ARTICULATIONS IN THE BODY

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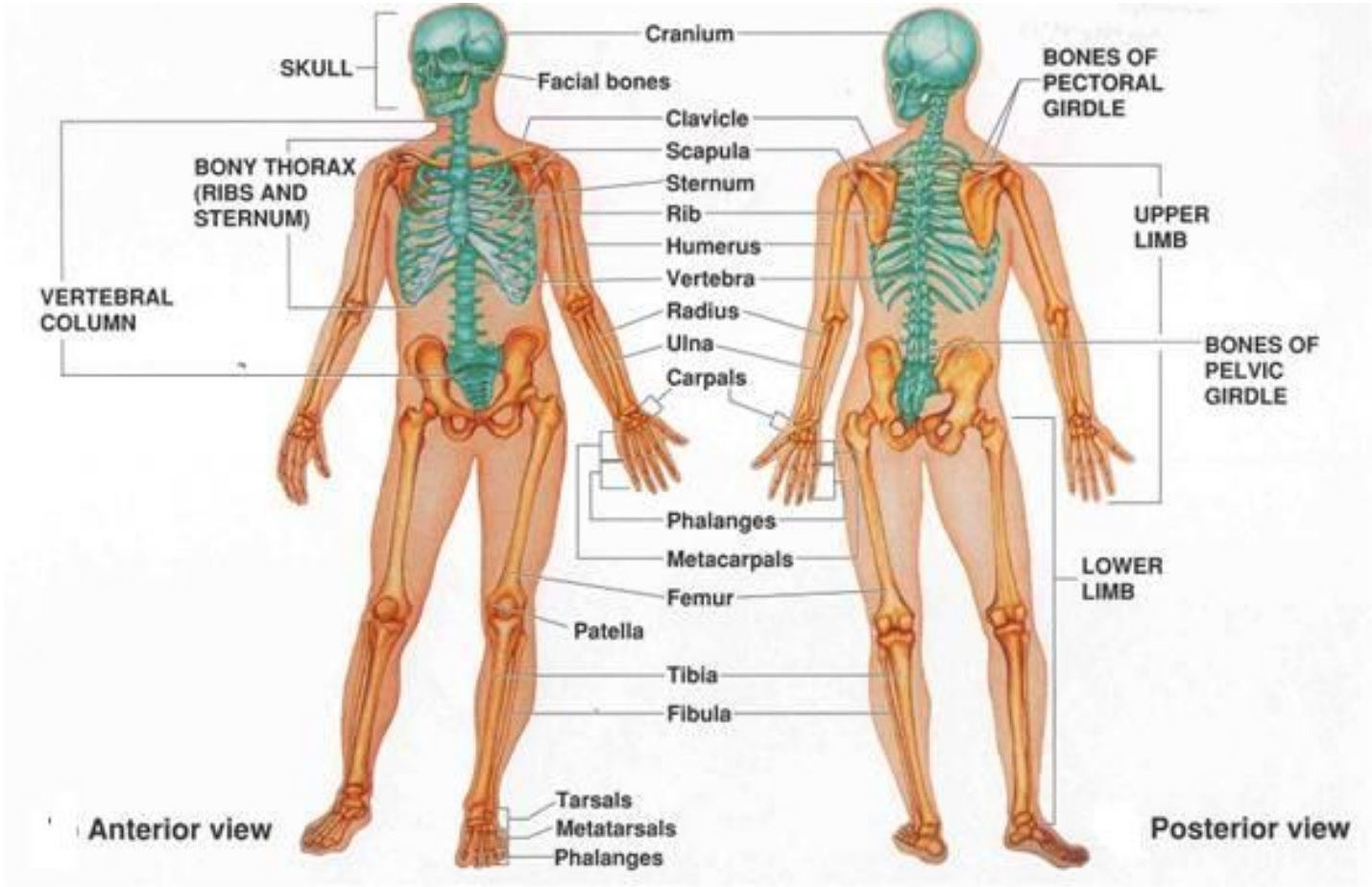
14. October.2014 Tuesday

ARTHROLOGY

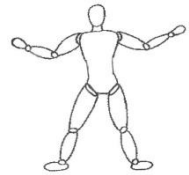
GREEK A RQRON JOINT –LOGY

science concerned with the
anatomy, function, dysfunction and treatment of joints.



- Joints (articulations)

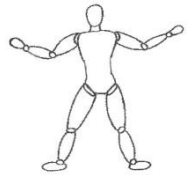
unions or junctions between two or more bones or rigid parts of the skeleton



- Whether or not movement occurs still called a joint.
- Some joints have no movement

- Others only slight movement
- Some freely movable

Classification of Joints



according to the tissues that lie between the bones:

1) **Fibrous joints**

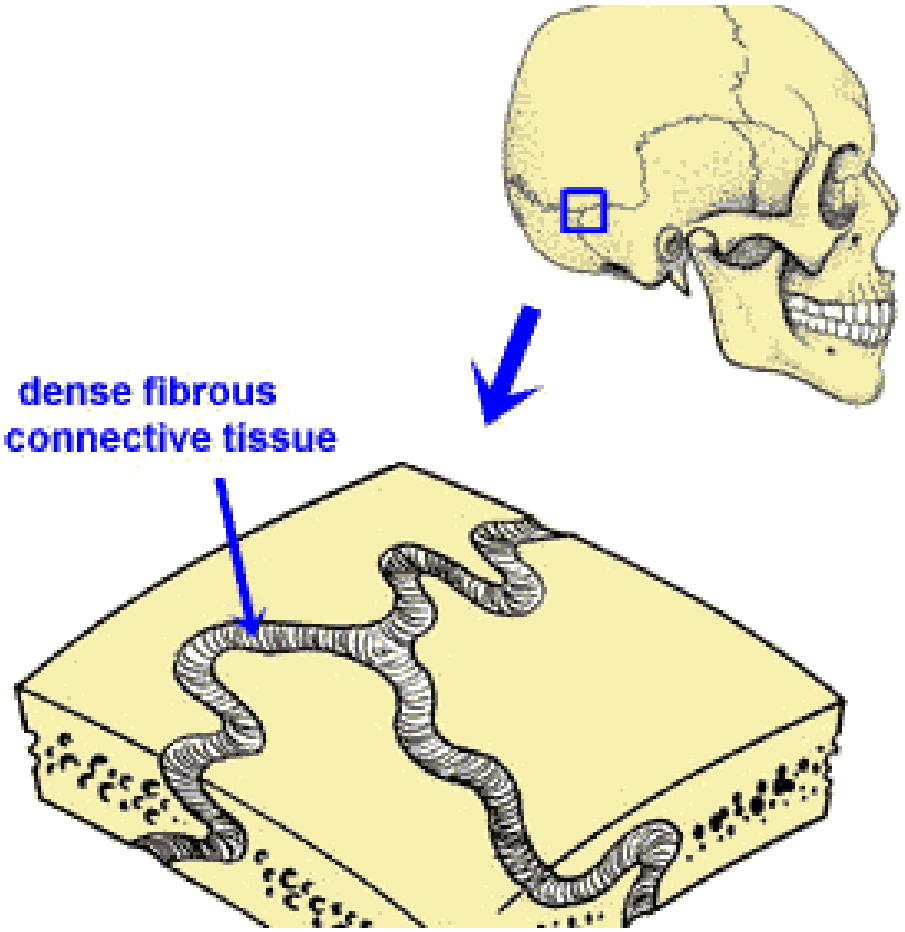
2) **Cartilaginous joints**

3) **Synovial joints**

Fibrous joints

Bones are united by fibrous tissue.

Sutures of the cranium



Fibrous joints

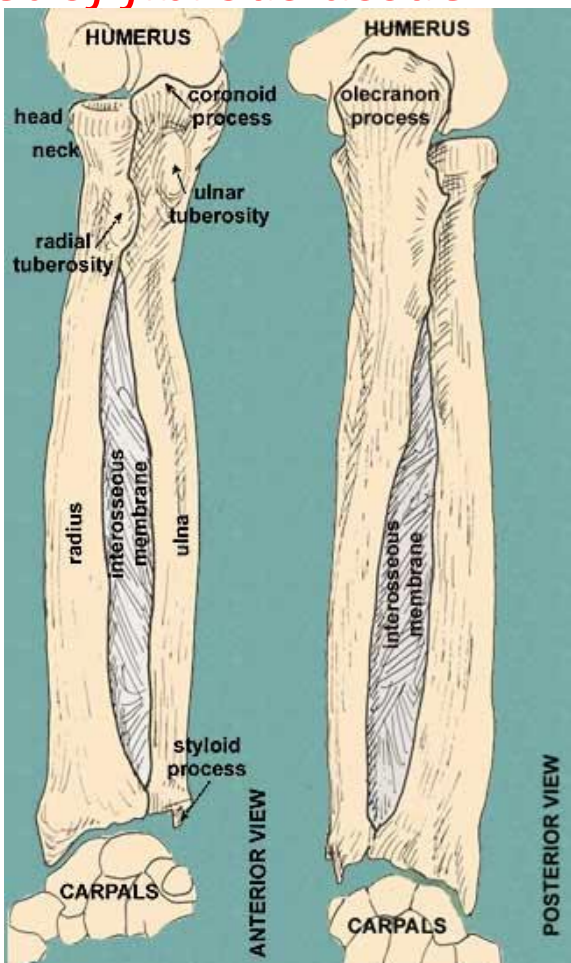
Syndesmosis type of fibrous joint

unites the bones with a sheet of fibrous tissue

either a ligament or a fibrous membrane

partially movable

The interosseous membrane in the forearm is a sheet of fibrous tissue that joins the radius and ulna in a syndesmosis.



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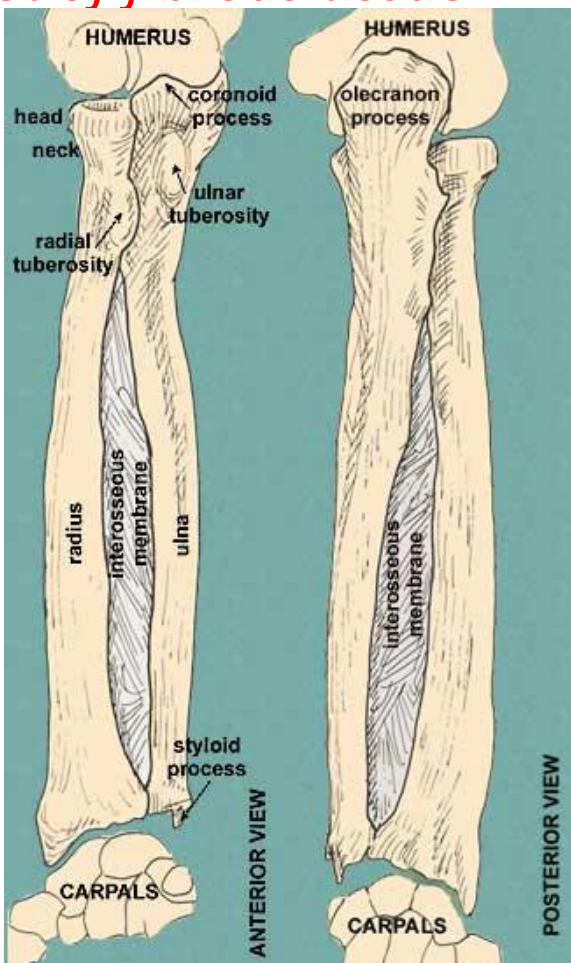
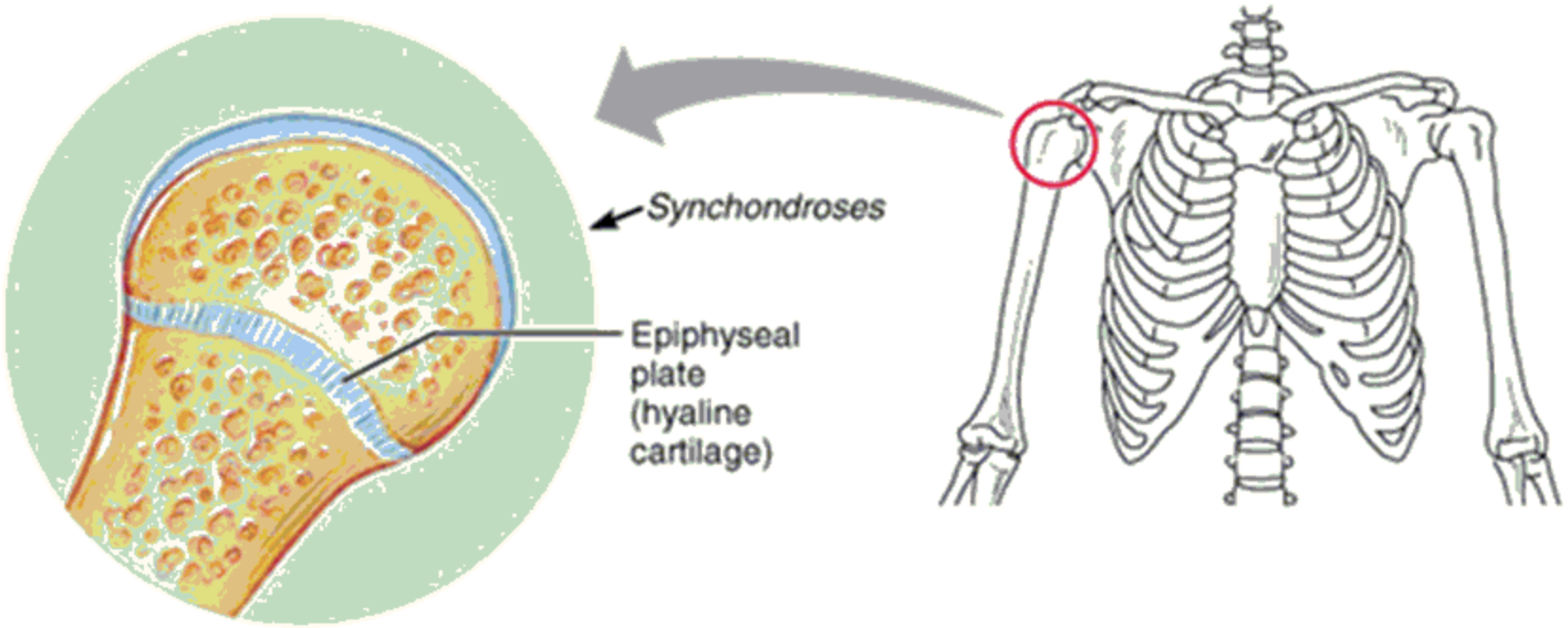
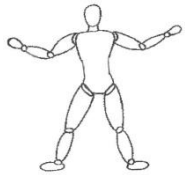


Cartilaginous joints

Bones are united by hyaline cartilage or fibrocartilage.



Cartilaginous joints

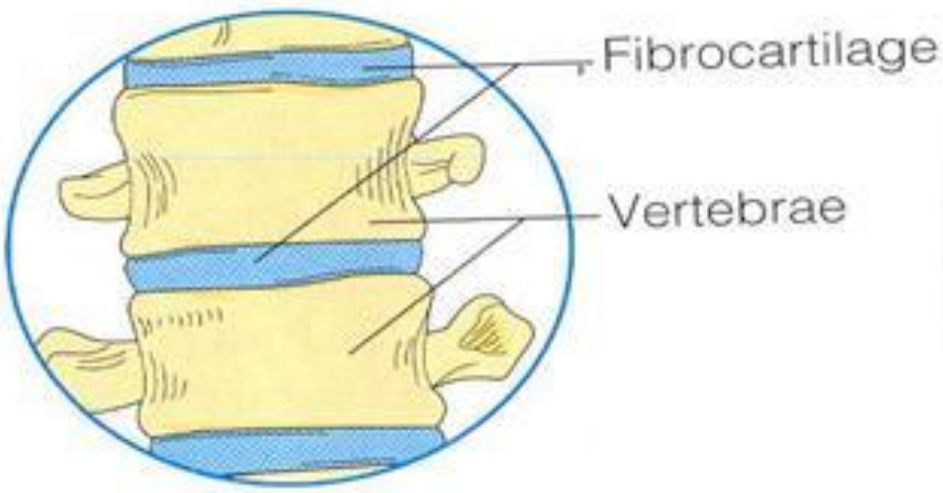


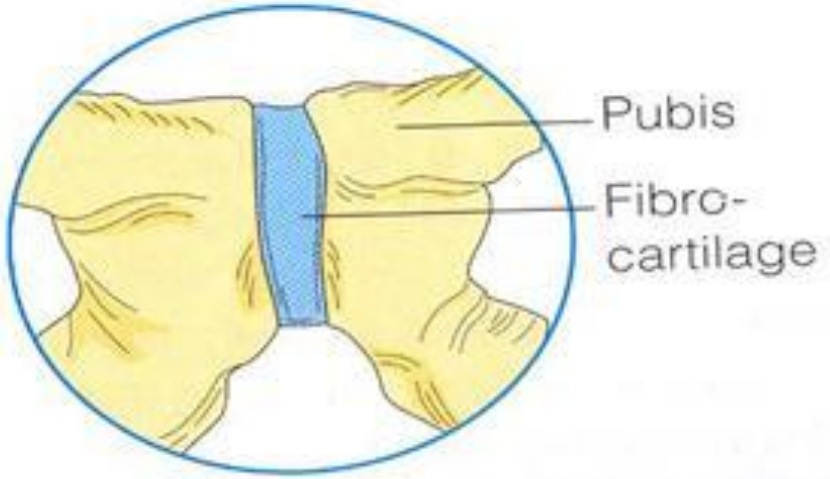
Pimary cartilaginous joints-**synchondroses**

hyaline cartilage- growth of a bone during early life

Secondary cartilaginous joints-**symphyses**

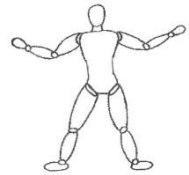
strong, slightly movable joints united by fibrocartilage



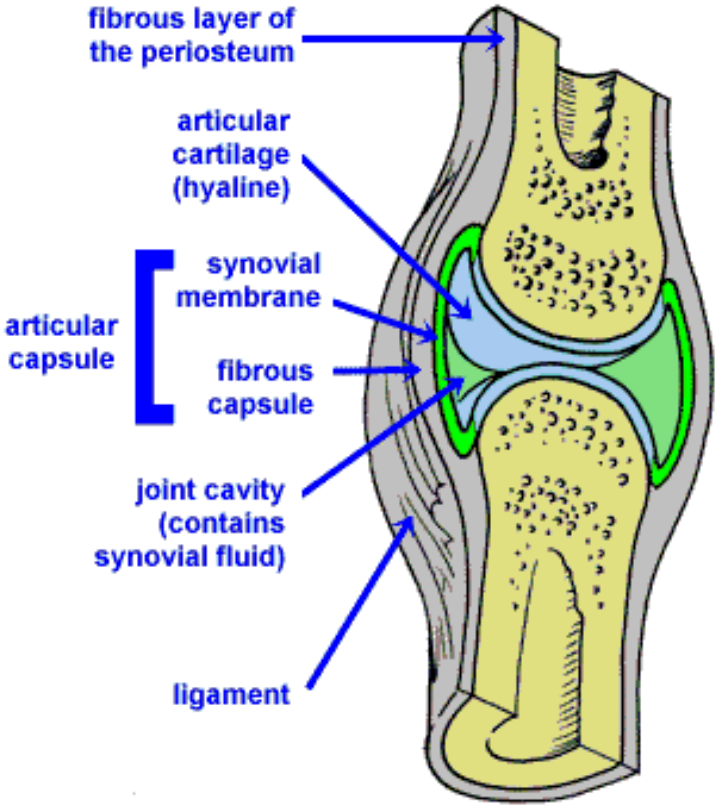


Synovial joints

Most common type of joints



- Bones united by a joint capsule enclosing an articular cavity.
- Provide free movement between the bones they join.



Joint cavity

potential space

contains lubricating synovial fluid, secreted by the synovial membrane.

