket Joints

Description: ball-like surface fits into cup-like depression
Functional Classification: triaxial diarthrosis: flexion-extension, abduction-adduction, rotation
Example: Hip and shoulder joints

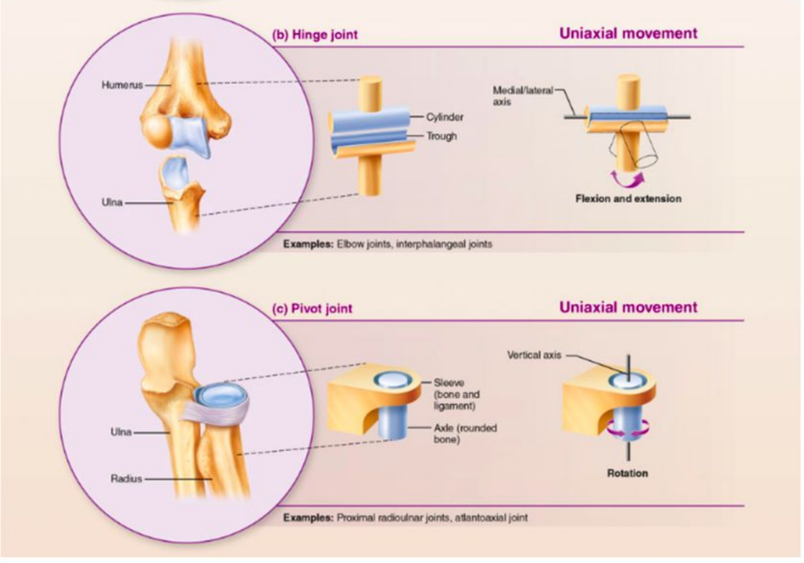

Ball-and-socket joint

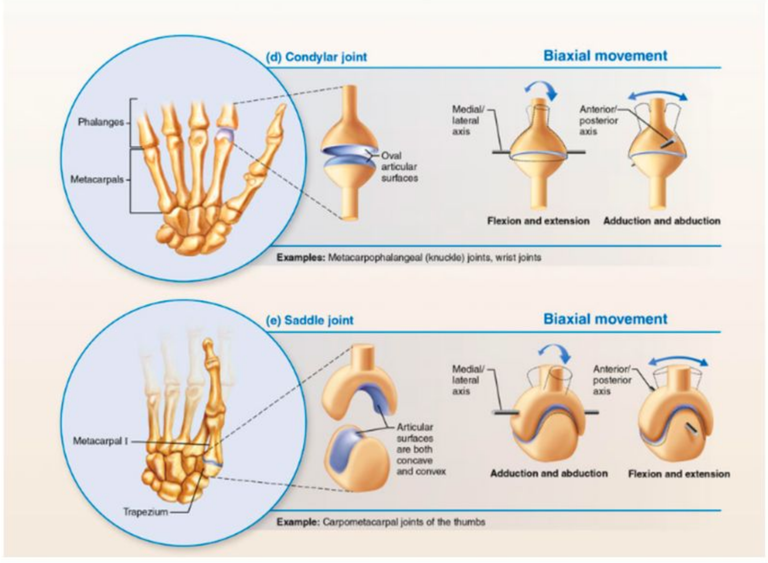
Types of Motion at Synovial Joints

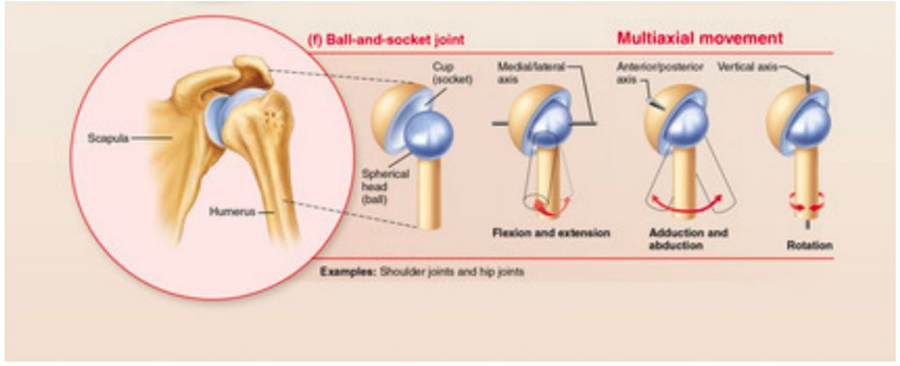
Uniaxial
Motion around a single axis
(Usually just flexion and extension)

Biaxial
Motion around two axes
(flexion and extension + aBduction & aDduction)

Triaxial
Motion around a three axes
(Flexion + extension, ABduction + aDduction and rotation)







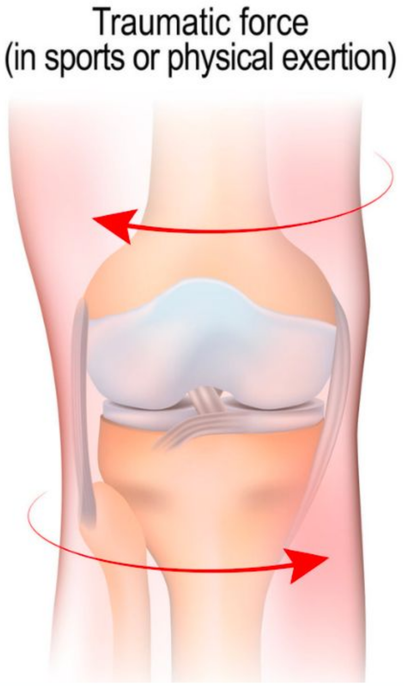
Clinical Correlations: Torn Cartilage & Arthroscopy

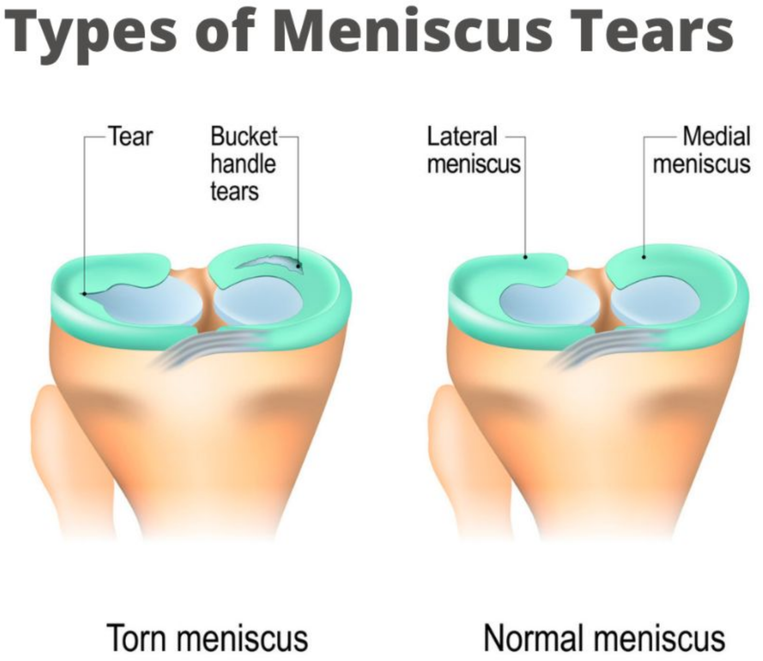
Torn meniscus: tearing of the cartilage in the knee (common in athletes). Damaged cartilage begins to wear. Arthritis begins to develop, unless there is a surgical repair.

Current procedure is a *partial meniscectomy:* only torn segments of the meniscus is removed.

Surgical repair is done by arthroscopy. This involves a procedure by using instrument-assisted examination of the interior of a joint (usually the knee). There is a lighted, pencil-thin fiber optic camera used for visualizing the nature and extend of the damage.

Arthroscopy can also be used:
1. Monitor the progression of disease and the effects of therapy.
2. Insertion of surgical instruments through incisions enable a physician to remove torn cartilage and repair cruciate ligament in the knee.
3. Obtain tissue samples for analysis
4. Perform surgery in other joints (ie: shoulder, elbow, ankle and wrist)





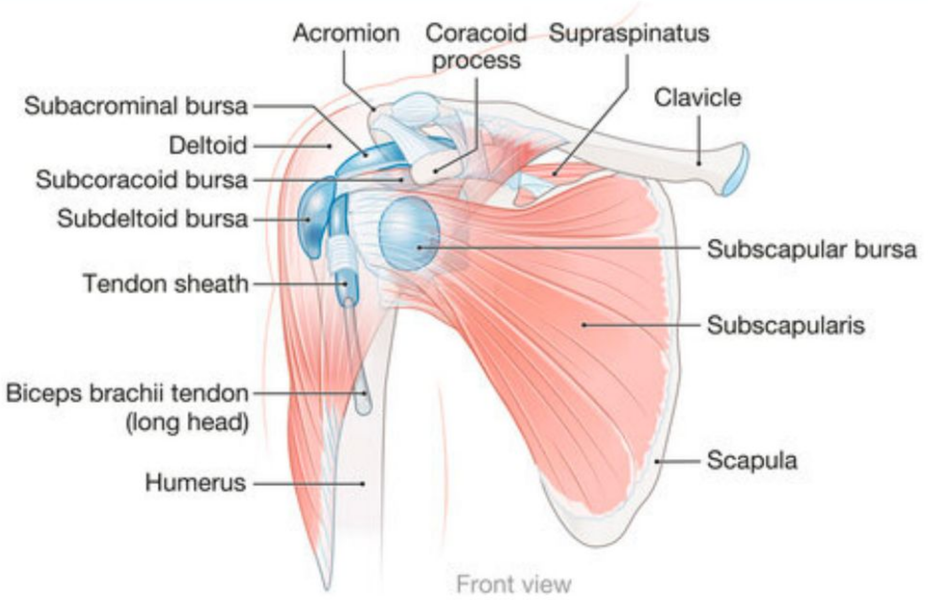
Bursae

Bursae: sac-like (purse-like) structures, strategically situated to alleviate friction in some joints (shoulder/knee).

These are not strictly part of synovial joints, but they do resemble joint capsules because the walls consist of an outer fibrous membrane of thin, dense CT lined by a synovial membrane. They are filled with a small amount of fluid (similar to synovial fluid).

Location: between skin and bones, tendon and bones, muscles and bones or ligaments and bones

Function: cushion the movement of these body parts against one another



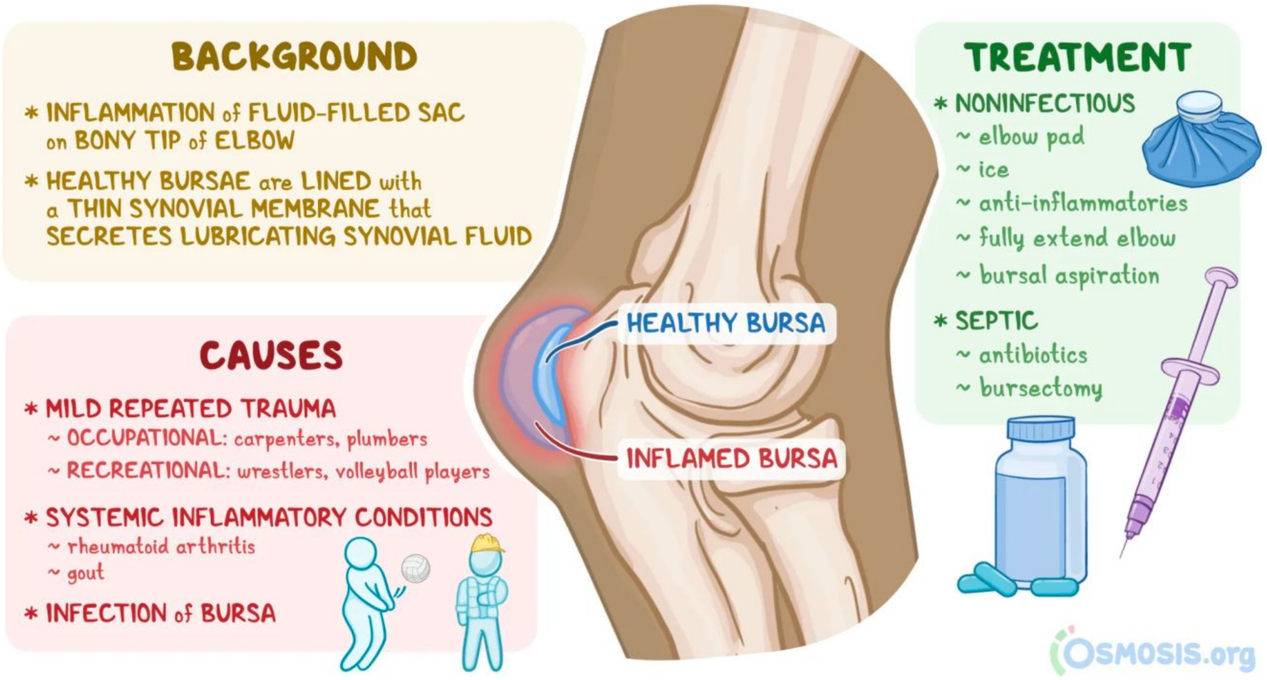
Clinical Correlations: Bursitis

Definition: acute or chronic inflammation of a bursa

Possible Causes:
1. Irritation from repeated, excessive exertion of a joint.
2. Acute or chronic infection (syphilis, tuberculosis)
3. Rheumatoid Arthritis

Symptoms:
1. Pain
2. Swelling
3. Tenderness
4. Limited movement

Treatment: oral anti-inflammatory agents and injections of cortisol-like steroids.