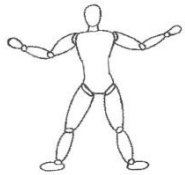
Articular cartilage

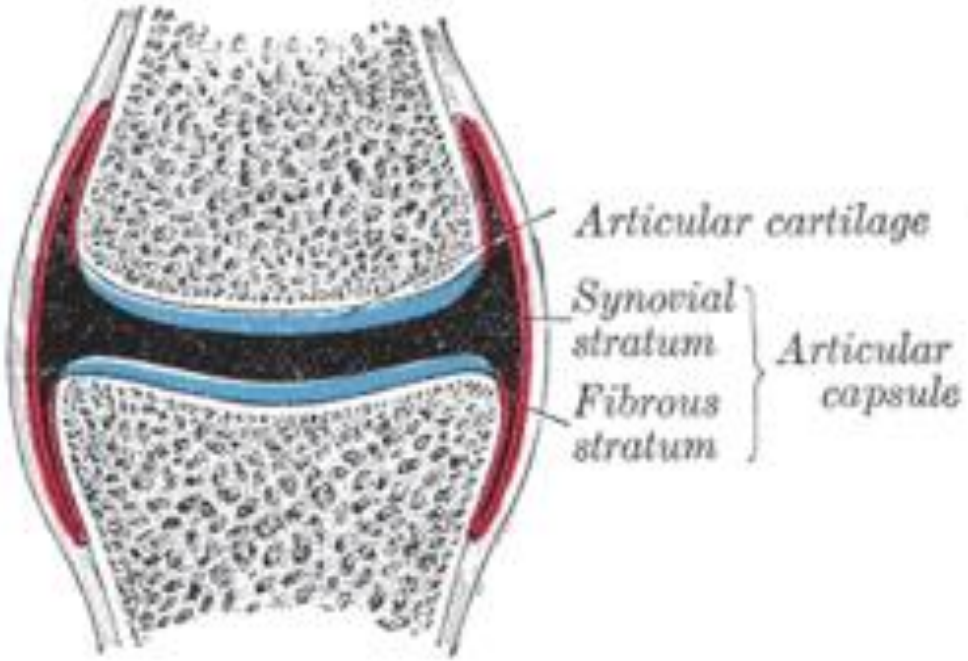
articular surfaces are covered by hyaline cartilage

Articular capsule

surrounds the joint and formed of two layers.

Articular capsule:
surrounds the joint
two layers.
Fibrous capsule
Synovial membrane

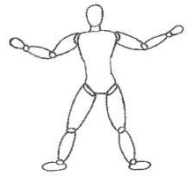




Some synovial joints have other distinguishing features, such as a fibrocartilaginous **articular disc or meniscus**, which are present when the articulating surfaces of the bones are incongruous.

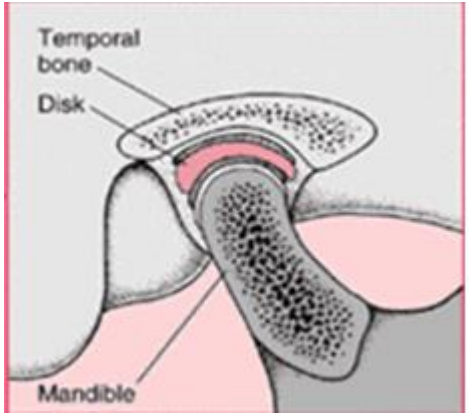
Ligaments

a cord or band of connective tissue uniting two structures.

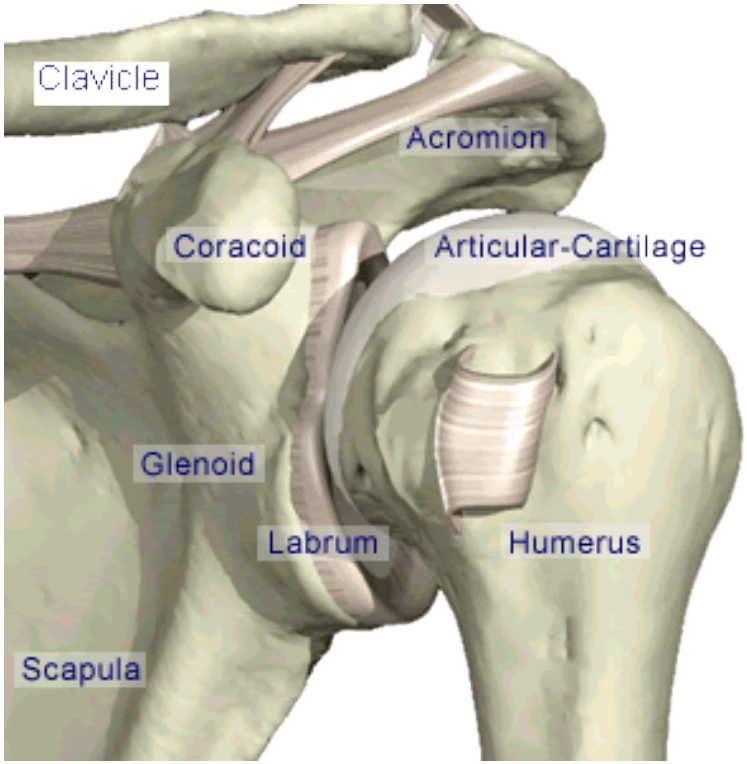


- Articular capsules are usually strengthened by articular ligaments.
- Connect the articulating bones to each other.
- limit the undesired and/or excessive movements of the joints.

Articular disc: Help to hold the bones together.

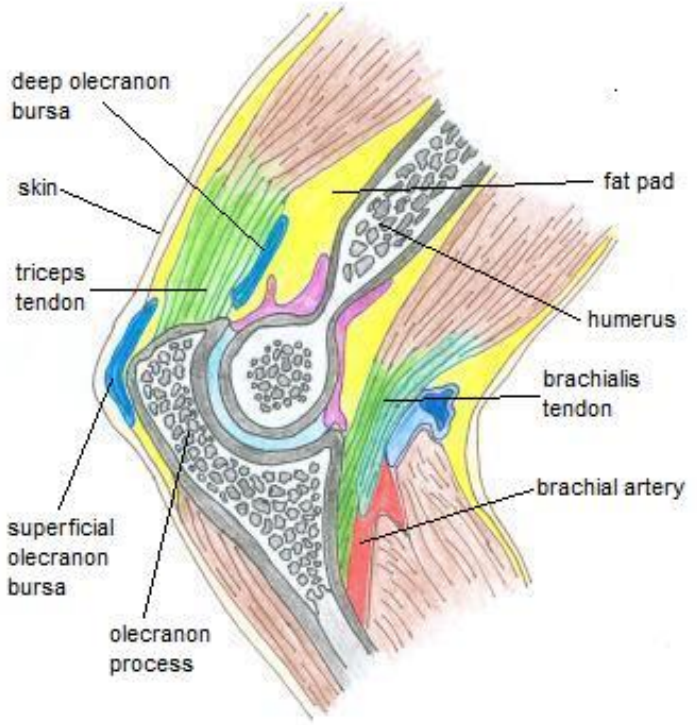


Labrum: A fibrocartilaginous ring which deepens the articular surface for one of the bones.



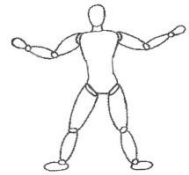
Bursa

- Flattened sacs that contain synovial fluid to reduce friction
- Walls are separated by a film of viscous fluid.
- Found wherever tendons rub against bones, ligaments, or other tendons.



CROSS SECTION OF ELBOW JOINT SHOWING BURSAE

Stability of Joints



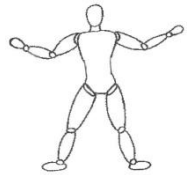
1) Negative pressure within the joint cavity

2) Shape, size, and arrangement of the articular surfaces

3) Ligaments

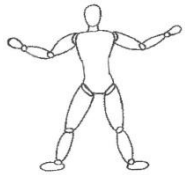
4) Tone of the muscles around the joint

Joint vasculature and innervation



- Joints receive blood from articular arteries that arise from the vessels around the joint.
- Articular veins are communicating veins that accompany arteries (L. venae comitantes) and, like the arteries, are located in the joint capsule, mostly in the synovial membrane.
- Joints have a rich nerve supply provided by articular nerves with sensory nerve endings in the joint capsule.

Types of synovial joints

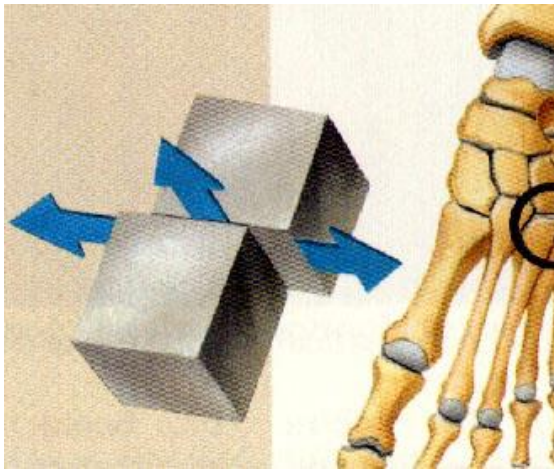


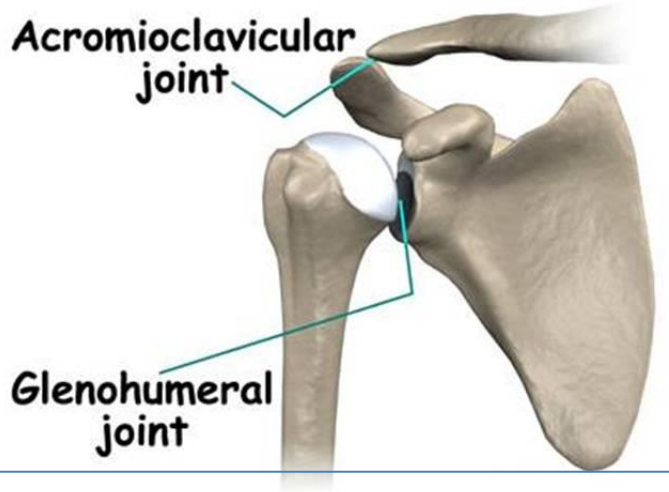
according to shape of articulating surfaces- type of movement they permit

1.Plane joints

uniaxial joints- gliding or sliding

acromioclavicular joint



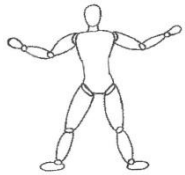


2. Hinge joints

uniaxial joints- flexion & extension

knee & elbow joints

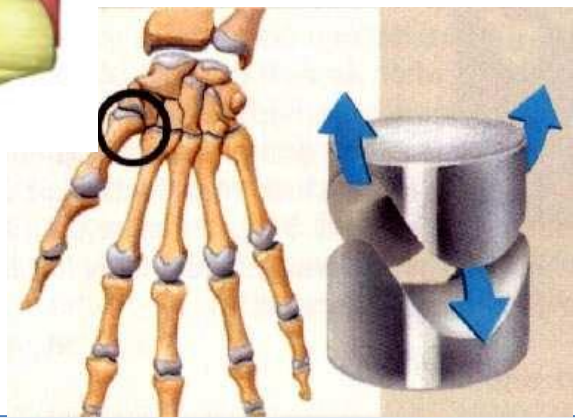
Types of synovial joints



3. Saddle joints

biaxial joints- flexion & extension, abduction & adduction

carpometacarpal joint at the base of the 1st digit (thumb)

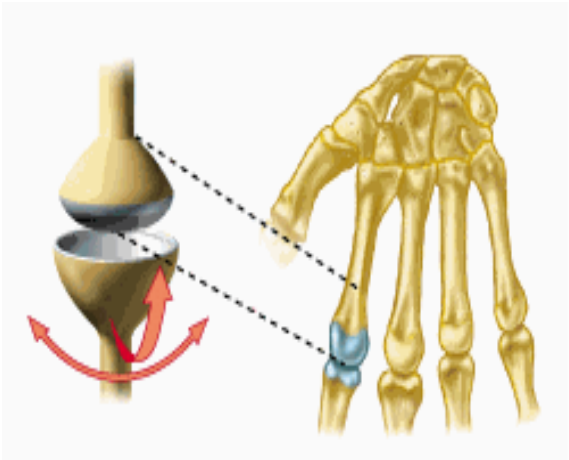


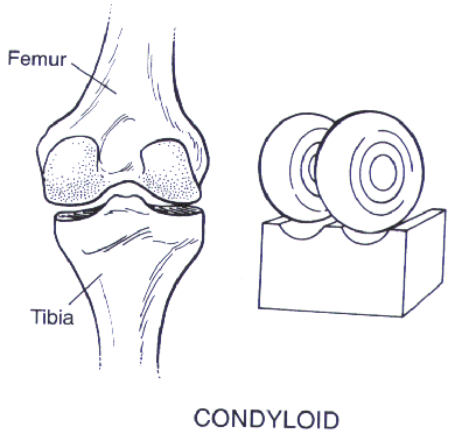
4. Condyloid (ellipsoid type)

biaxial joints- flexion & extension, abduction & adduction

metacarpophalangeal joints (knuckle joints)

radiocarpal joint (wrist)





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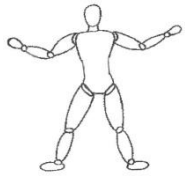
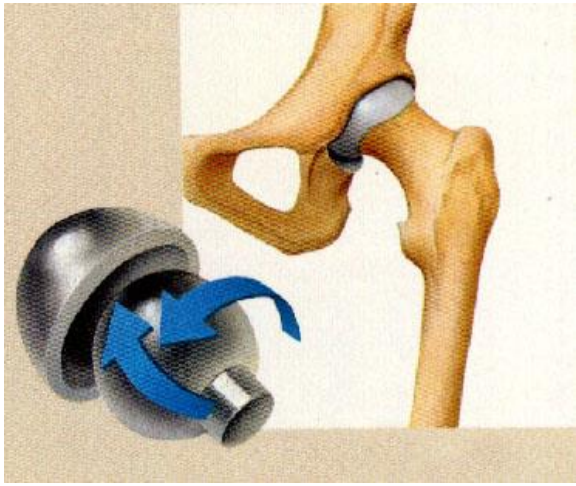
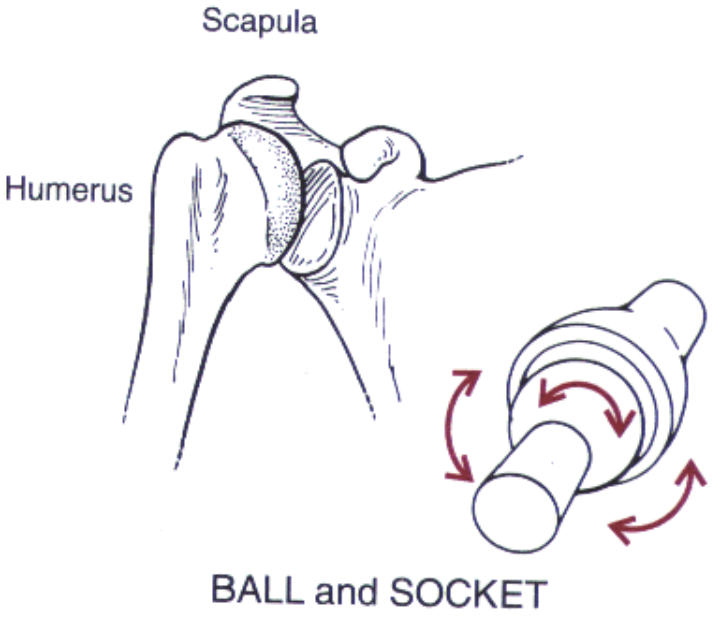


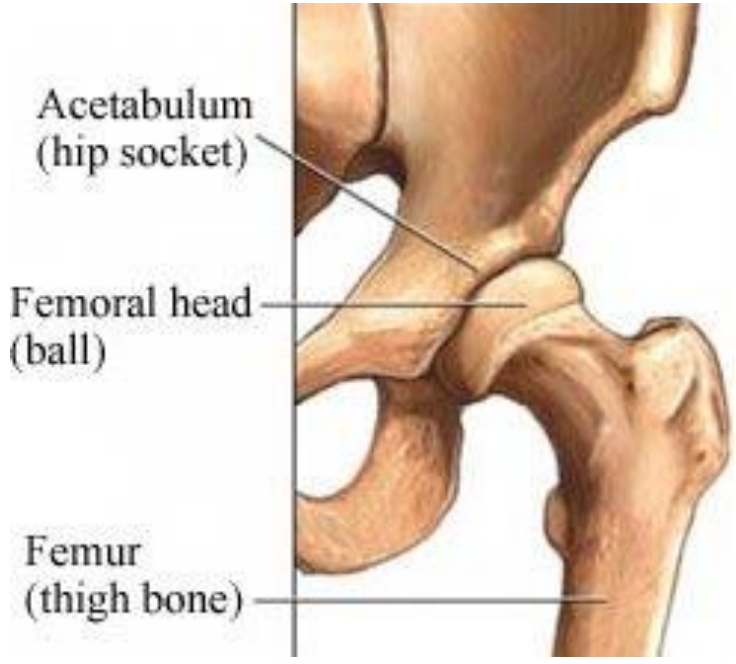
5. Ball and socket joints (spheroidal joints)

multiple axes and planes: flexion and extension, abduction and adduction, medial and lateral rotation, and circumduction