Tendon Sheaths

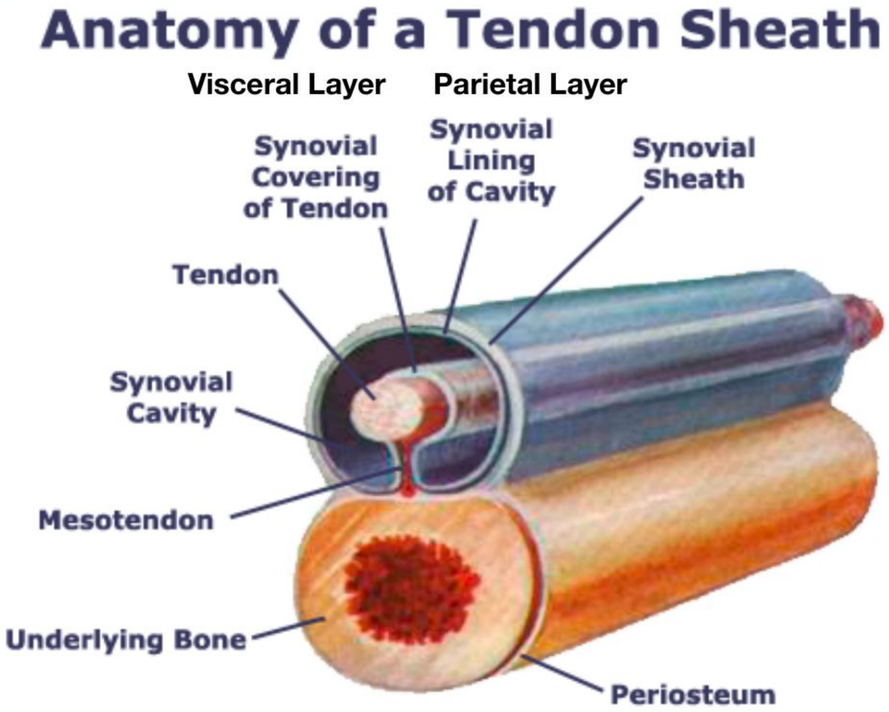
Tendon sheaths (synovial sheaths): tube-like bursae that wrap around certain tendons that experience considerable friction as they pass through tunnels formed by CT and bone

There are two layers:
1. *Visceral Layer:* the inner layer of the tendon sheath (attached to the surface of the tendon)
2. *Parietal Layer:* the outer layer of the tendon sheath (attached to bone)

Between the layers is a thin film of synovial fluid.

Function: reduce friction at joints by protecting all sides of the tendon as it slides back and forth

Locations:
1. *Wrist* (tendons come together in a confined space)
2. *Ankle* (tendons come together in a confined space)
3. *Fingers/toes* (where there is a lot of movement)
4. *Tendon of Biceps brachii* (where tendons pass through synovial cavity)



Factors Affecting Contact and Range of Motion at Synovial Joints

ROM (Range of motion) is measured in degrees of a circle, through which bones of a joint can be moved.
1. Structure & Shape of the articulating bones
2. Strength and tension (tautness) of the joint ligaments
3. Arrangements and tension of the muscles
4. Contact of soft parts
5. Hormones
6. Disuse

Structure & Shape of the articulating bones [spatial relationship/how close they are together]

Strength & tension of the joint ligaments [tense ligaments restrict ROM and direct the movement of the articulating bones with respect to each other]

Arrangement & tension of the muscles [muscle tension reinforces the restrained placed in a joint by ligaments, restricting its movement]

Contact of soft parts [The point at which one body surface contacts another may limit mobility]

Hormones [*relaxin*, pregnancy hormone produced by the placenta and ovaries increases flexibility of fibrocartilage of the pubic symphysis and looses ligaments between hip-bone, coccyx toward the end of pregnancy.

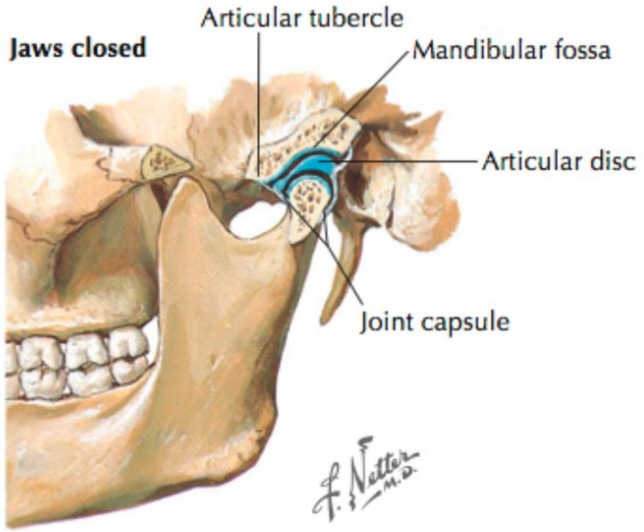
Disuse [movement at a joint may be restricted if a joint has not been used for an extended period of time. Can be restricted by decreased amounts of synovial fluid, diminished flexibility of ligaments and tendons and muscular atrophy or wasting in the size of the mm]

Temporomandibular Joint

Combined hinge and plane joint formed by the following structures:
1. Mandibular fossa
2. Mandible
3. Articular Tubercle of the Temporal bone

Only freely moveable joint between the skull bones *(exception: ear ossicles)*

All other skull joints are suture and are either **immovable or slightly immovable**

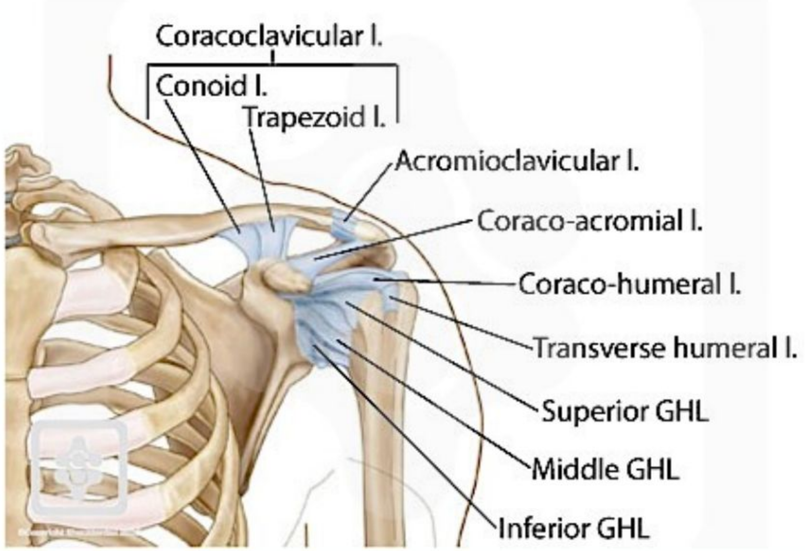


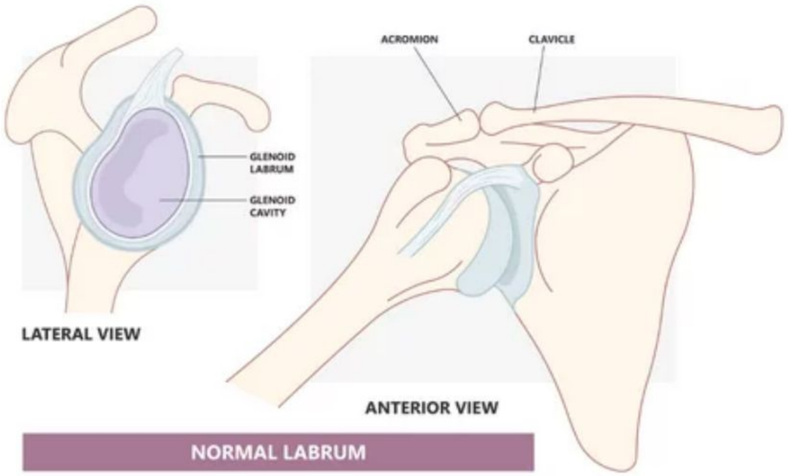
Glenohumoral (Shoulder) Joint

Definition: Ball & Socket formed by the head of the humerus and the glenoid cavity of the scapula. [aka: glenohumoral joint]

Anatomical Components:

1. **Articular capsule** [thin, loose sac that envelopes the shoulder joint and extends from the glenoid cavity to the anatomical neck of the humerus]
2. **Coracohumeral ligament** [strengthens the superior part of the articular capsule; extends from the coracoid process of the scapula to the greater tubercle of the humerus. *F:* strengthens the superior part of the articular capsule and reinforces the anterior aspect of the articular capsule.]
3. **Glenohumeral ligaments** [3 thickenings of the articular capsule over the anterior surface of the joint; extends from glenoid cavity to lesser tubercle and anatomical neck of the humerus; often indistinct ligaments; minimal strength. *Function: joint stabilization when* the humerus approaches or exceeds the limits of motion.
4. **Transverse humeral ligament** [Narrow sheet extending from greater tubercle to the lesser tubercle of the humerus. Function: retinaculum to hold the long head of the biceps tendon.]
5. **Glenoid labrum** [narrow rim of fibrocartilage around the edge of the glenoid cavity that slightly deepens and enlarges the glenoid cavity.

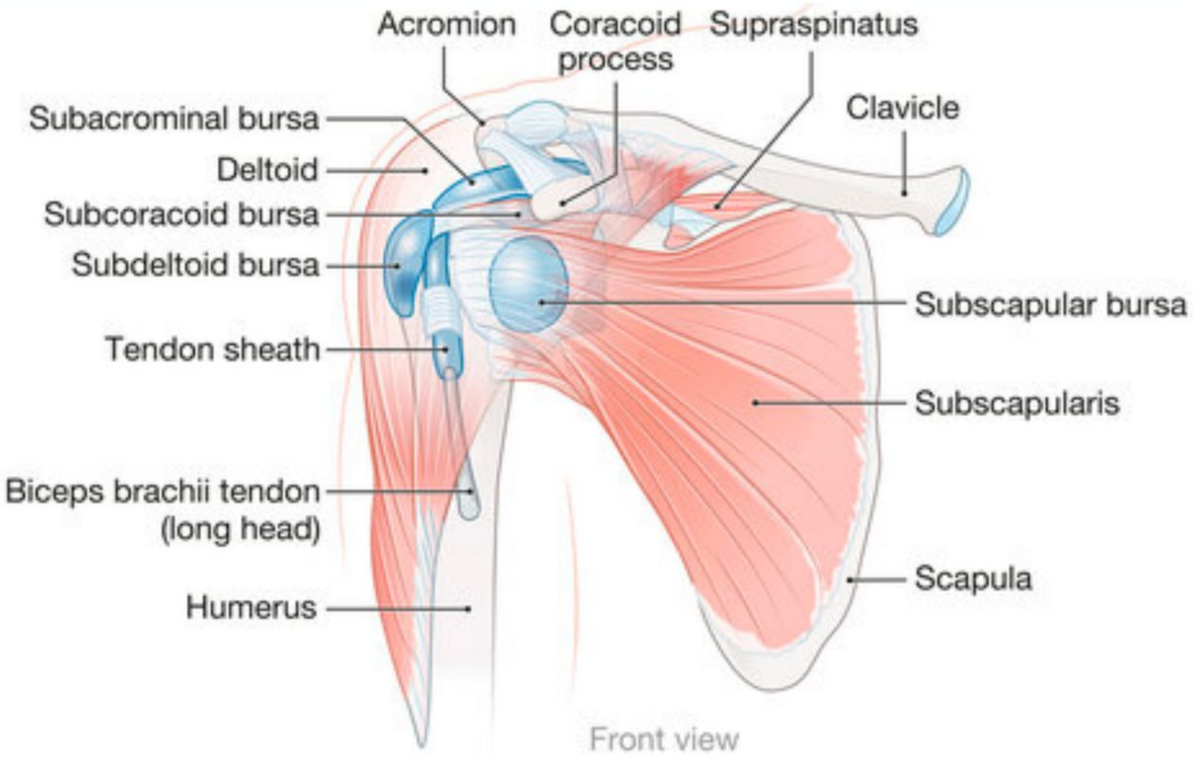




Glenohumoral (Shoulder) Joint

Bursae [five bursae associated with the shoulder joint]

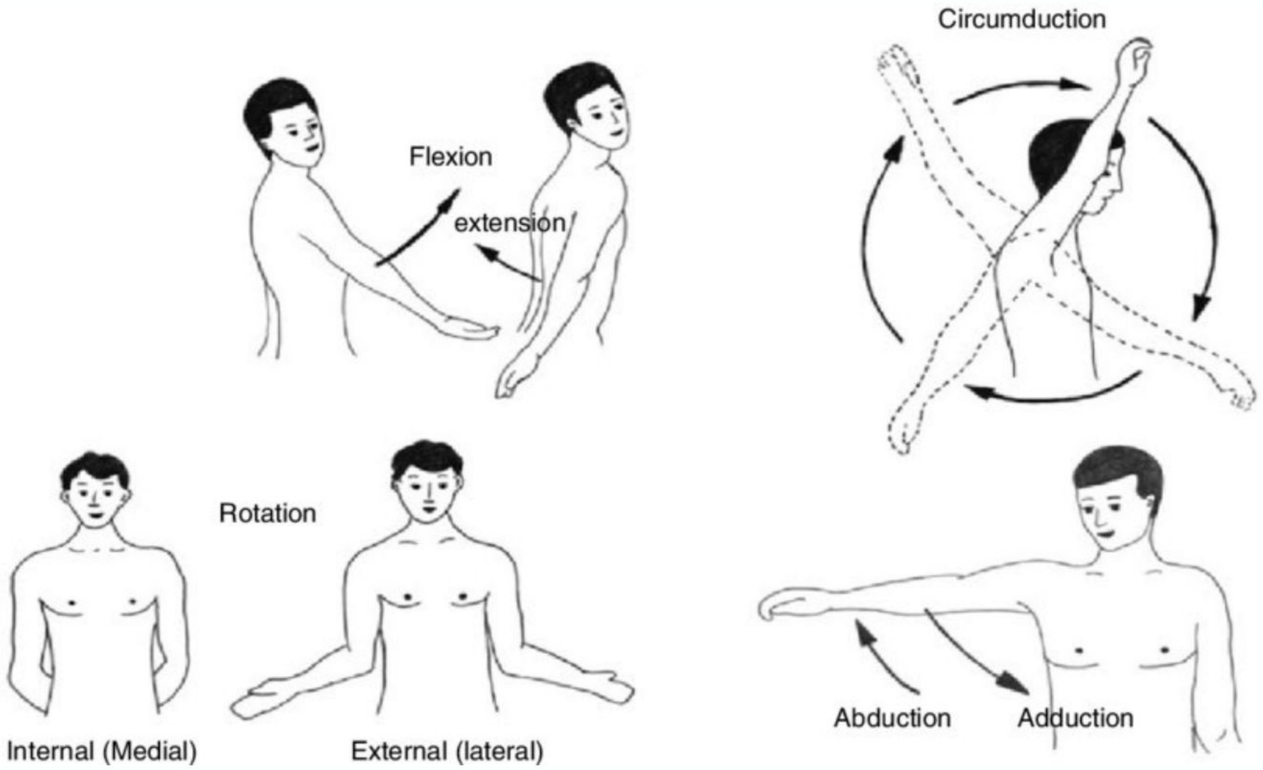
1. Subscapular bursa
2. Subdeltoid bursa
3. Subacromial bursa
4. Subcoracoid bursa
5. (Supracoracoid) Coracoclavicular bursa