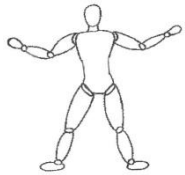
hip & shoulder joints







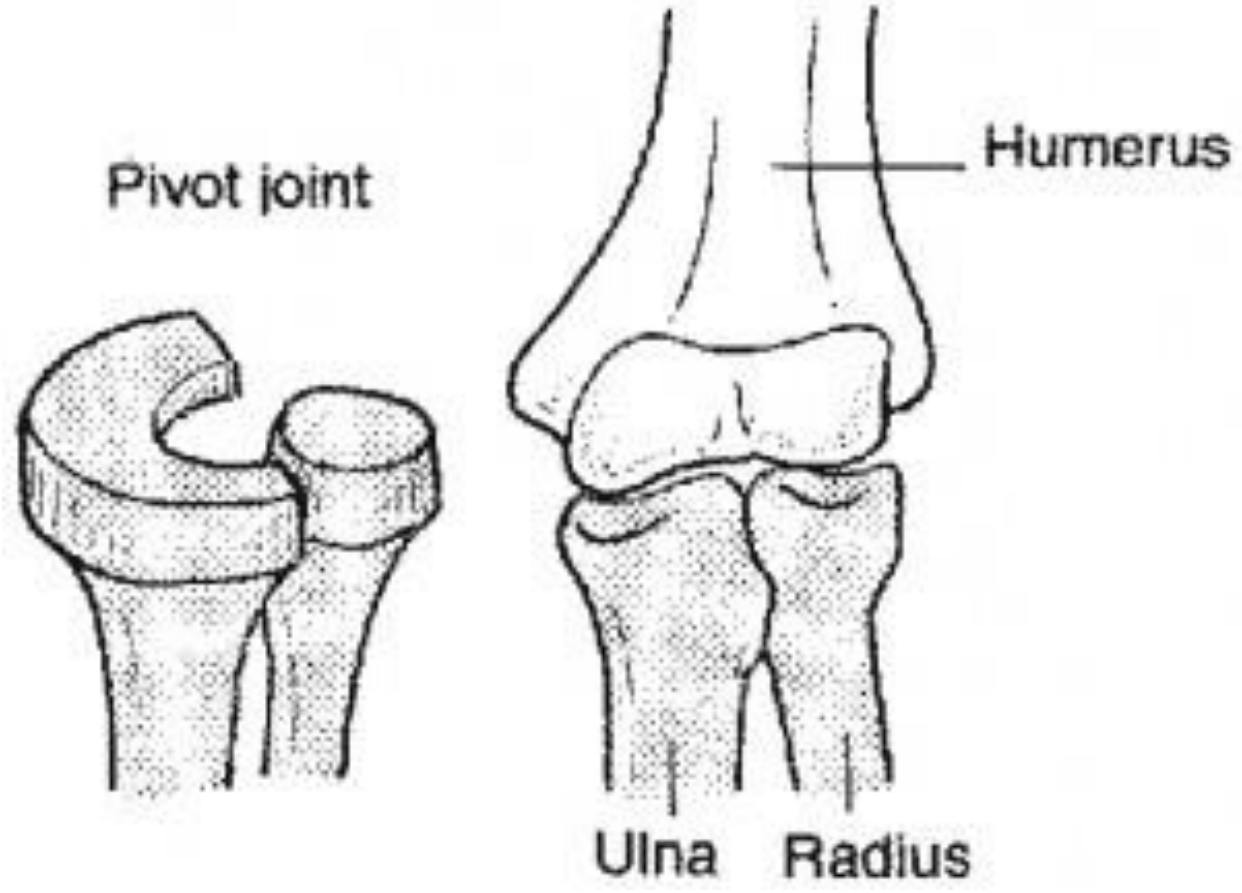
Types of synovial joints

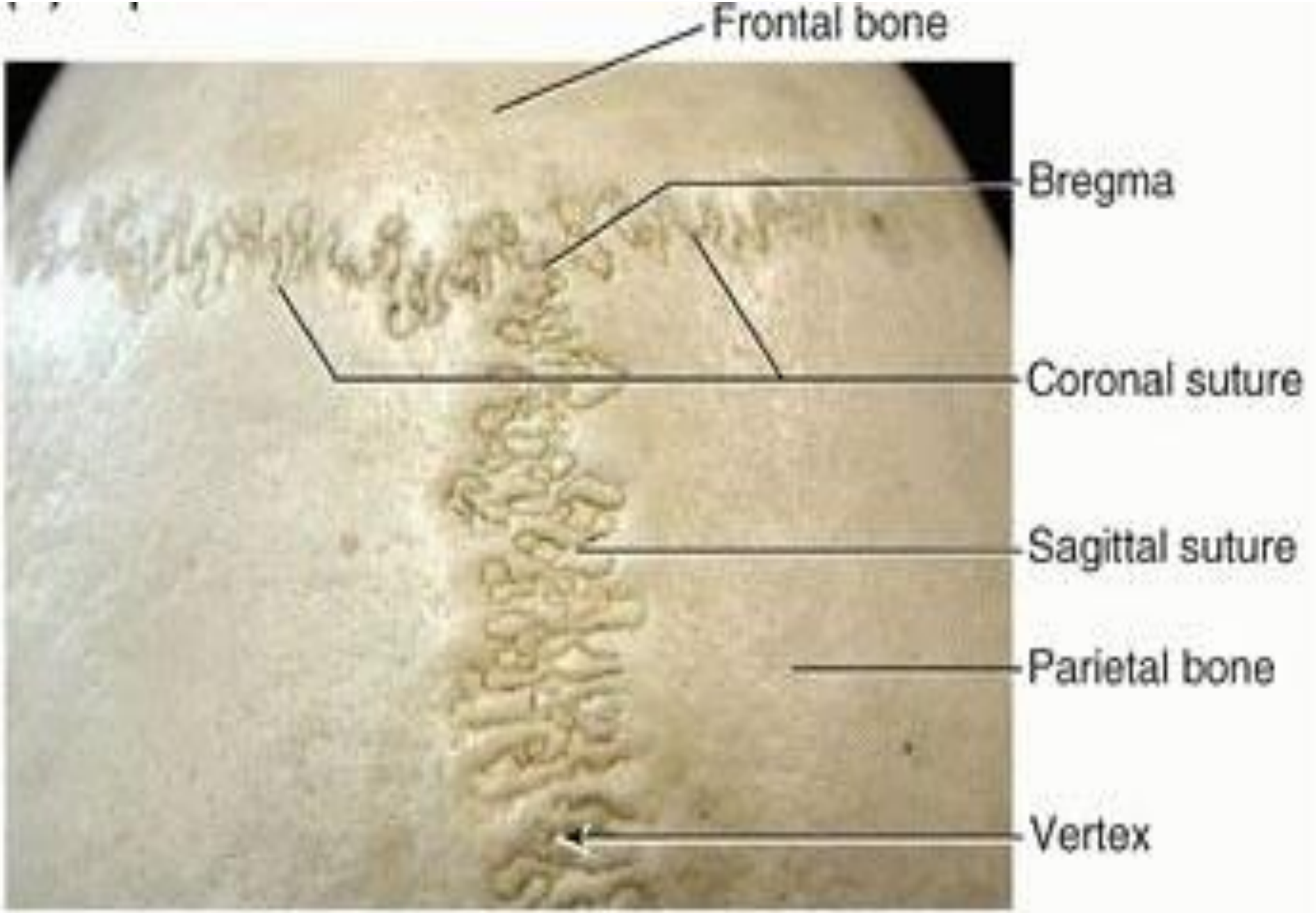


6. Pivot joints

uniaxial joints- rotation around a central axis

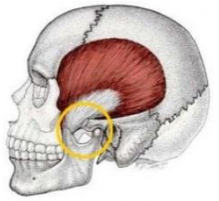
proximal & distal radioulnar joints





Superior (vertical) aspect

TEMPOROMANDIBULAR JOINT

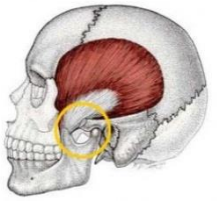


a modified **hinge type of synovial joint**

Movements

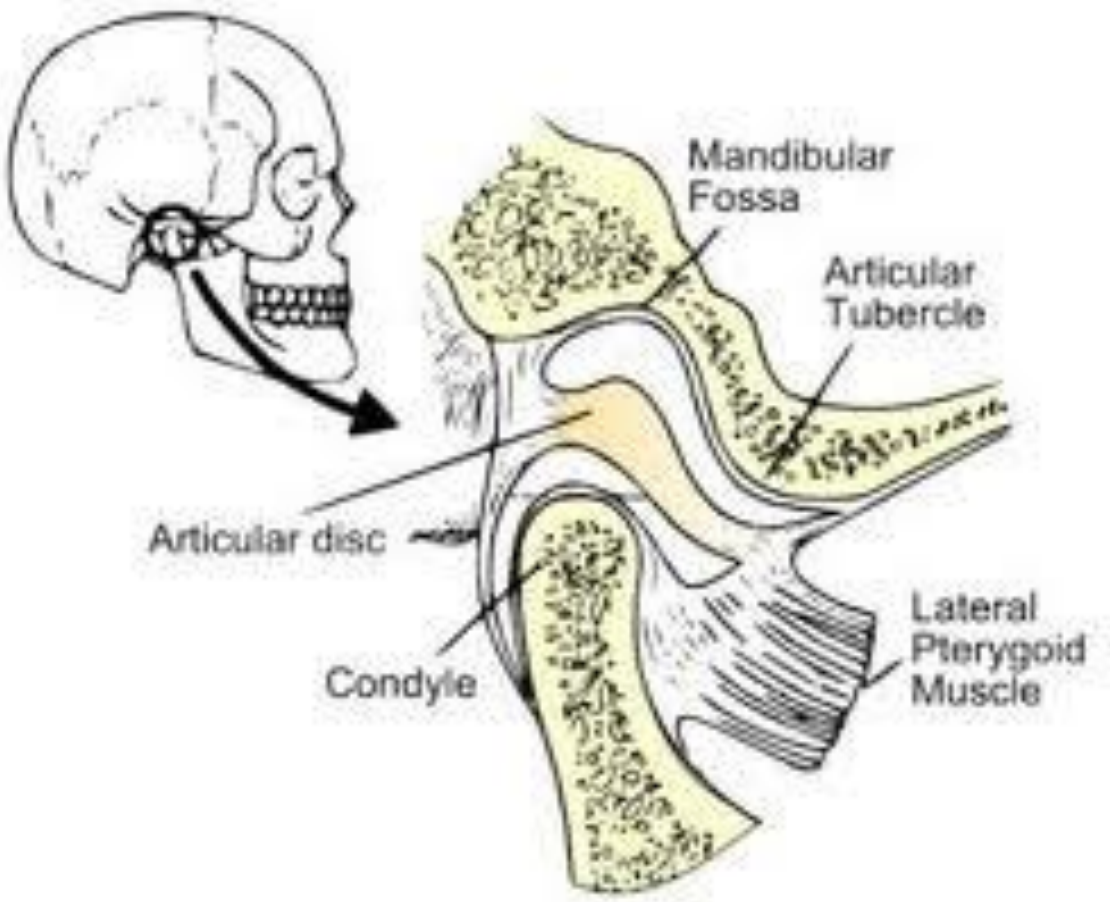
- gliding (translation)
- small degree of rotation (pivoting)
- flexion (elevation)
- extension (depression)

TEMPOROMANDIBULAR JOINT

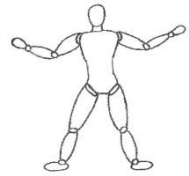


- mandibular fossa & articular tubercle of temporal bone
- head of the mandible

articular disc of the TMJ



JOINTS OF THE VERTEBRAL COLUMN

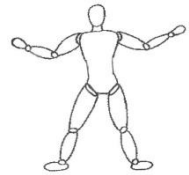


The vertebral column in an adult typically consists of 33 vertebrae arranged in five regions: 7 cervical, 12 thoracic, 5 lumbar, 5 sacral, and 4 coccygeal.

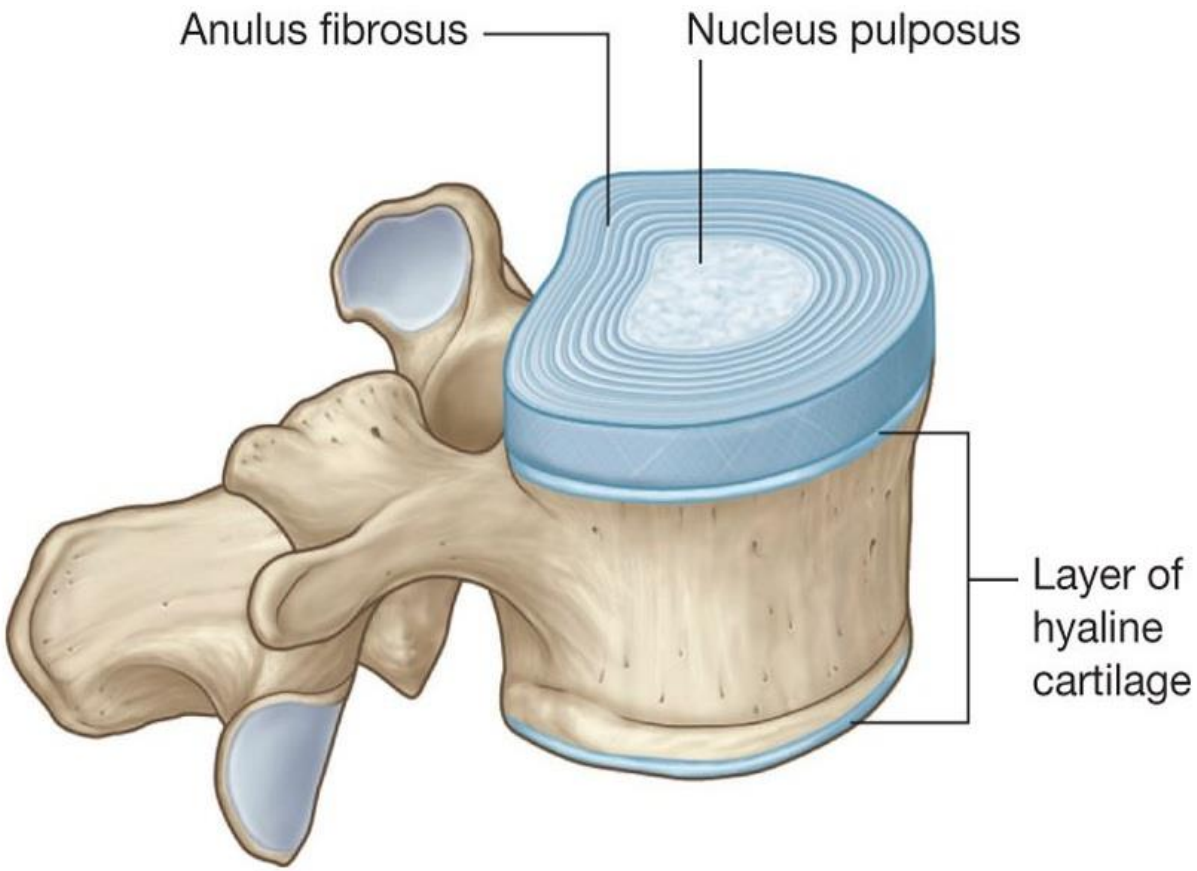
- Joints of the vertebral bodies **symphyses (secondary cartilaginous joints)**
- Joints of the vertebral arches **(facet joints)**
- Craniovertebral (atlanto-axial and atlanto-occipital) joints
- Costovertebral joints
- Sacroiliac joints

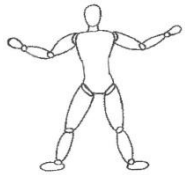
Joints of the vertebral bodies

designed for weight-bearing and strength



- Two vertebrae connected by intervertebral (IV) discs and ligaments.
- Discs provide strong attachments between the vertebral bodies.





1. anulus fibrosus (L. anus, a ring)

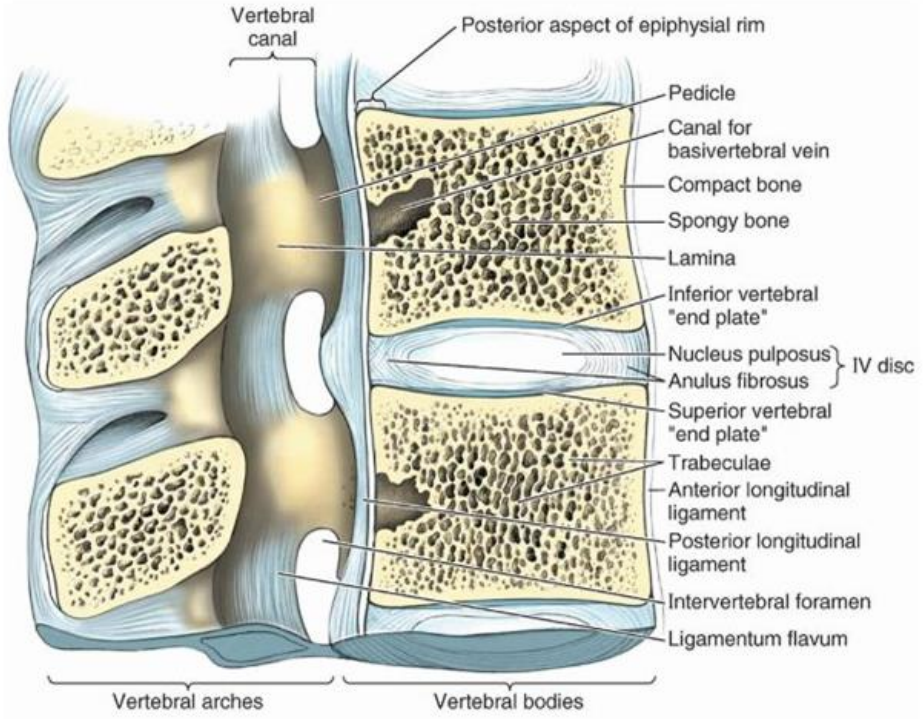
bulging fibrous ring forming the circumference of the IV disc

2. anterior longitudinal ligament

covers and connects the anterolateral aspects of the vertebral bodies and IV discs.

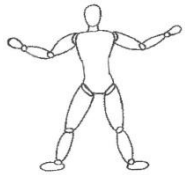
3. posterior longitudinal ligament

runs within the vertebral canal along the posterior aspect of the vertebral bodies.

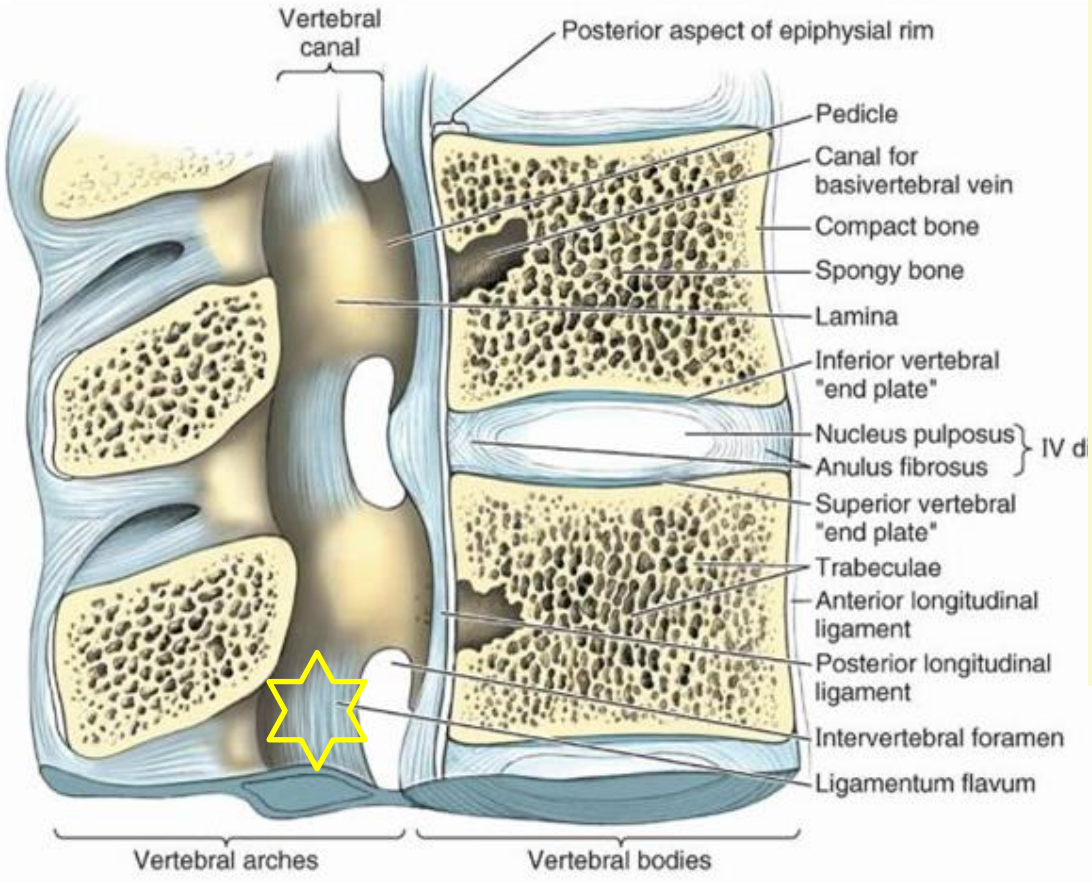


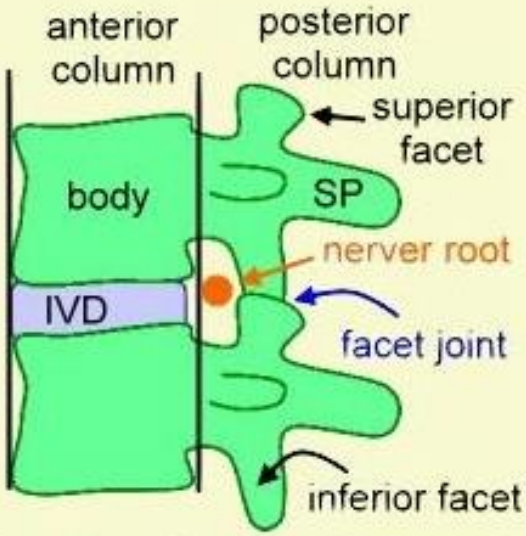
Joints of the vertebral arches

between superior & inferior articular processes of adjacent vertebrae



The adjacent vertebral arches are joined by broad, pale yellow bands of elastic tissue called the **ligamenta flava** (L. flavus, yellow).



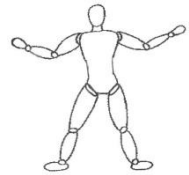


Lumbar Motion Segment
(Lateral View)

PLANE TYPE SYNOVIAL JOINT

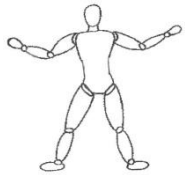
GLIDING MOVEMENTS

MOVEMENTS OF THE VERTEBRAL COLUMN



- The range of movement varies according to the region and the individual.
- The mobility results primarily from the compressibility and elasticity of the intervertebral discs.
- Movements by the vertebral column include **flexion, extension, lateral flexion, rotation, and circumduction**.

Craniovertebral joints



A. atlanto-occipital joints

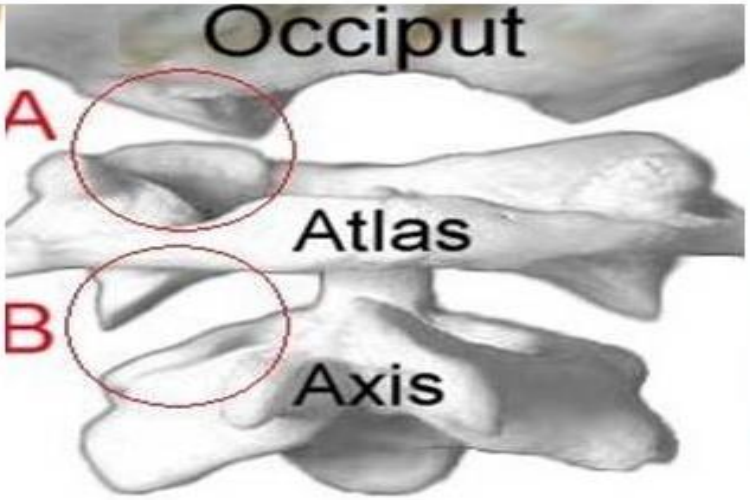
between atlas (C1 vertebra), & occipital bone of the cranium

B. atlanto-axial joints

between atlas &axis (C2 vertebra)

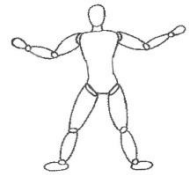
Their design gives a wider range of movement than in the rest of the vertebral column.