Glenohumoral (Shoulder) Joint

Movements at the Shoulder:

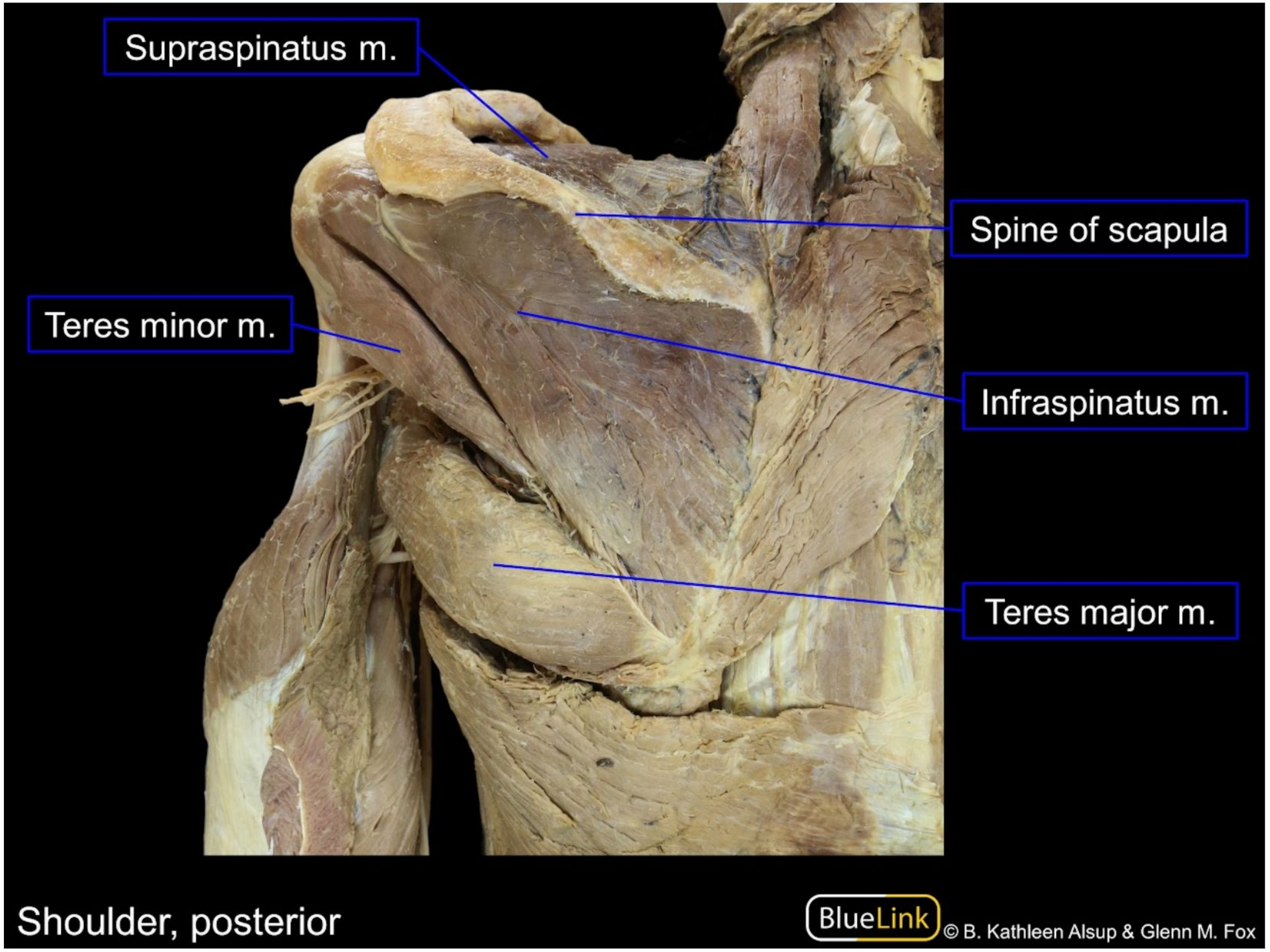
1. Flexion, extension, hyperextension, abduction, adduction, medial rotation, lateral rotation and circumduction.
2. Most freedom of any other joint in the body [*why? Loose articular capsule, shallow glenoid cavity relative to humeral head*]
3. Ligaments provide some strength, however the majority of the strength comes from the *rotator cuff muscles* of the shoulder.



Glenohumoral (Shoulder) Joint

Rotator cuff muscles (SITS Muscles) [hold the head of the humerus in the glenoid cavity]

1. Supraspinatus (Posterior)
2. Infraspinatus (Posterior)
3. Teres minor (Posterior)
4. Subscapularis (Anterior)



Elbow Joint

Definition: hinge joint formed by:
1. Trochlea
2. capitulum of the humerus
3. trochlear notch of the ulna
4. head of the radius.