Posterior View
Cervical Spine



A: Atlanto-Occipital Joint
B: Altanto–Axial Joint

Craniovertebral joints



Atlanto-occipital joints

nodding of the head, such as the flexion and extension of the head

approval "yes" movement

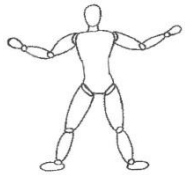
3 Atlanto-axial articulations

2 (right and left) lateral atlantoaxial joints

1 median atlantoaxial joint.

head turned from side to side, "no" movement

JOINTS OF THE UPPER LIMB



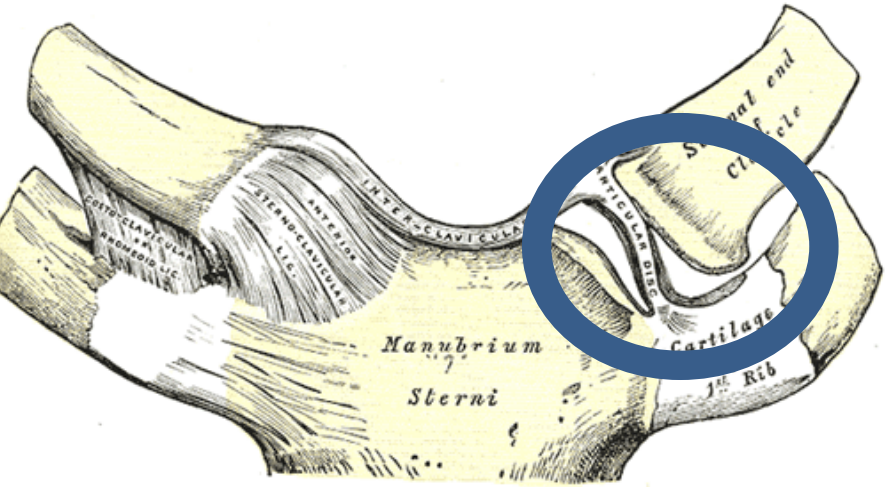
Sternoclavicular joint (SC)

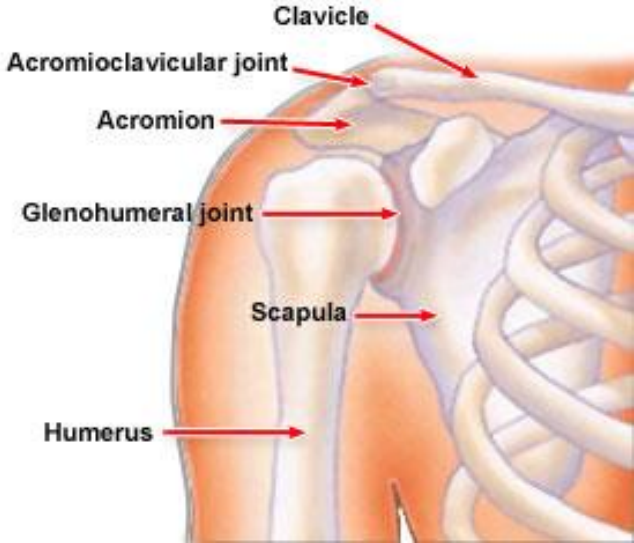
sternal end of the clavicle articulates with manubrium & 1st costal cartilage

- The only articulation between upper limb & axial skeleton.
- During full elevation of the limb, clavicle is raised to 60° angle.

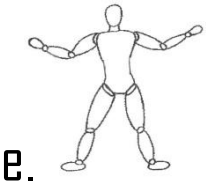
Acromioclavicular joint

acromial end of the clavicle articulates with the acromion of the scapula.





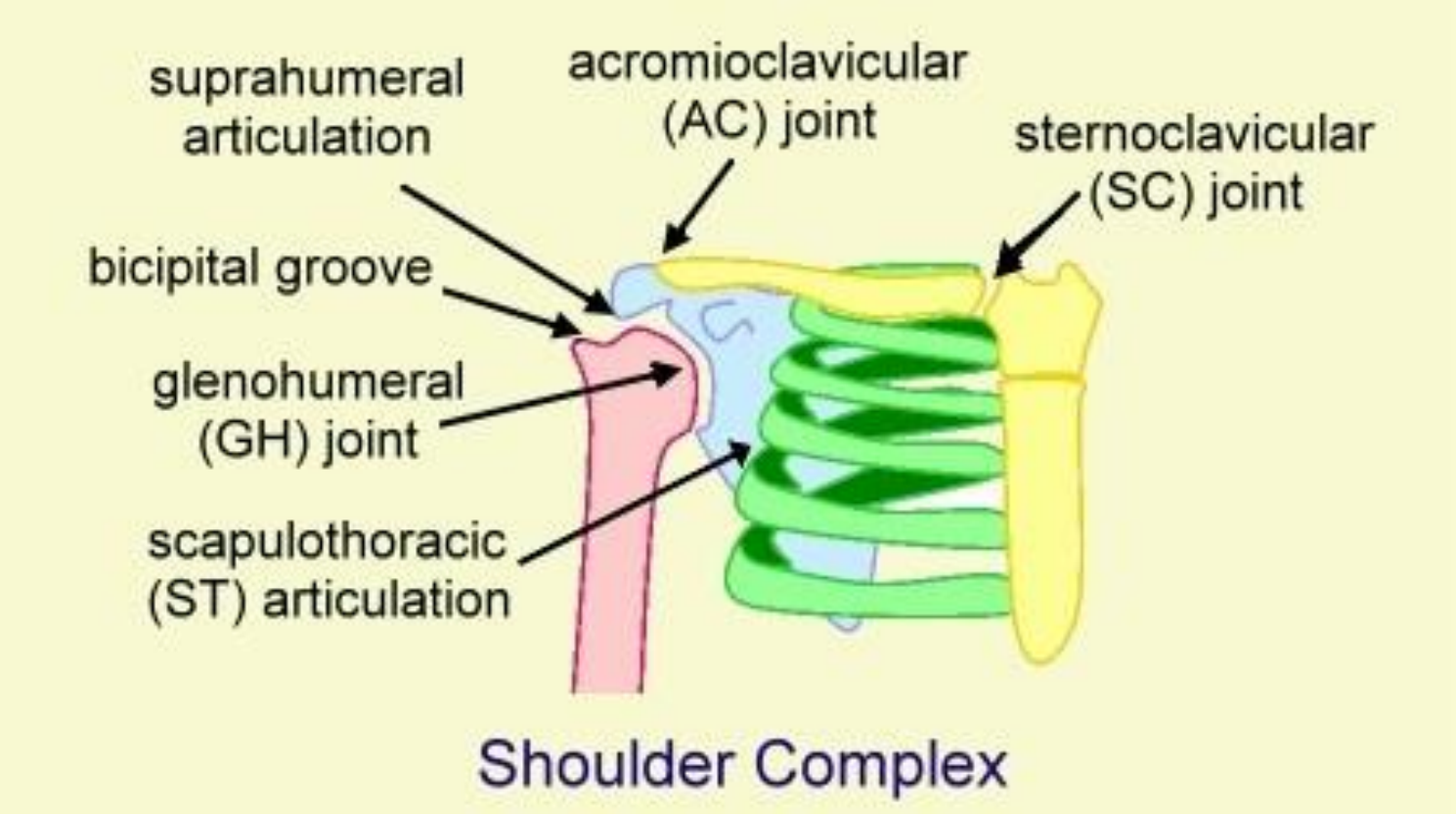
Glenohumeral (shoulder) joint



permits a wide range of movement; mobility makes the joint relatively unstable.

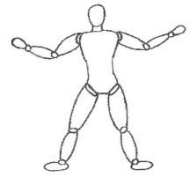
Humeral head articulates w/ **glenoid cavity of the scapula**

deepened slightly but effectively by the ring-like, fibrocartilaginous glenoid labrum (L., lip).



Glenohumeral (shoulder) joint

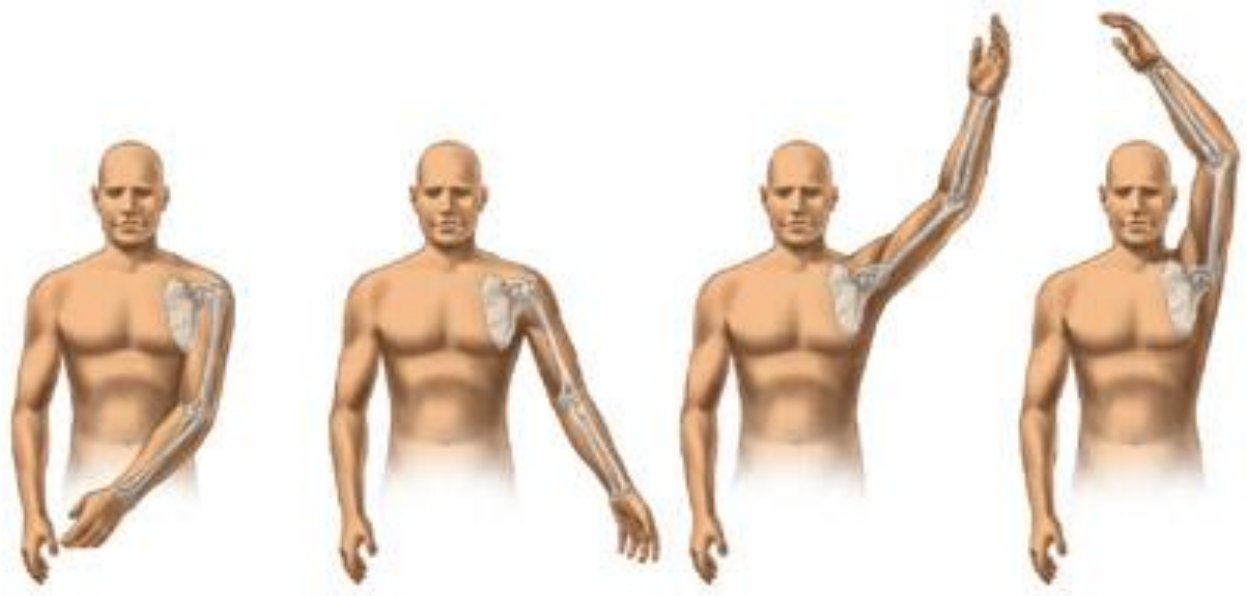
more freedom of movement than any other joint in the body



- results from the laxity of its joint capsule & large size of the humeral head compared with the small size of the glenoid cavity.

- movements around three axes

flexion-extension, abduction-adduction, rotation (medial and lateral) of the humerus, circumduction

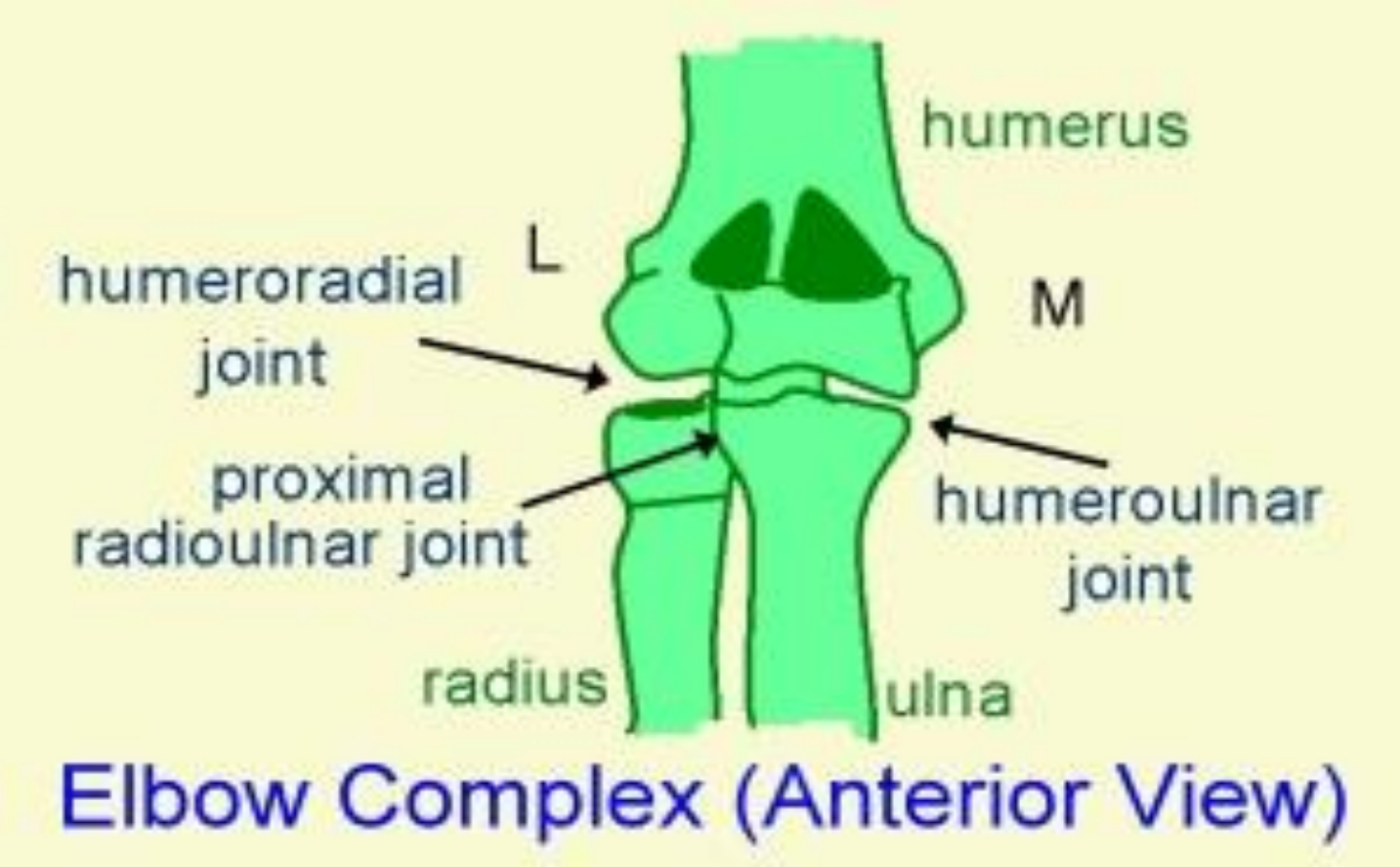


Shoulder Joint Range of Motion

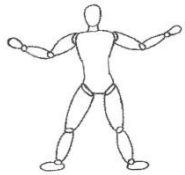
Elbow Joint

located inferior to the epicondyles of the humerus

humeroulnar & humeroradial articulations



collateral ligaments of the elbow joint

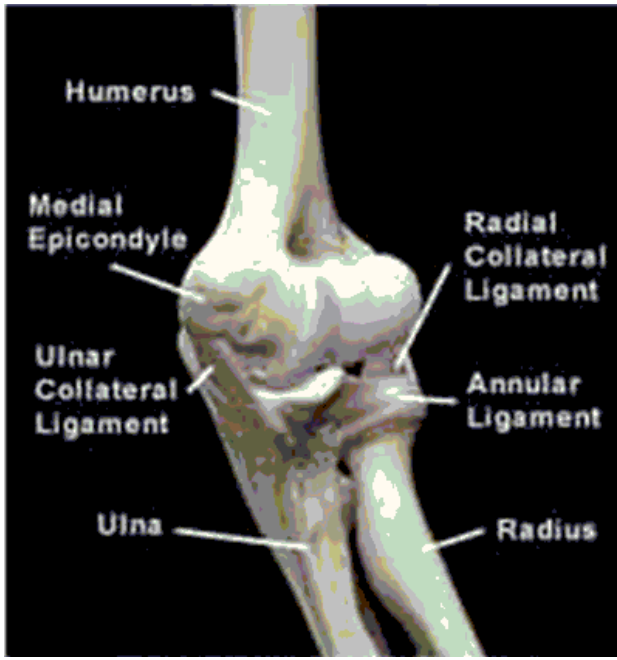


strong triangular bands

medial and lateral thickenings of the fibrous layer of the joint capsule

Radial collateral ligament

Ulnar collateral ligament

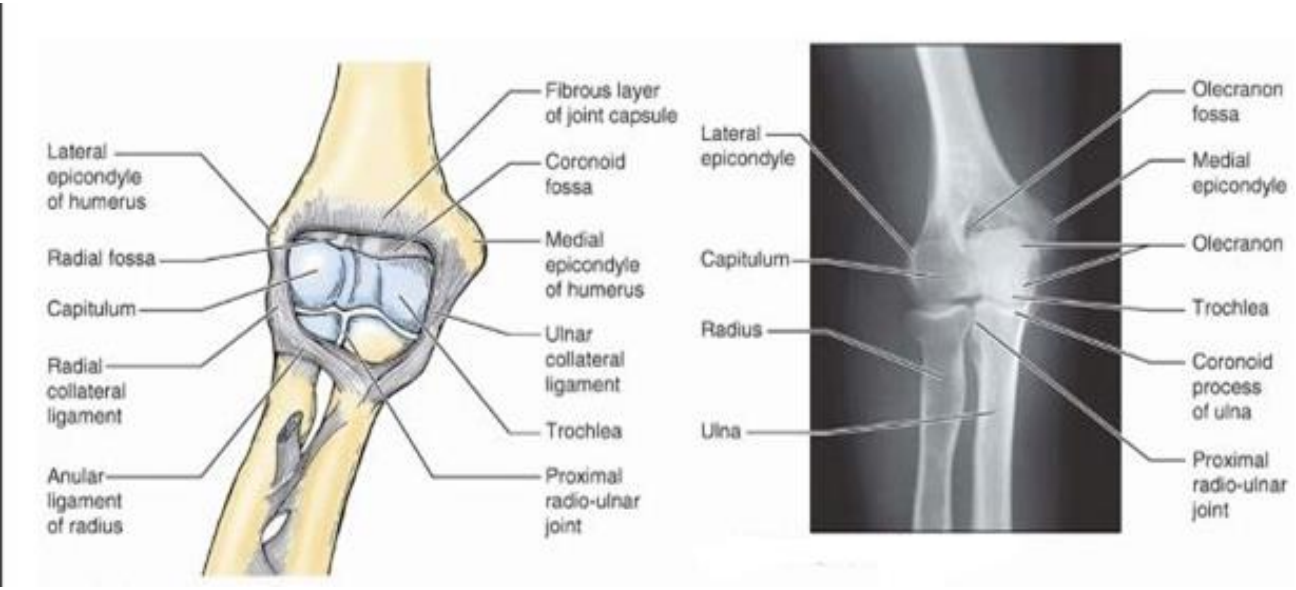


Flexion and extension occur at the elbow joint.

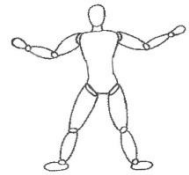
Intratendinous olecranon bursa

Subtendinous olecranon bursa

Subcutaneous olecranon bursa



Proximal (superior) radio-ulnar joint

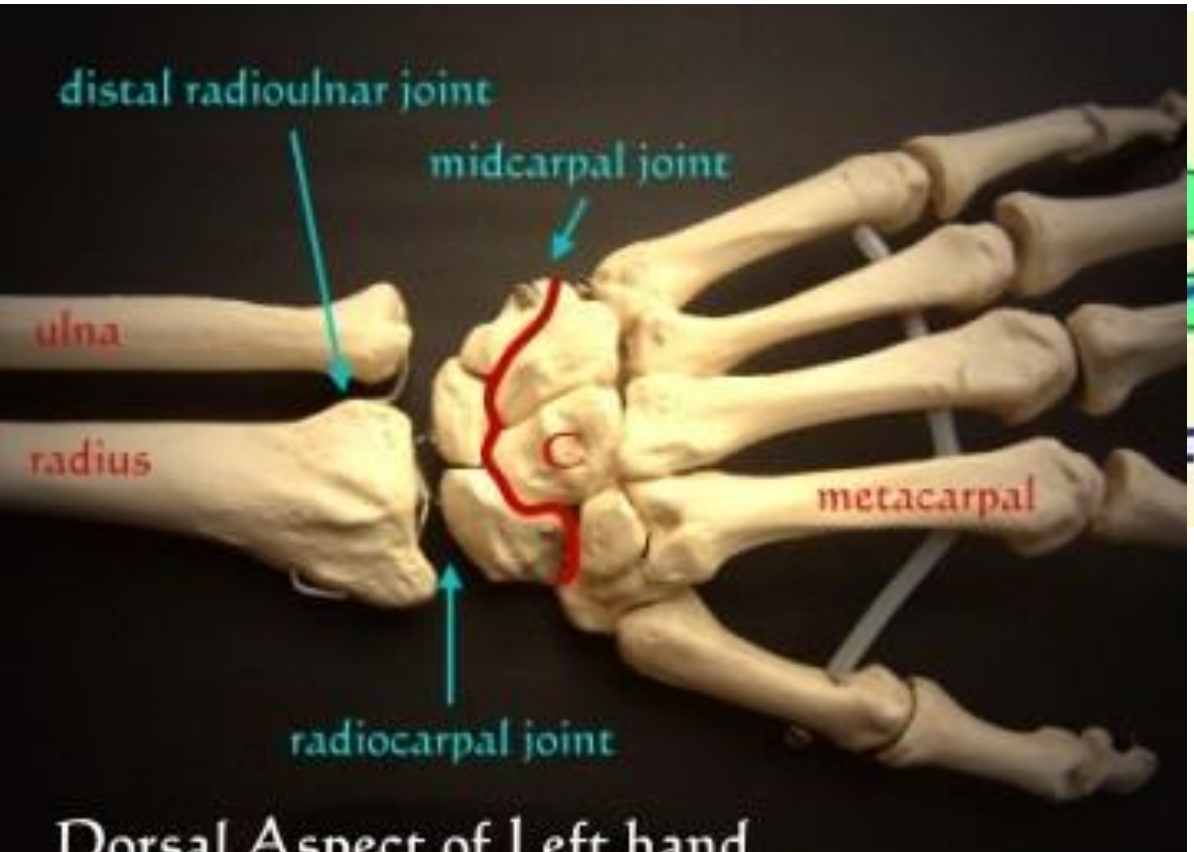


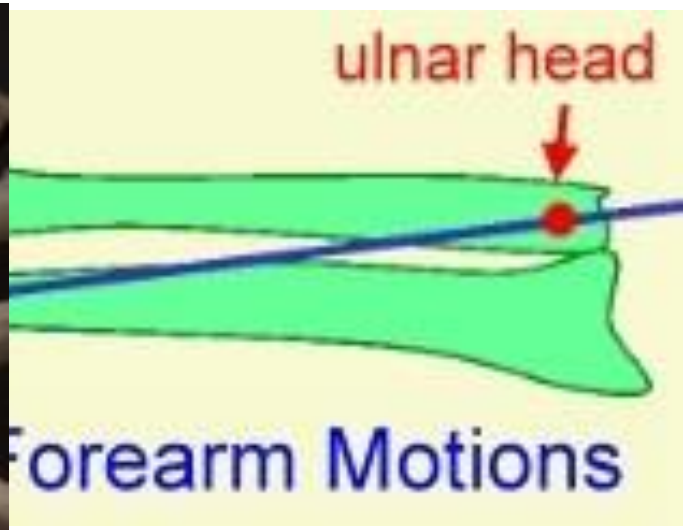
allows movement of the head of the radius on the ulna

Radial head is held in position by the anular ligament of the radius.

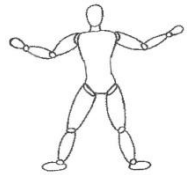
Distal (inferior) radio-ulnar joint

The radius moves around the relatively fixed distal end of the ulna.





Wrist (radiocarpal) joint

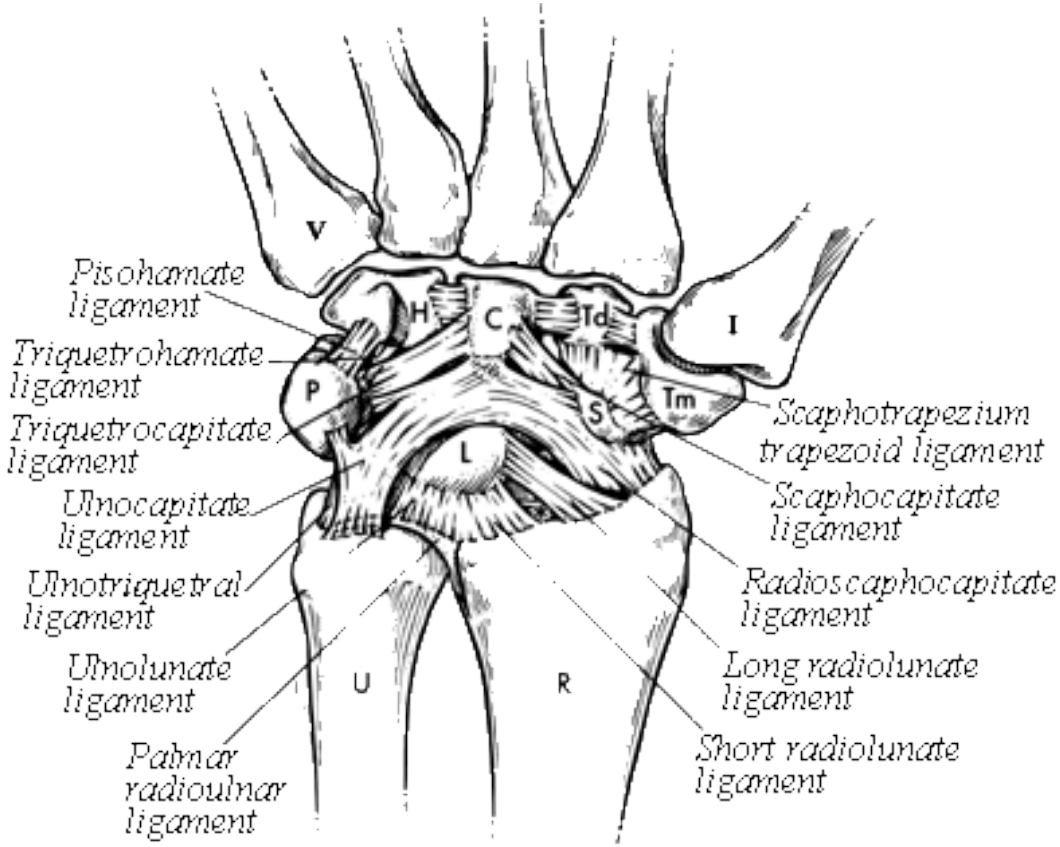


ulna does not participate in the wrist joint.

Distal end of the radius & articular disc of the distal radio-ulnar joint articulate with

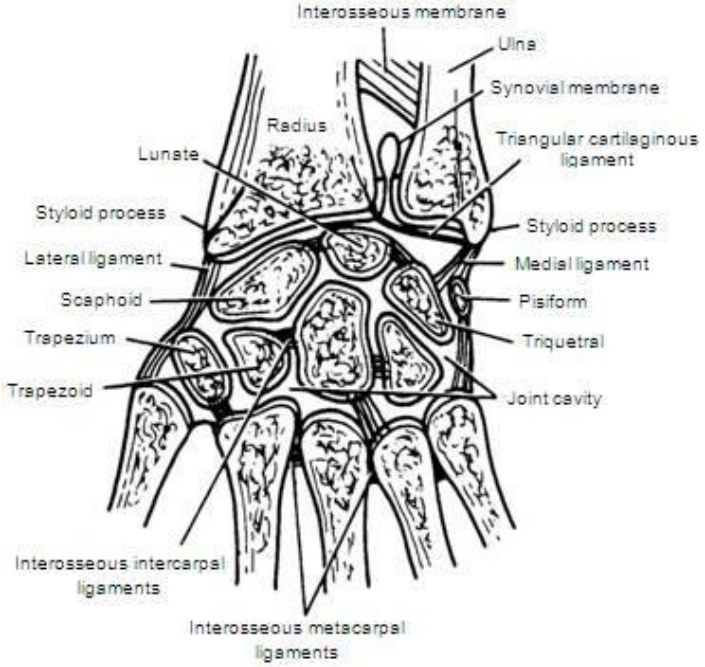
proximal row of carpal bones, except for the pisiform.

Flexion
Extension
Abduction
Adduction
radial deviation-ulnar deviation
Circumduction



Intercarpal joints

interconnect the carpal bones.

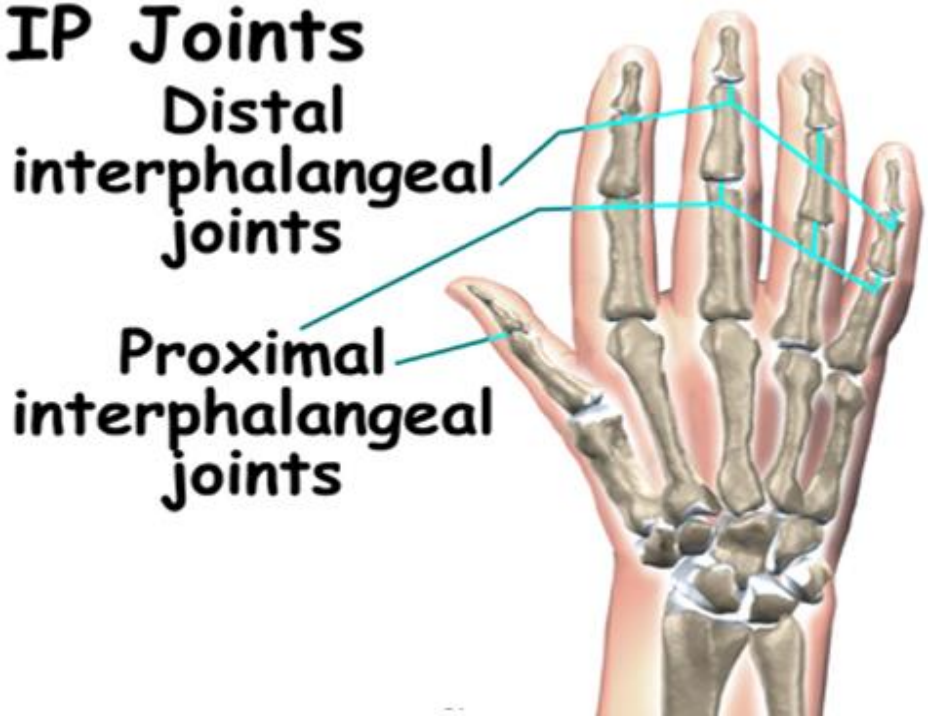


Carpometacarpal joints

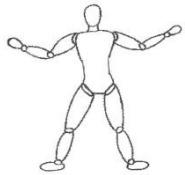
Intermetacarpal joints

Metacarpophalangeal joints

Interphalangeal joints



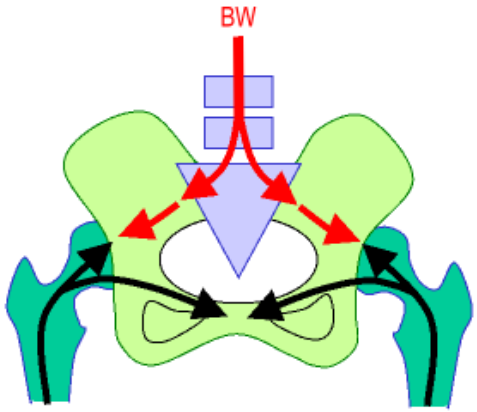
JOINTS OF THE LOWER LIMB



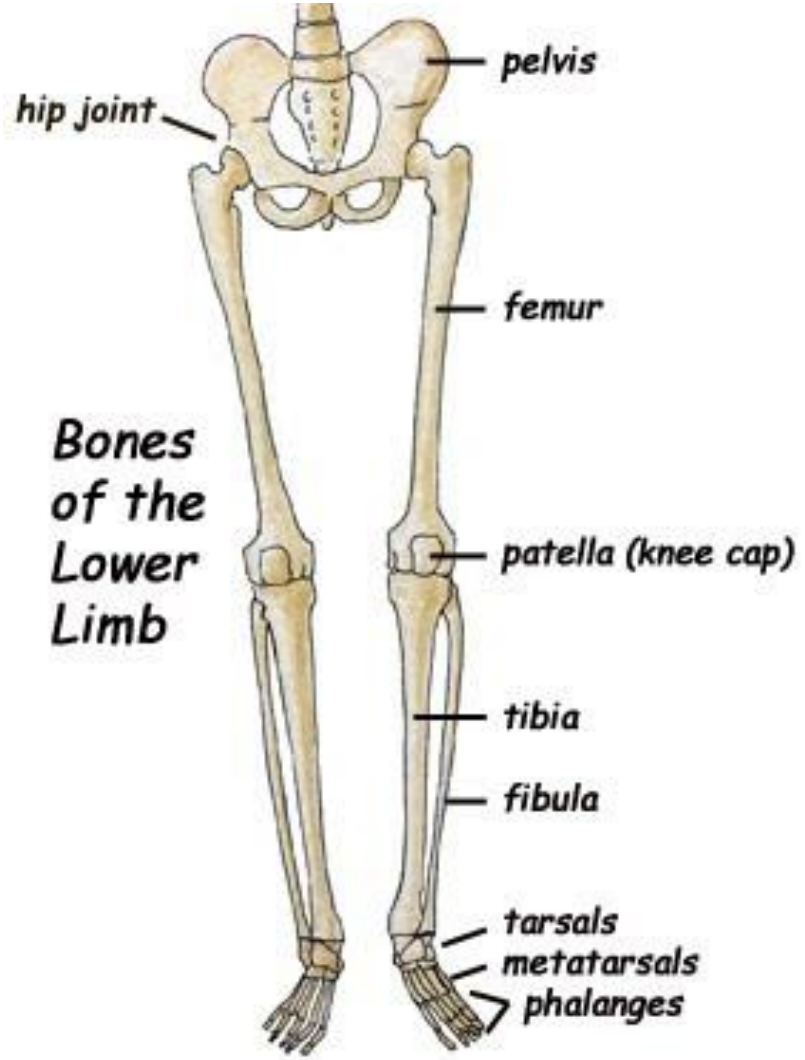
articulations of the pelvic girdle

lumbosacral joints, sacroiliac joints, and pubic symphysis

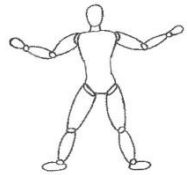
- **hip joints**
- **knee joints**
- **tibiofibular joints**
- **ankle joints**
- **foot joints**



Trabecular system of the Pelvis
Follows Weight-Bearing Lines



JOINTS OF THE PELVIS



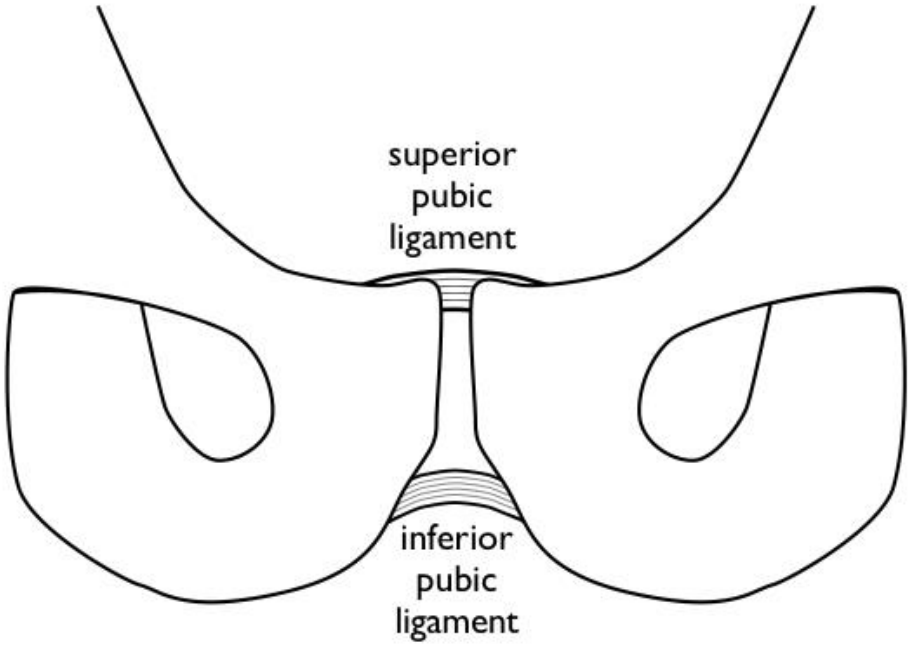
Pubic symphysis

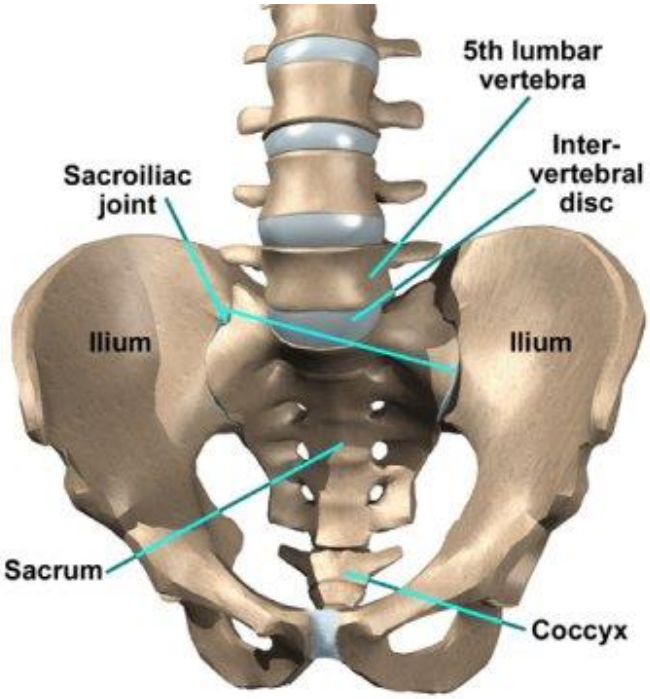
interpubic disc & surrounding ligaments
unite the bodies of the pubic bones in the median plane.