Anatomical Components:

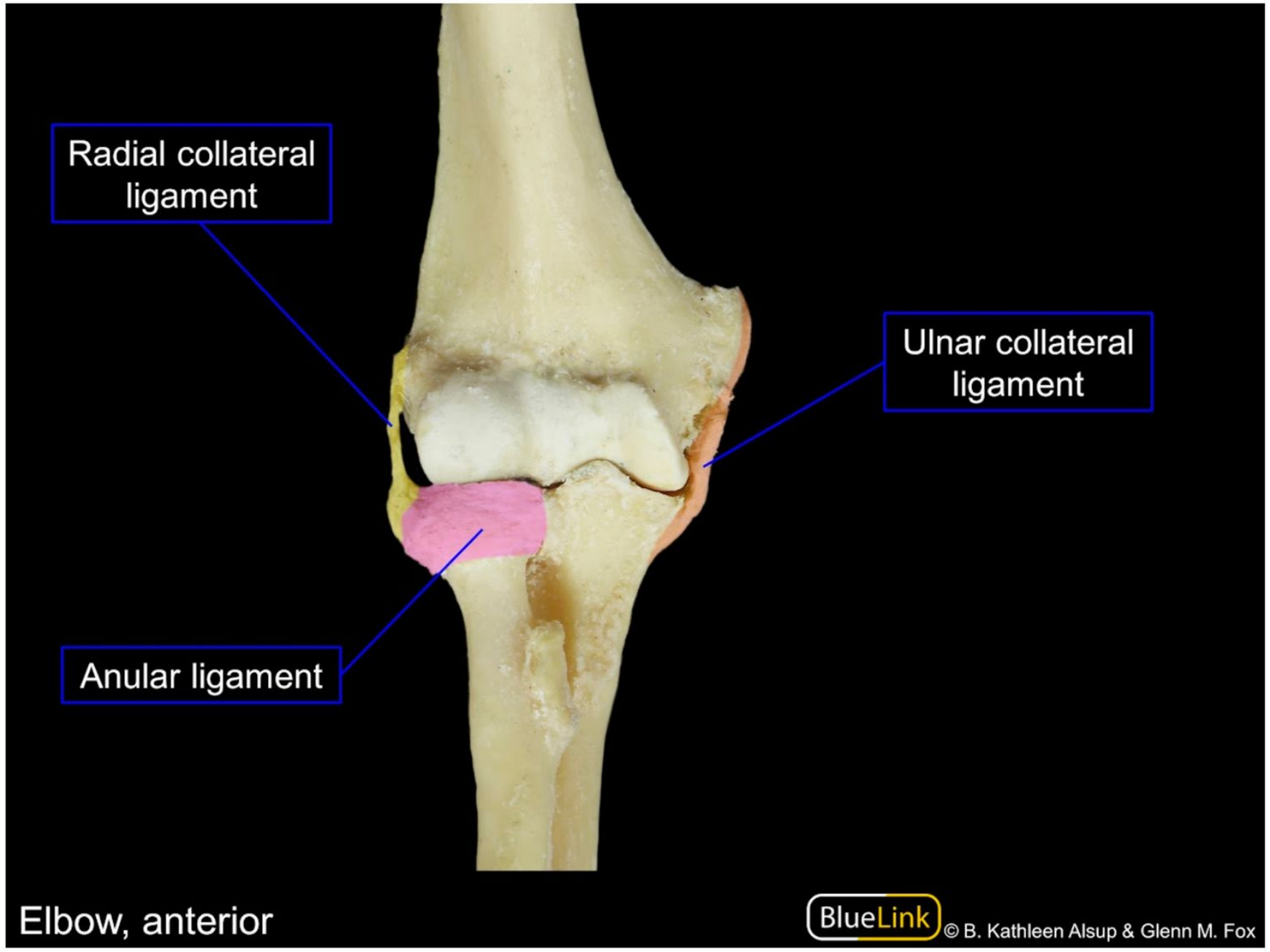
1. **Articular capsule**

[*anterior part:* covers the anterior part of the elbow joint, from the **radial and coronoid fossa** of the humerus to the **coronoid process of the ulna** and **annular ligament** of the radius.]

[*Posterior part:* from **capitulum, olecranon fossa, lateral epicondyle of the humerus to the annular ligament of the radius, olecranon of the ulna and the ulnar posterior to the radial notch**.] [This description will not be asked on an exam—It is here to help you if you need the visual borders of the articular capsule]

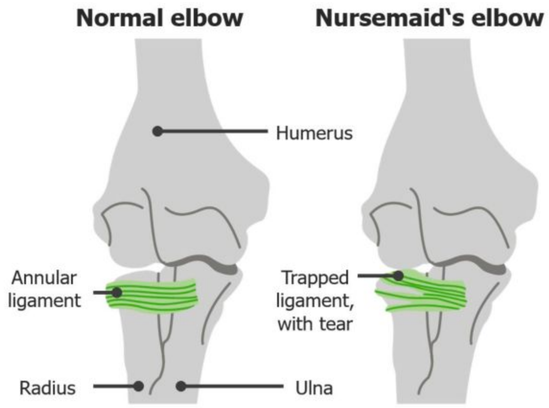
2. **Ulnar collateral ligament** [thick, triangular ligament that extends from the **medial epicondyle of the humerus** to the **coronoid process** and **olecranon of the ulna.** *Function*: deepens the socket for the trochlea of the humerus]
3. **Radial collateral ligament** [Strong, triangular ligament that extends from the **lateral epicondyle of the humerus** to the **annular ligament of the radius** and the **radial notch** of the ulna.]
4. **Anular ligament of the radius** [strong band that encircles the head of the radius. *Function*: holds the head of the radius in the radial notch of the ulna.

Movements: flexion and extension

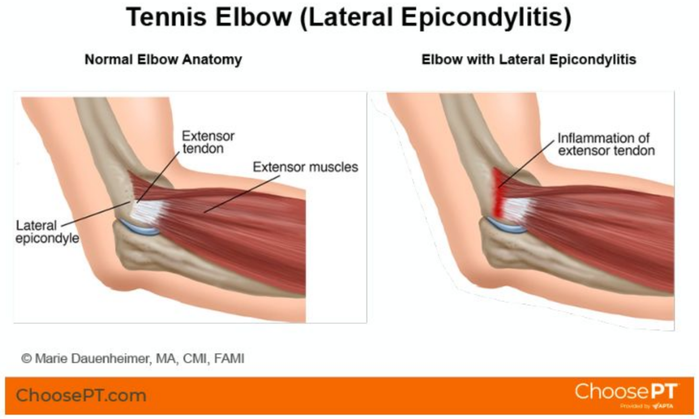


Clinical Correlations: Injuries at the Elbow Joint

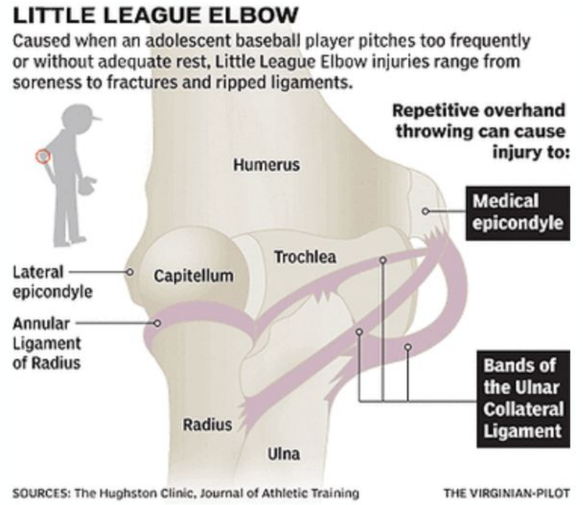
Nurse Maid's Elbow [Dislocation of the radial head past the radial annular ligament, found at the proximal radioulnar joint. Dislocation is most likely to occur when pulling on the forearms while extended and supinated-swinging with outstretched arms]