Lumbosacral joints

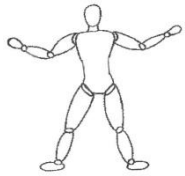
L5 and S1 vertebrae articulate

Sacrococcygeal joint





HIP JOINT



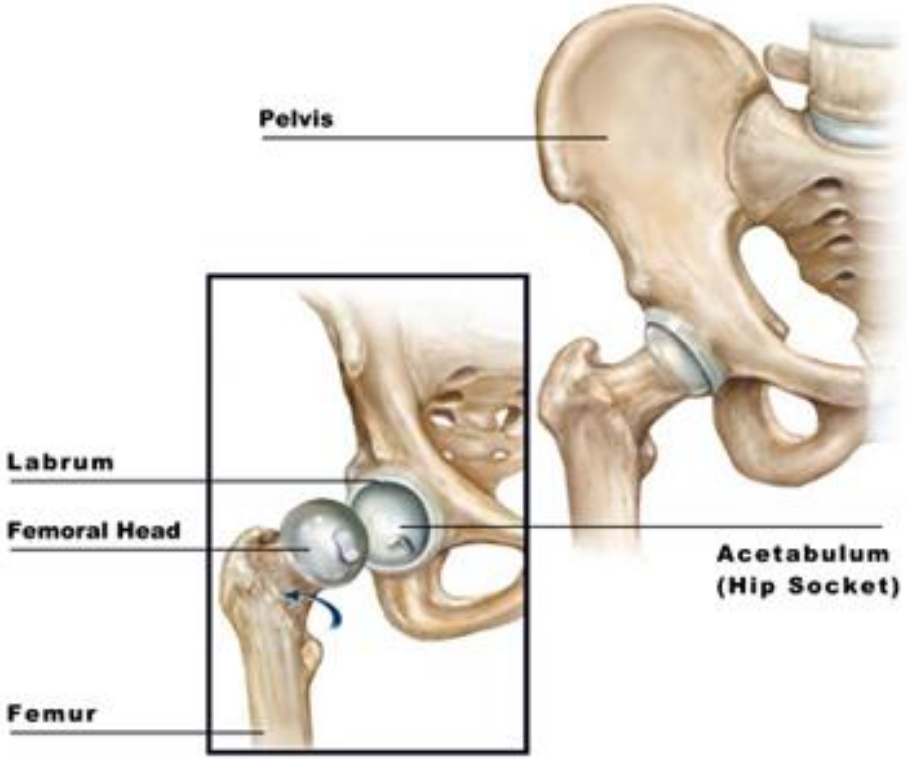
Feature 1: **Connection between lower limb & pelvic girdle**

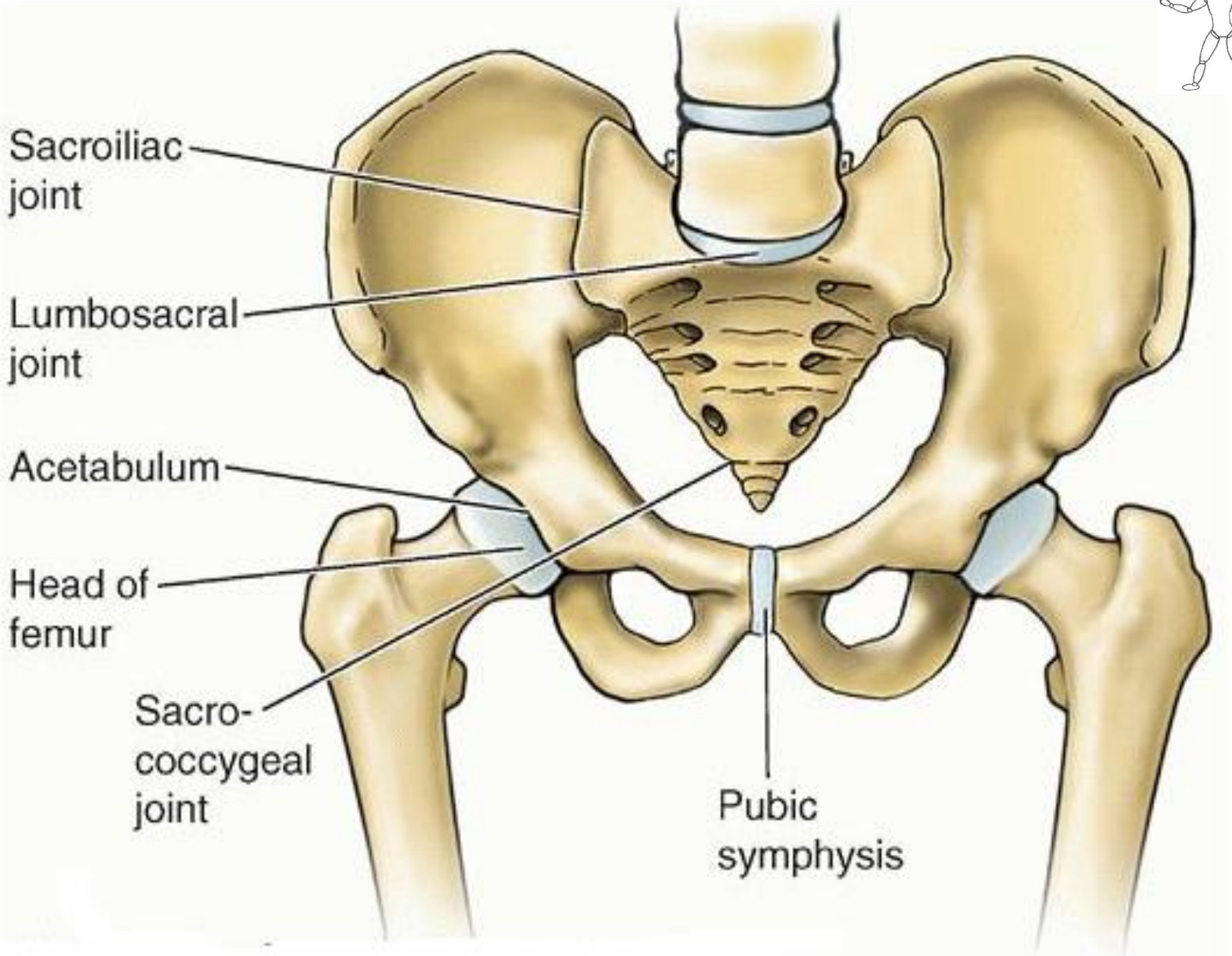
Feature 2: **2nd most movable after the shoulder joint**

Synovial Joint Type: **Ball and socket (Head of the femur & acetabulum)**

Weight transfer: **To the heads and necks of the femurs**

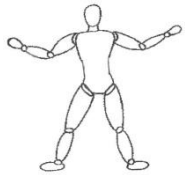
acetabular labrum
(L. labrum, lip)
fibrocartilaginous rim attached to the margin of acetabulum, increasing acetabular articular area by nearly 10%.




Sacroiliac joint
Lumbosacral joint
Acetabulum
Head of femur
Sacro-coccygeal joint
Pubic symphysis

Ligaments

HIP JOINT

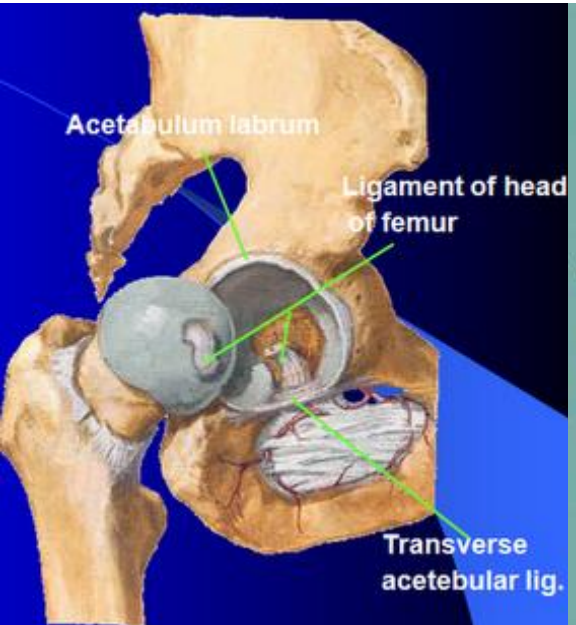


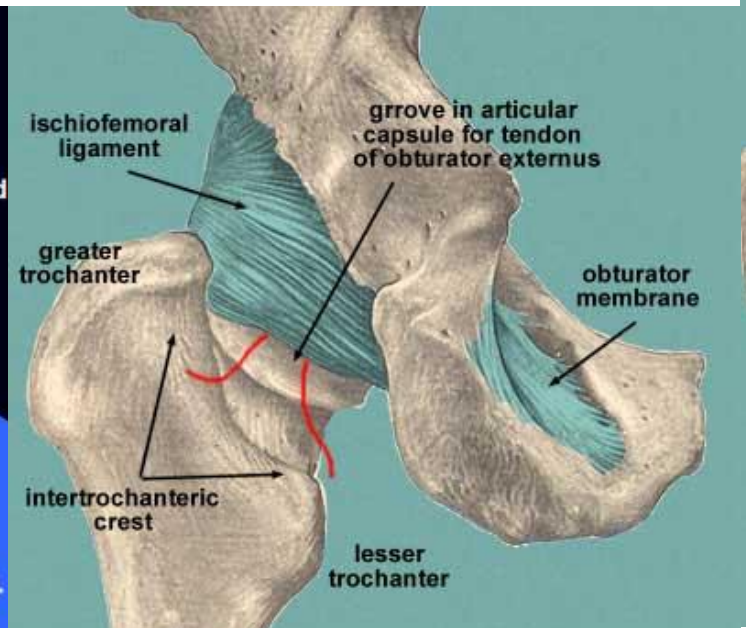
Transverse acetabular ligament continuation of acetabular labrum

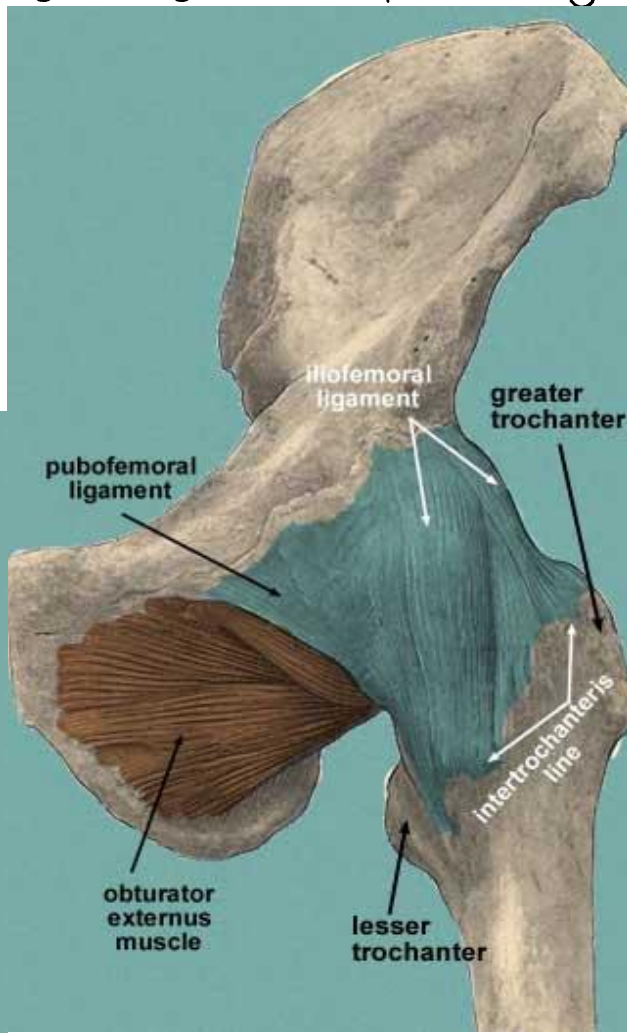
3 intrinsic ligaments

1) Iliofemoral ligament anteriorly and superiorly , strongest ligament of the body
2) Pubofemoral ligament anteriorly and inferiorly
3) Ischiofemoral ligament posteriorly

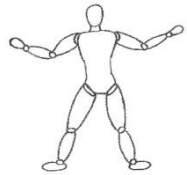
Ligament of the head of the femur



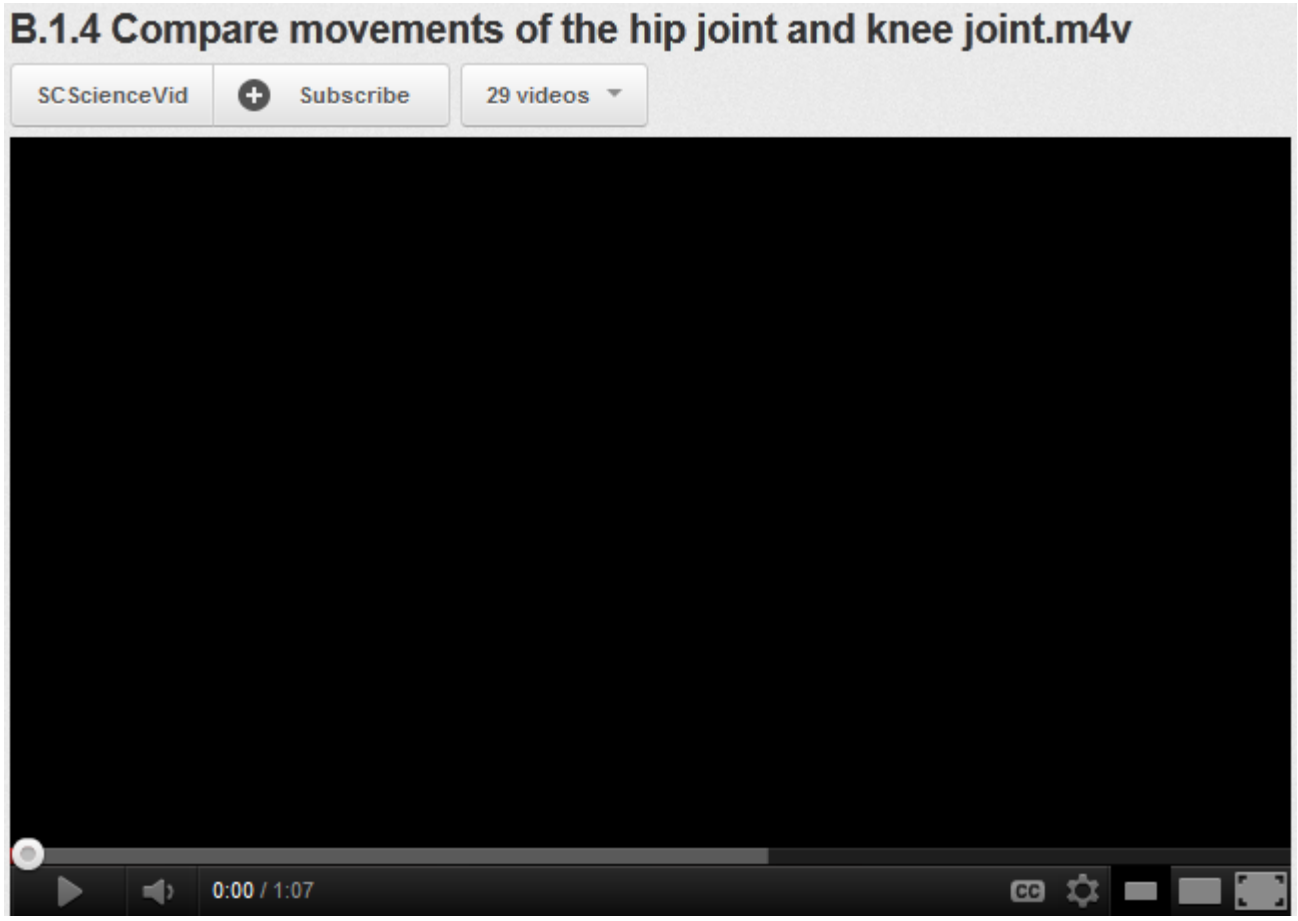




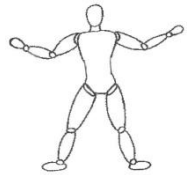
MOVEMENTS OF HIP JOINT



- ✓ Flexion-extension
- ✓ Abduction-adduction
- ✓ Medial-lateral rotation
- ✓ Circumduction



KNEE JOINT



Feature 1: **Largest & most superficial joint**

Feature 2: **Hing movements (Ext/Flex) combined with gliding & rotation**

Synovial Joint Type: **Hinge**

The knee joint consists of three articulations:

2 **femorotibial articulations** (lateral and medial)
between lateral & medial femoral and tibial condyles

One **intermediate femoropatellar articulation**
between patella & femur

No fibula involvment in the knee joint.

KNEE JOINT

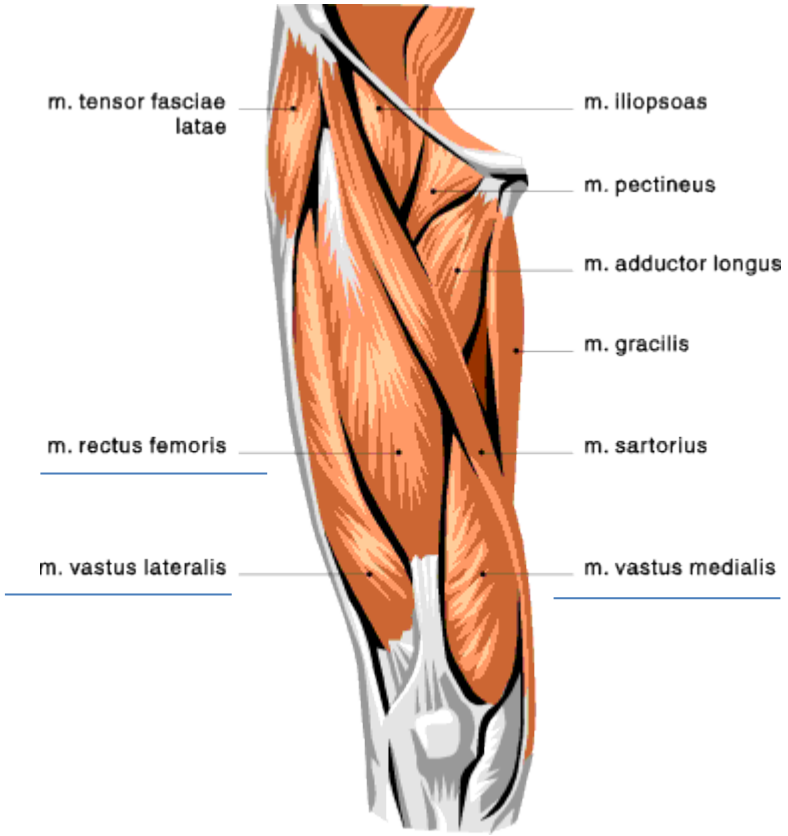
The stability of the knee joint depends on

(1) strength & actions of the surrounding muscles and their tendons

(2) ligaments that connect the femur and tibia.

muscles are most important.

the most important muscle in stabilizing the knee joint quadriceps femoris.



Extracapsular ligaments

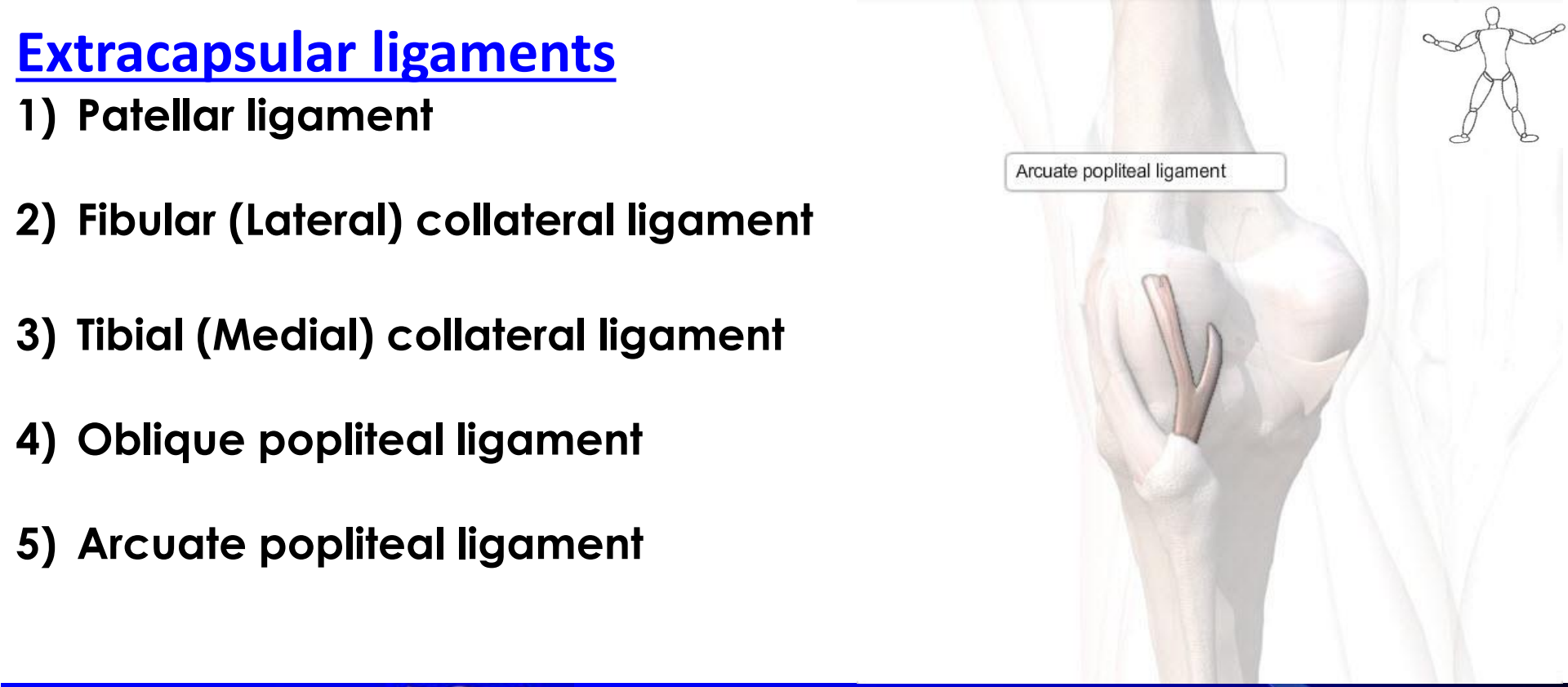
1) Patellar ligament

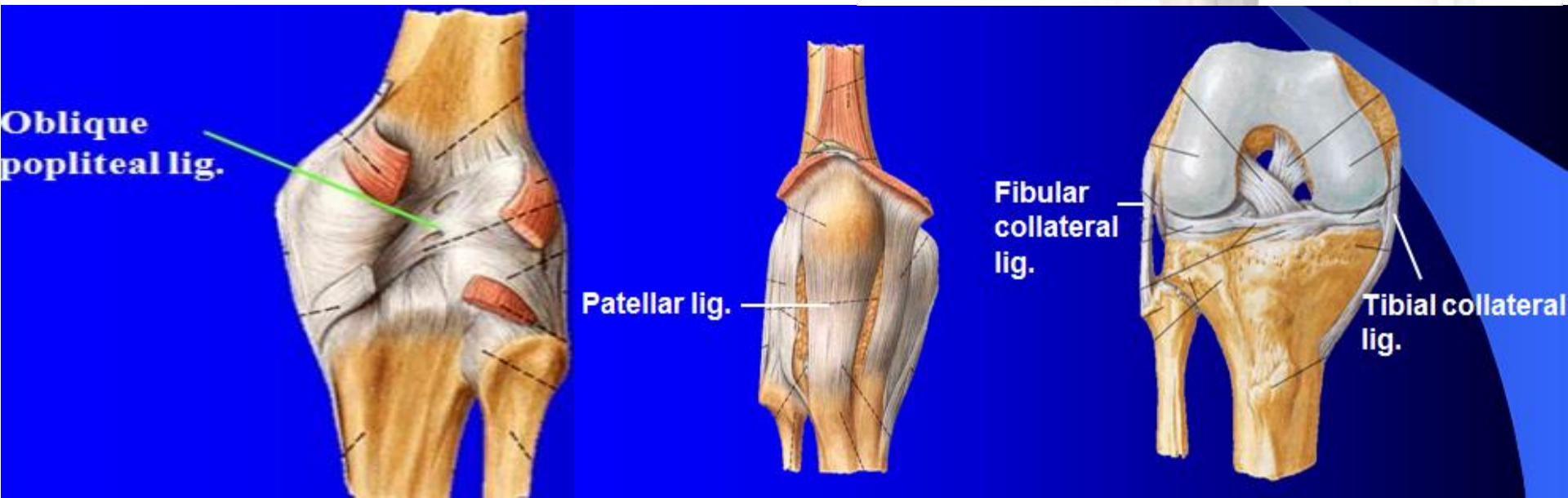
2) Fibular (Lateral) collateral ligament

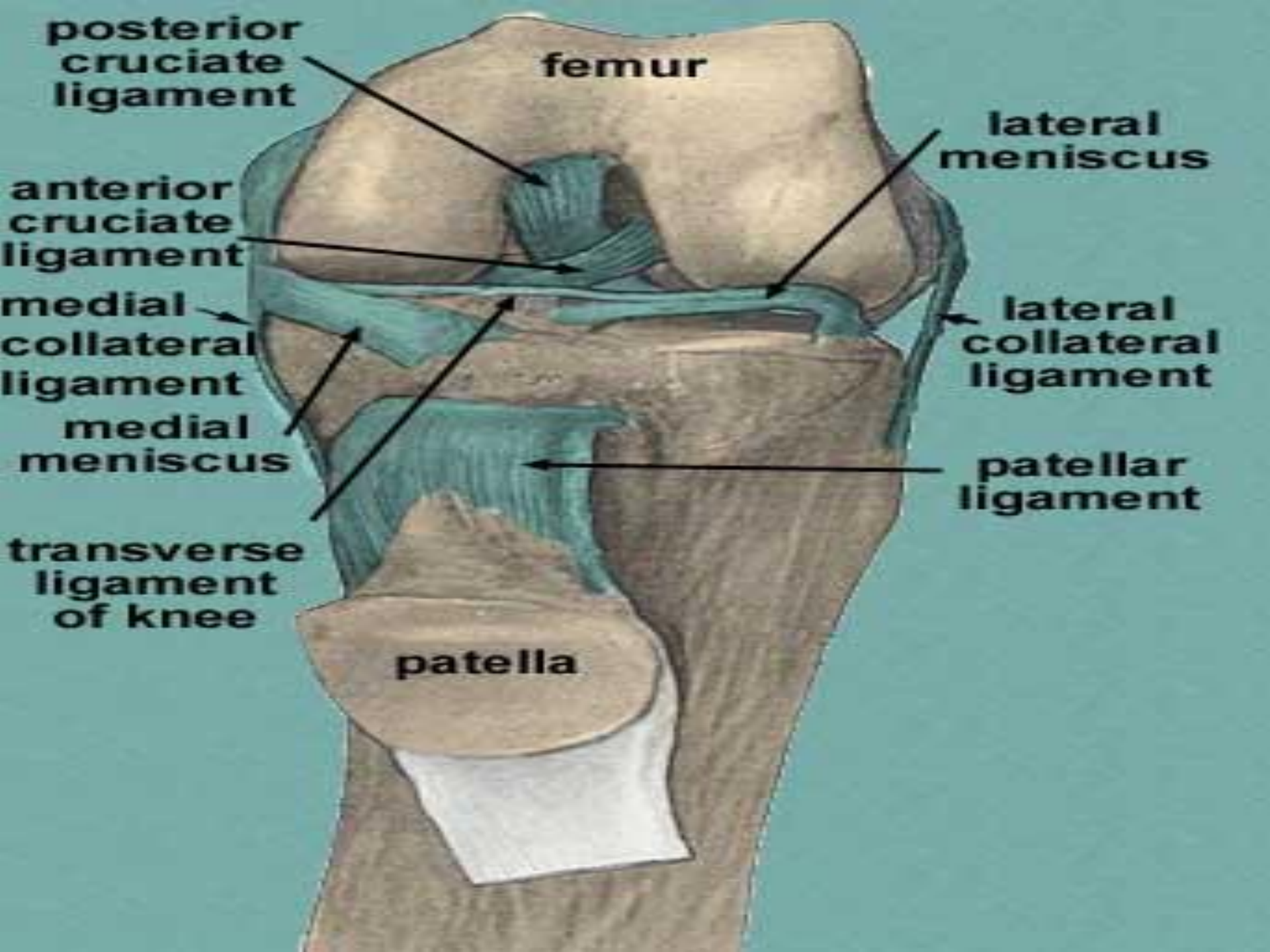
3) Tibial (Medial) collateral ligament

4) Oblique popliteal ligament

5) Arcuate popliteal ligament





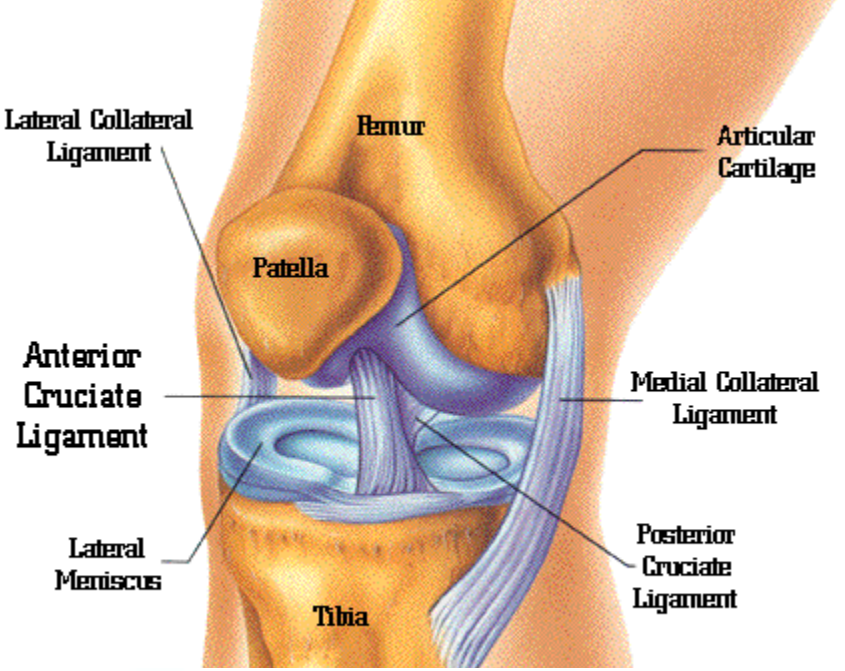

posterior cruciate ligament
femur
lateral meniscus
anterior cruciate ligament
medial collateral ligament
lateral collateral ligament
medial meniscus
patellar ligament
transverse ligament of knee
patella

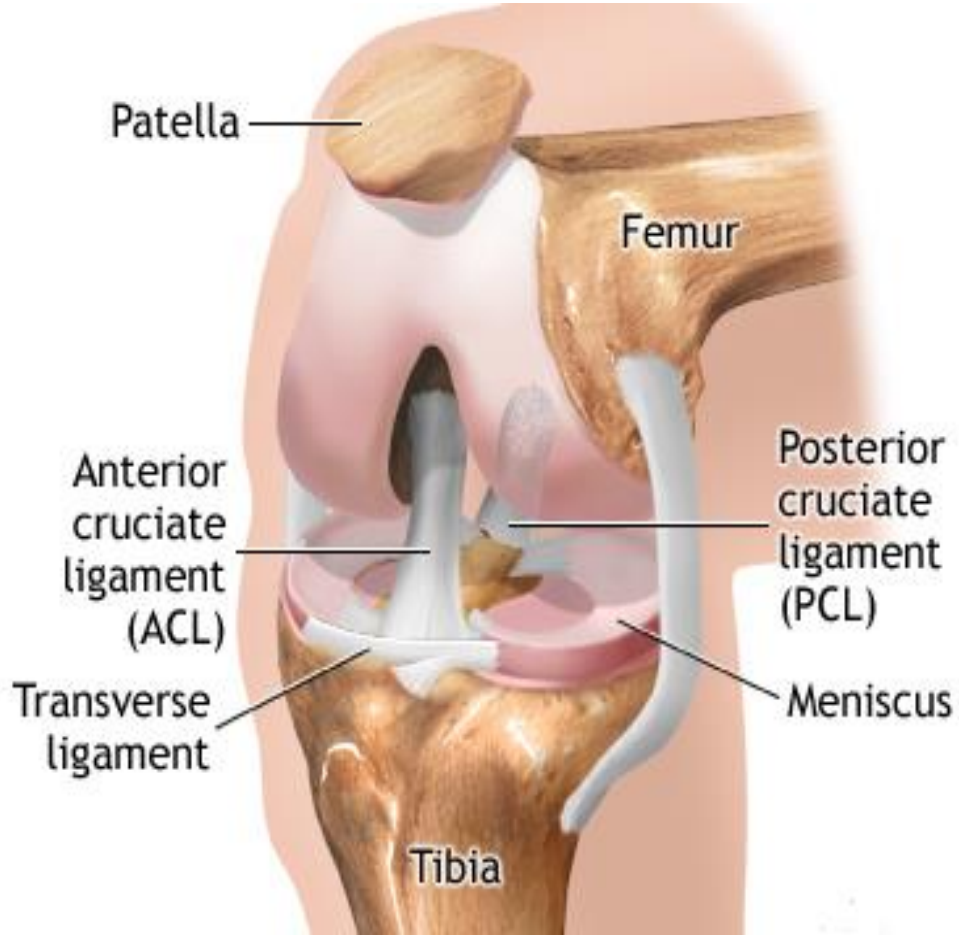
INTRA-ARTICULAR LIGAMENTS

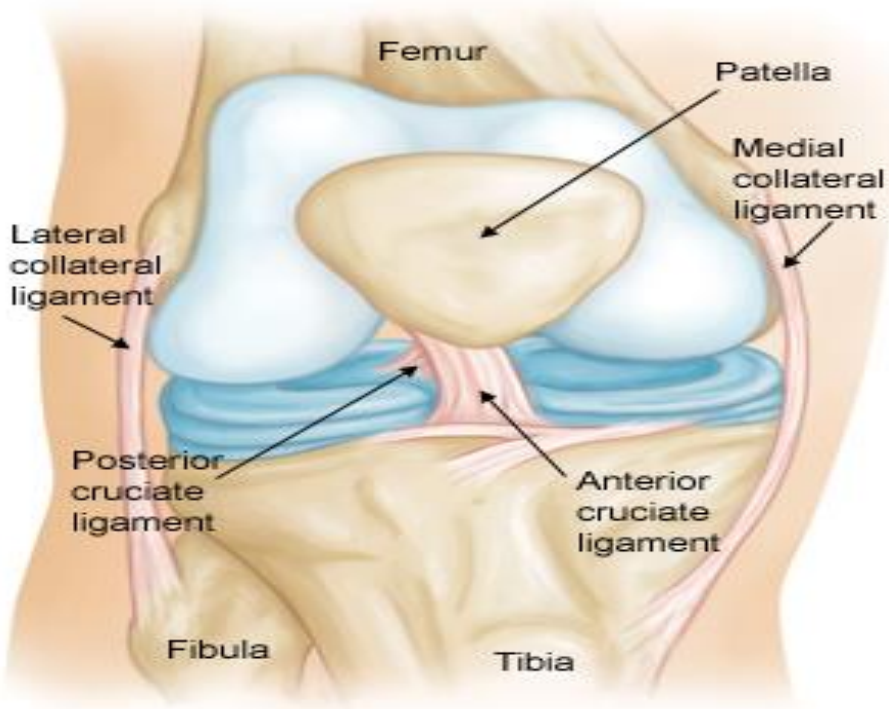
Cruciate ligaments & menisci

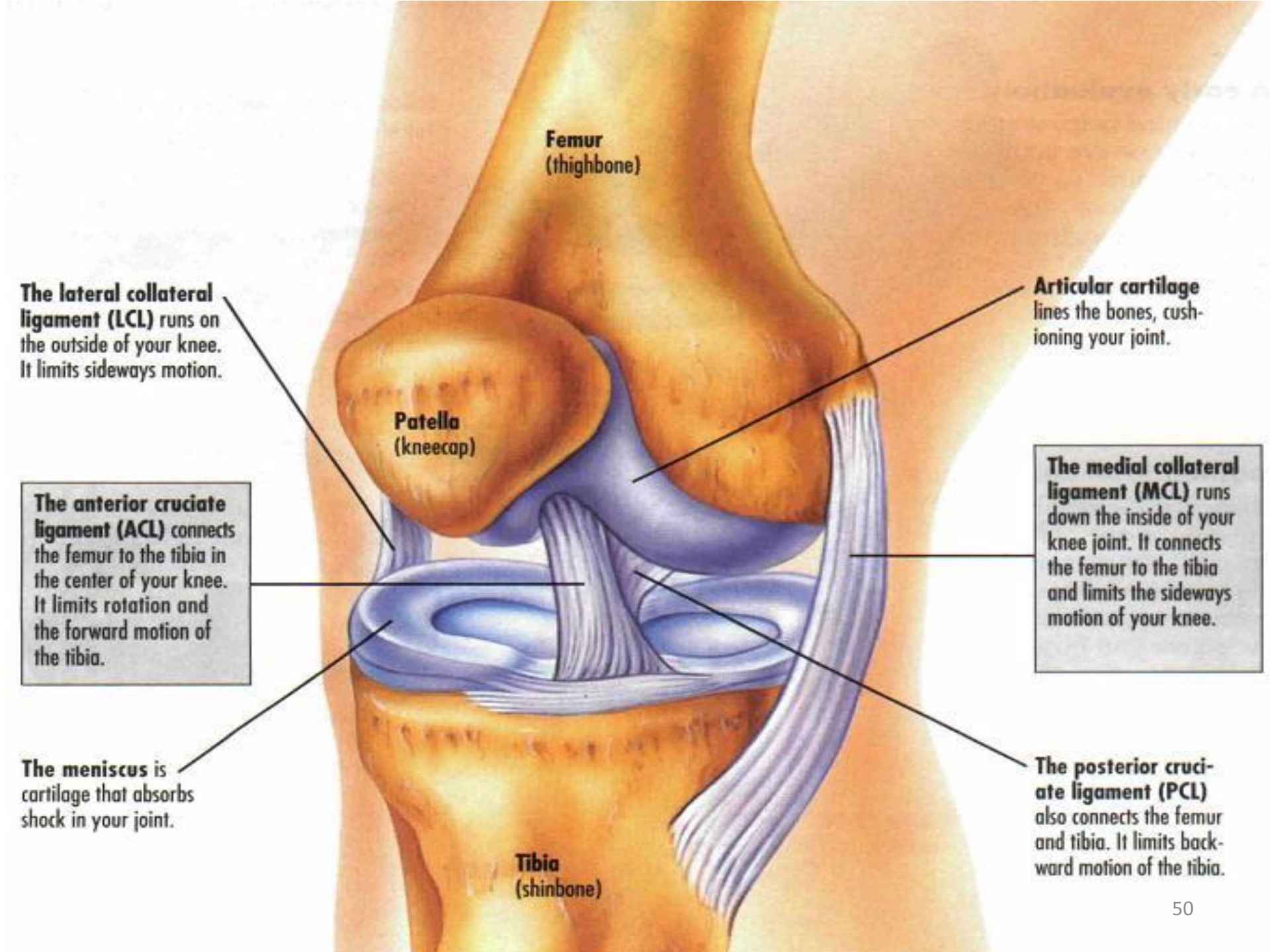
Anterior cruciate ligament (ACL)

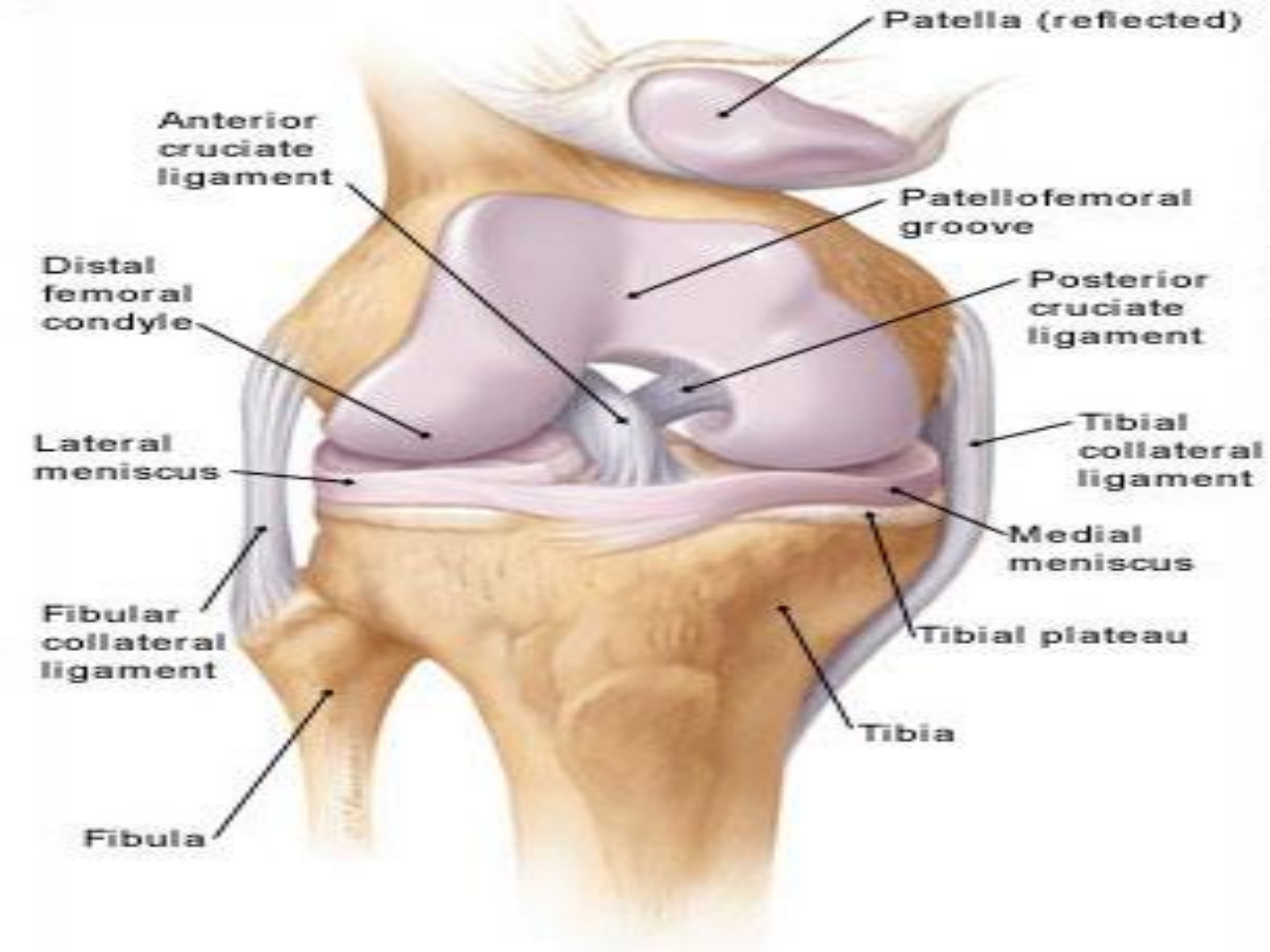
Posterior cruciate ligament (PCL)