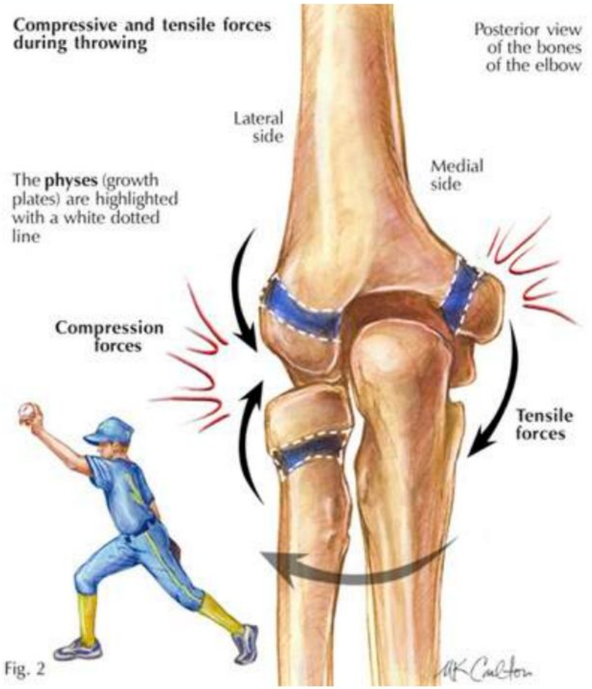


Tennis Elbow [pain at or near the lateral epicondyle of the humerus; extensor mm strain or sprain resulting in pain.]



Little League Elbow (Most often medial epicondylitis)
[inflammation of the medial epicondyle; elbow joint may enlarge, fragment or separate]



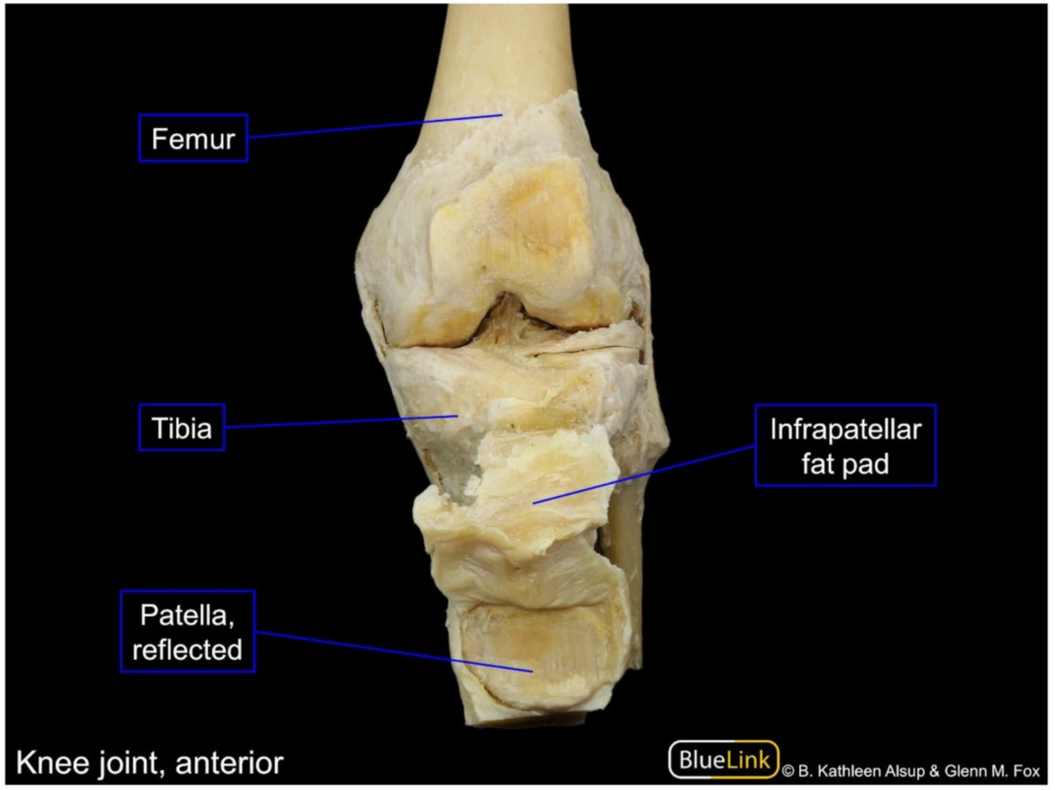


Knee Joint

KNEE JOINT
Definition: (Tibiofemoral joint): the largest and most complex joint of the body

Type: modified hinge joint [primary movement is uniaxial hinge movement]

Consists of three joints w/in a single synovial cavity:
1. **Laterally** [*tibiofemoral joint*] between the lateral condyle of the femur and the lateral meniscus & lateral condyle of the tibia (weight bearing bone of the leg)
2. **Medially** [*tibiofemoral joint*] between the medial condyle of the femur, medial meniscus & medial condyle of the tibia
3. **Intermediate** [*patellofemoral joint*] between the patella and the patellar surface of the femur



Knee Joint (Menisci)

Def: two fibrocartilage discs between the tibial and femoral condyles; compensate for the irregular shaped bones; circulate synovial fluid]

Articular Discs of the Knee

Medial Meniscus

[**C-shaped**]
Attachment sites:
- anterior intercondylar fossa of the tibia;
- anterior end to anterior cruciate ligament;
- posterior end attached to the posterior intercondylar fossa of the tibia between attachments of the posterior cruciate ligament and lateral meniscus

Lateral meniscus

[**O-shaped**]
Attachment sites:
- anterior end attached anteriorly to the intercondylar eminence of the tibia;
- laterally & posteriorly to the anterior cruciate ligament
- Posterior end attached posteriorly to intercondylar eminence of the tibia and anterior to the posterior end of the medial menisci.

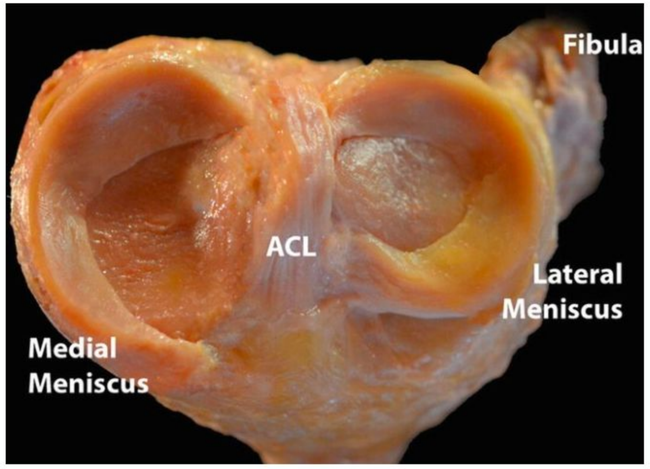


Image: Medial and lateral meniscus

Medial and lateral menisci are *attached to* ***each other*** by the *transverse ligament of the knee*.