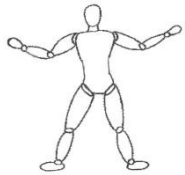



Femur
(thighbone)
The lateral collateral ligament (LCL) runs on the outside of your knee. It limits sideways motion.
Articular cartilage lines the bones, cushioning your joint.
Patella
(kneecap)
The anterior cruciate ligament (ACL) connects the femur to the tibia in the center of your knee. It limits rotation and the forward motion of the tibia.
The medial collateral ligament (MCL) runs down the inside of your knee joint. It connects the femur to the tibia and limits the sideways motion of your knee.
The meniscus is cartilage that absorbs shock in your joint.
The posterior cruciate ligament (PCL) also connects the femur and tibia. It limits backward motion of the tibia.
Tibia
(shinbone)


Patella (reflected)
Anterior cruciate ligament
Patellofemoral groove
Distal femoral condyle
Posterior cruciate ligament
Lateral meniscus
Tibial collateral ligament
Medial meniscus
Fibular collateral ligament
Tibial plateau
Tibia
Fibula

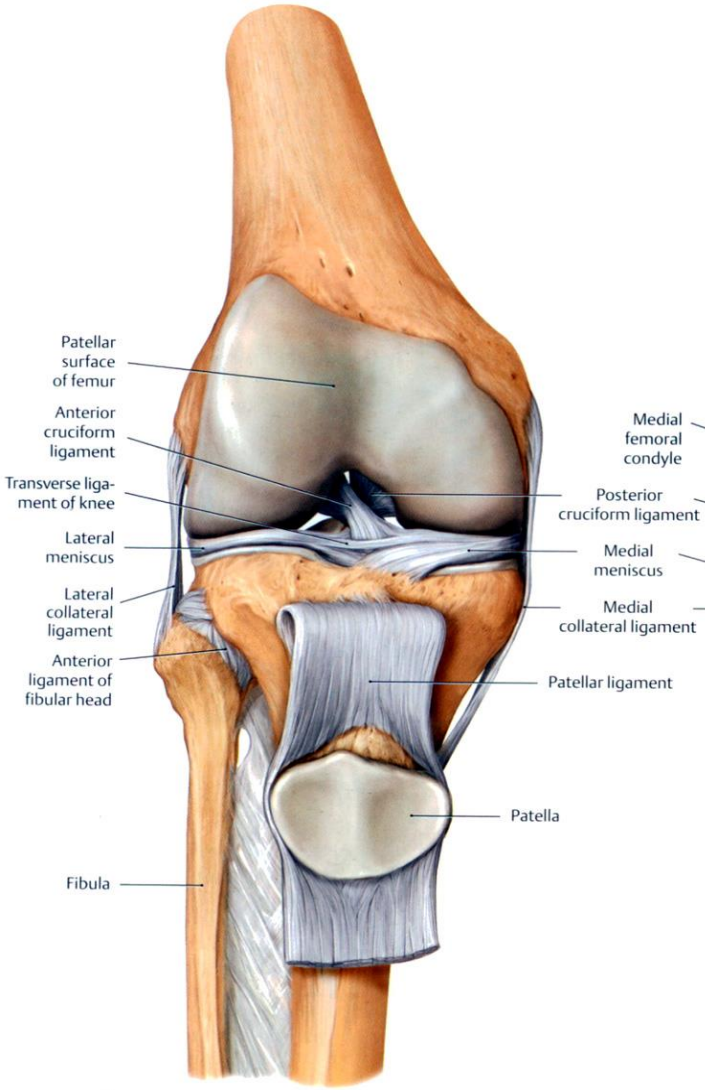
the right knee

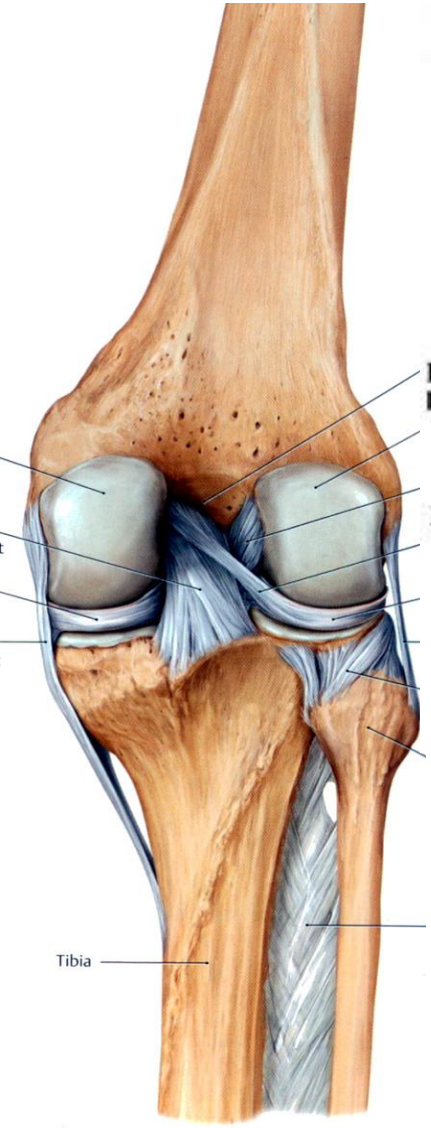
Menisci of the knee joint

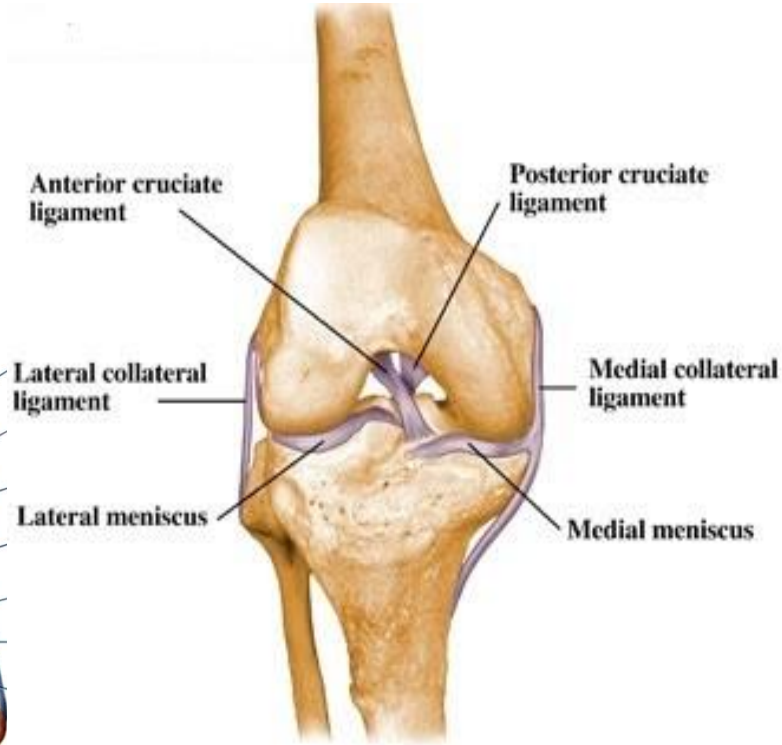


crescentic plates of fibrocartilage on the articular surface of tibia

deepen the surface and play a role in shock absorption.

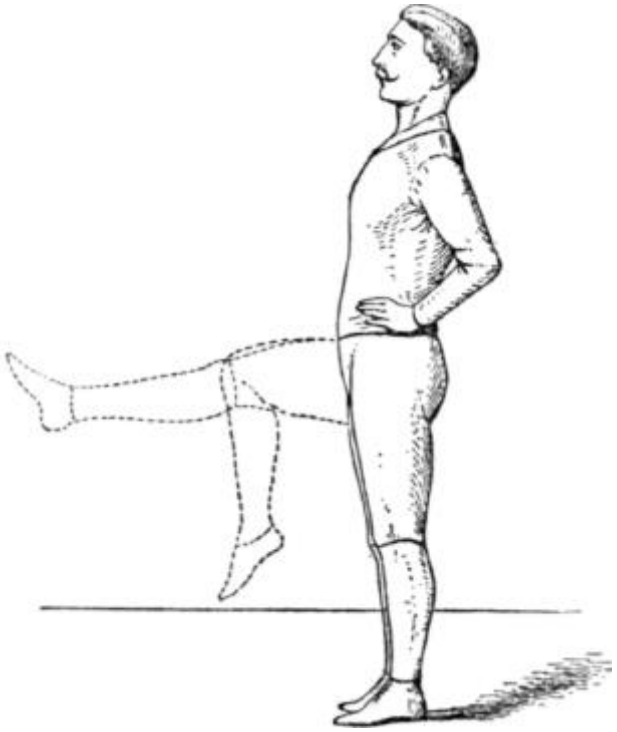






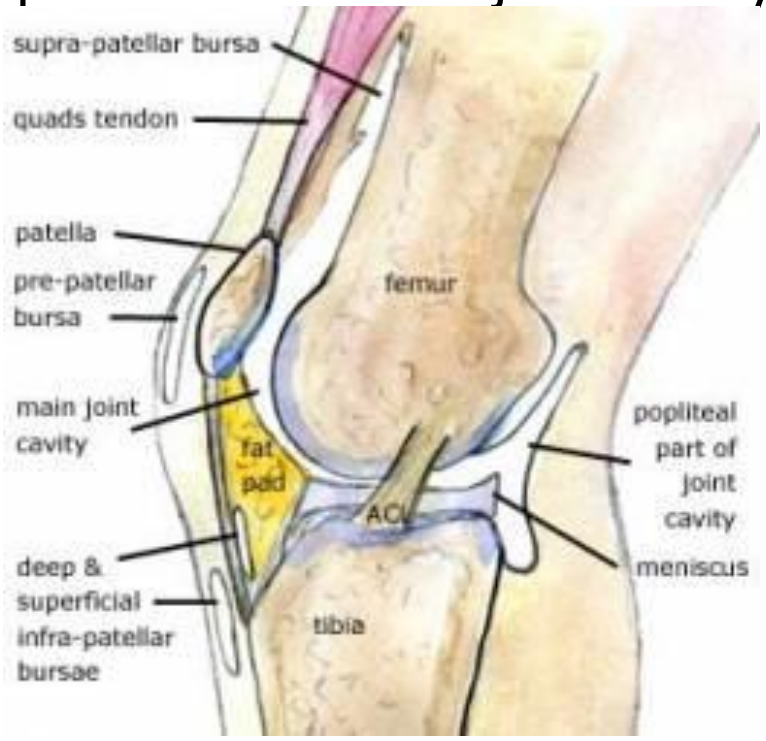
MOVEMENTS OF KNEE JOINT

Flexion and extension main knee movements
some rotation occurs when the knee is flexed.

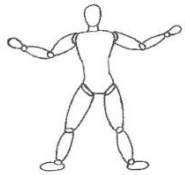


BURSAE AROUND KNEE JOINT

- There are at least 12 bursae around the knee joint because most tendons run parallel to the bones and pull lengthwise across the joint during knee movements.
- The **subcutaneous prepatellar** and **infrapatellar bursae** are located at the convex surface of the joint, allowing the skin to be able to move freely during movements of the knee.
- The large **suprapatellar bursa** is especially important because an infection in it may spread to the knee joint cavity.



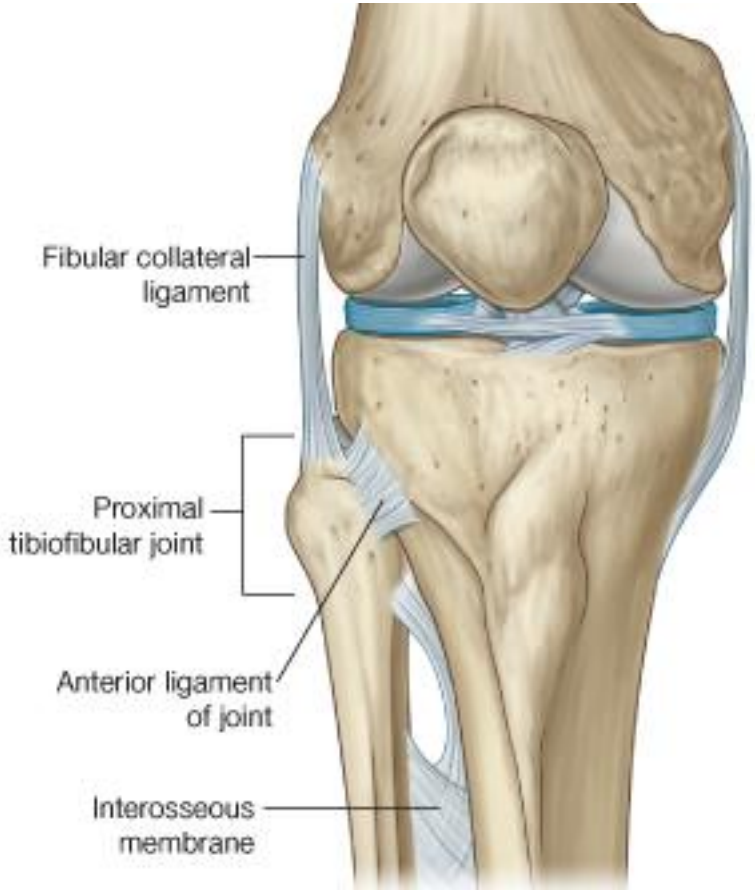
TIBIOFIBULAR JOINTS



(Superior) Tibiofibular joint

Syndesmosis (inferior tibiofibular) joint

In addition, an interosseous membrane joins the shafts of the two bones.



ANKLE JOINT

Talocrural joint

Distal ends of the tibia & fibula & superior parts of the talus

Synovial Joint Type: Hinge

LIGAMENTS OF ANKLE JOINT

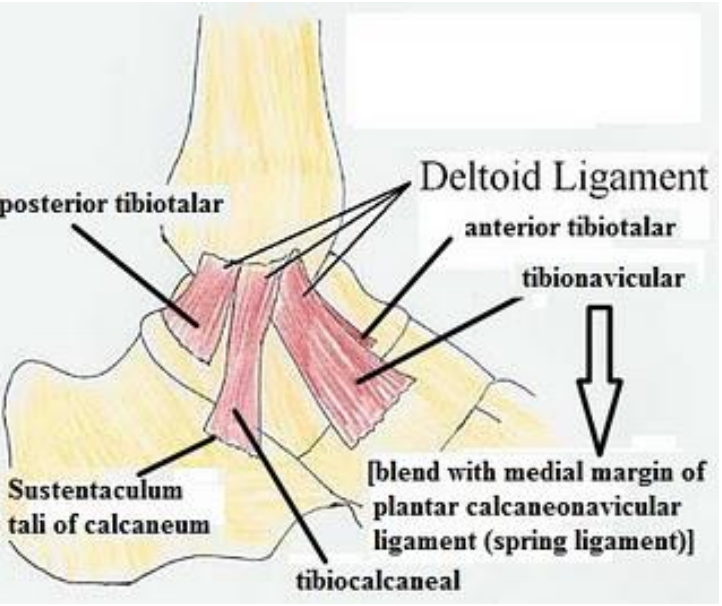
1) Lateral ligaments of the ankle

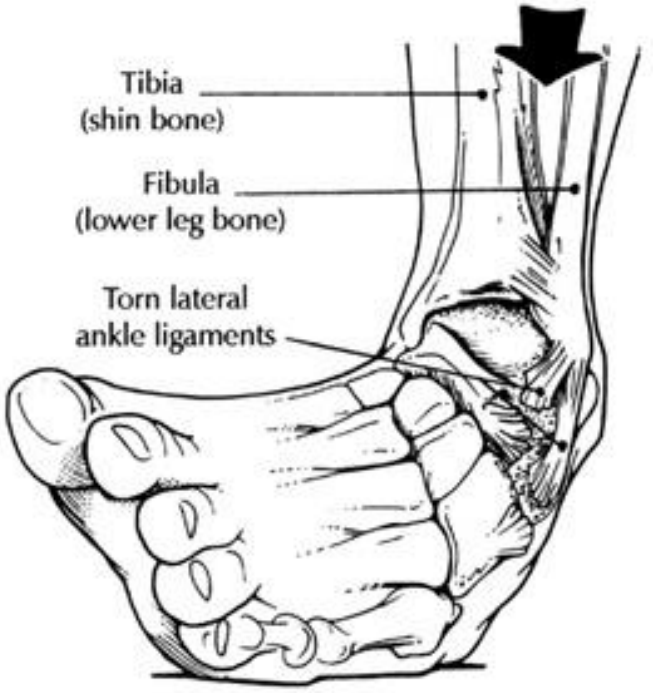
Anterior talofibular ligament

Posterior talofibular ligament

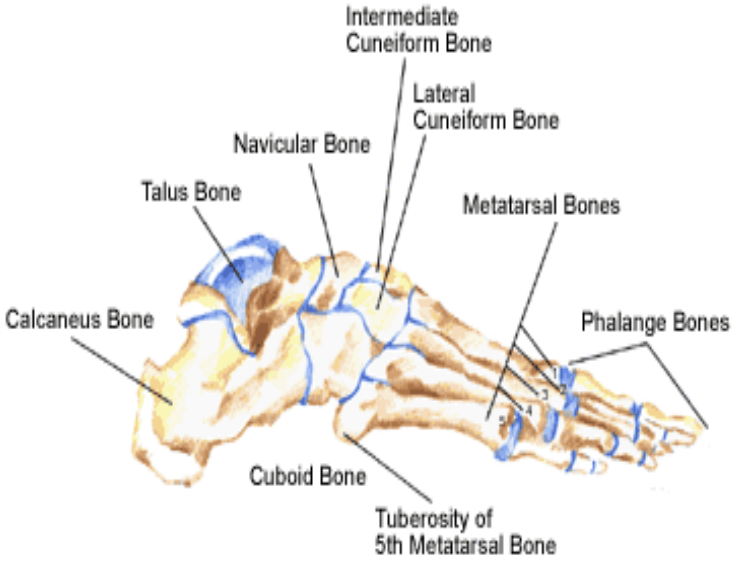
Calcaneofibular ligament

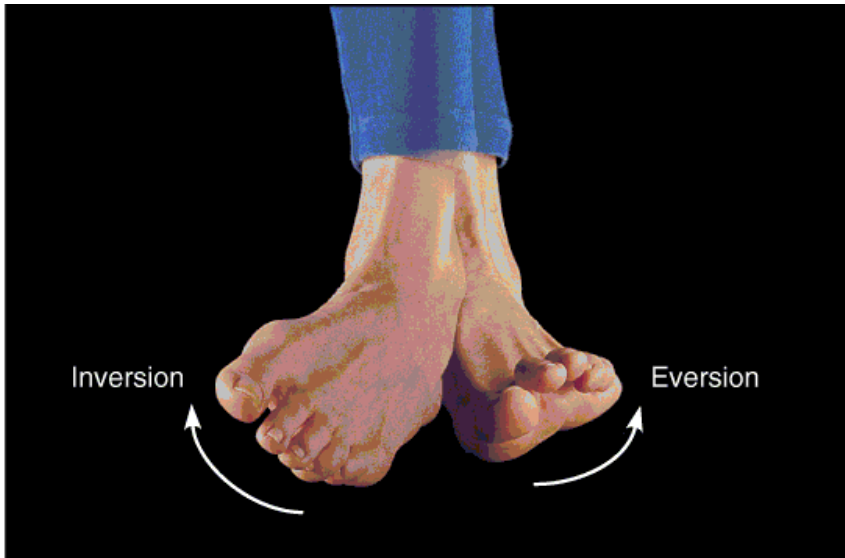
2) Medial ligament of the ankle (deltoid ligament)





The many joints of the foot involve the tarsals, metatarsals, and phalanges.





ARCHES OF THE FOOT

- weight-bearing capabilities and resiliency of the foot
  - foot's ability to adapt to changes in surface contour
    - supported by ligaments of the foot and tendons