Medial and lateral menisci are attached to the ***margins of the head of the tibia*** by the *coronary ligaments.*

Knee Joint (Ligaments)

Ligaments of the Knee

Intracapsular

Anterior Cruciate Ligament

[Extends posteriorly & laterally;
F: limits hyperextension of the knee and anterior sliding of the tibia on the femur. 70% of serious knee injuries is a result of tearing or stretching this ligament.

- Most commonly injured in women for several reasons (3-6x more common):
- Less space between femoral condyle=limited ACL movement
- Wider pelvis=greater angle between the femur and the tibia=increased risk for an ACL tear
- Female hormones=greater flexibility/relaxation of ligaments
- Less muscle strength

Posterior Cruciate Ligament

[extends anteriorly and medially;
F: prevents posterior sliding of the tibia with flexion of the knee. This is important in walking up/down stairs or at an incline.

Extracapsular Ligaments

Patellar Ligament

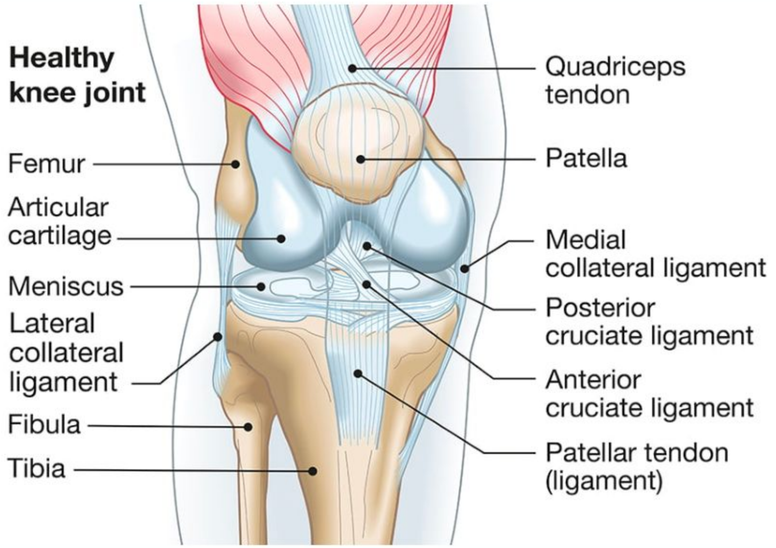
[continuation of the common tendon of insertion of the quadriceps femoris mm that extends from the patella to the tibial
Function: strengthens the anterior surface of the joint
Posterior surface of the ligament is separated from the synovial membrane of the joint by an infrapatellar fat pad.

Medial (Tibial) Collateral Ligament

[broad, flat ligament on the medial surface of the joint that extends from the medial epicondyle of the femur the medial condyle of the tibia.
F: Strengthens medial surface of the joint

Lateral (Fibular) Collateral Ligament

[round ligament from lateral condyle of femur lateral side of the head of the fibula;
F: Strengthens Lateral surface of the joint.



Note: There are more ligaments, but these are the only only ones I will have on your structure list.

Knee Joint (Injuries)

Injuries of the Knee

Swollen Knee

Immediate Swelling

immediate to hours after injury [cause of swelling: damaged blood vessels leak blood into the adjacent areas of exact injuries: torn meniscus, ACL rupture, damage to synovial membranes, fracture, collateral ligament sprain

Delayed Swelling

excessive production of synovial fluid

Unhappy Triad

[knee injury that involves damage to three components of that knee at the same time]

Mechanism: knee gets a **lateral blow,** while foot is fixed on the ground [tearing of the tibial collateral ligament results in tearing of the meniscus]

Three components:
- tibial collateral ligament
- medial meniscus
- anterior cruciate ligament

Image: Injury at the medial meniscus, medial collateral ligament and the anterior cruciate ligament.

Knee Dislocation

Displacement of the tibia relative to the femur
- Most common type: anterior (cause: hyperextension of the knee)
- Frequent cause of damage to the popliteal artery: Knee dislocations

Treatment of knee injuries: PRICE or surgery

PRICE
- Protection
- Rest
- Ice
- Compression
- Elevation

Clinical Correlation: Rheumatism & Arthritis

Rheumatism

definition: **any painful disorder** of the supporting structures of the body (bones, ligaments, tendons, muscles) that is **not caused by infection or injury**

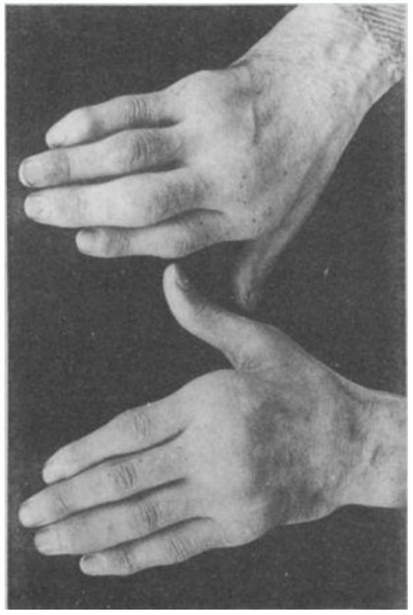


Image: Pannus seen in the hands caused by abnormal granulation tissue produced by the synovial membrane.

Arthritis

definition: **a form of rheumatism** in which joints are ***swollen, stiff, and painful.***

[Most leading cause of physical disability of in adults older than 65 yrs]

Osteoarthritis

Definition: progressive; degenerative joint disease in which joint cartilage is gradually lost.

Cause: The combination of aging, obesity, irritation of the joints, muscle weakness, abrasion/wear and tear.

Joints: most commonly found in **weight-bearing joints/synovial joints**

R*heumatoid arthritis*

Definition: autoimmune disease in which the body attacks its own tissues, in this case the cartilage and joint linings.
It will usually be bilaterally (both sides of the body), though not always to the same degree.

Primary symptoms: inflammation of synovial membrane [pain and tenderness of the joint].

Pannus: the abnormal granulation tissue produced by the synovial membrane. [This is what causes the distortion of the fingers]

Two major distinctions between osteoarthritis and rheumatoid arthritis:
1. Osteoarthritis affects large joints (knees, hips) secondary to wear and tear
2. Rheumatoid arthritis affects small joints and actively attack the cartilage

Clinical Correlation: Gouty Arthritis

Definition: sodium urate crystals deposit in the soft tissues of the joints, most commonly the feet (the base of the big toe). Crystals irritate and erode the cartilage.

Symptoms: inflammation, swelling and acute pain.

Eventually, it will destroy all joint tissue and the bone will fuse and become immovable.

Tx: *Pain relief:* Ibuprofen, naproxen, cholchine, cortisone; *Decrease uric acid levels:* allopurinol.