ARTICULATIONS OF LOWER EXTREMITY

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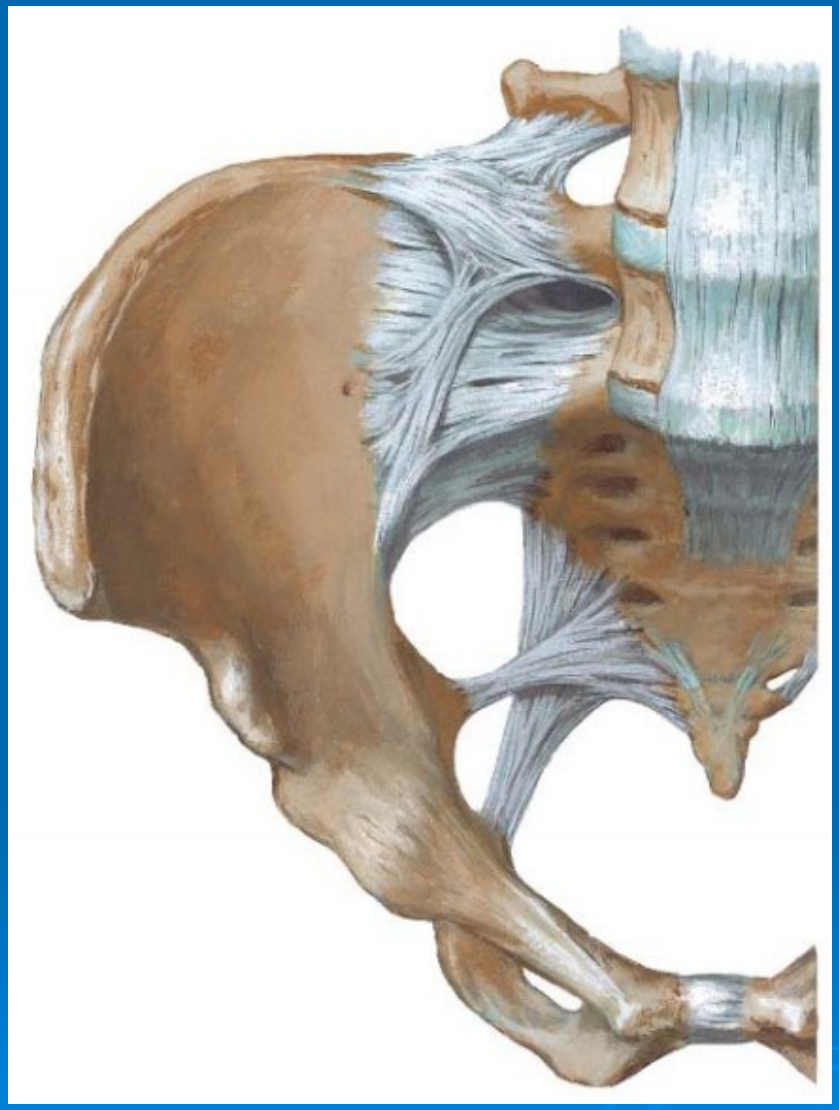
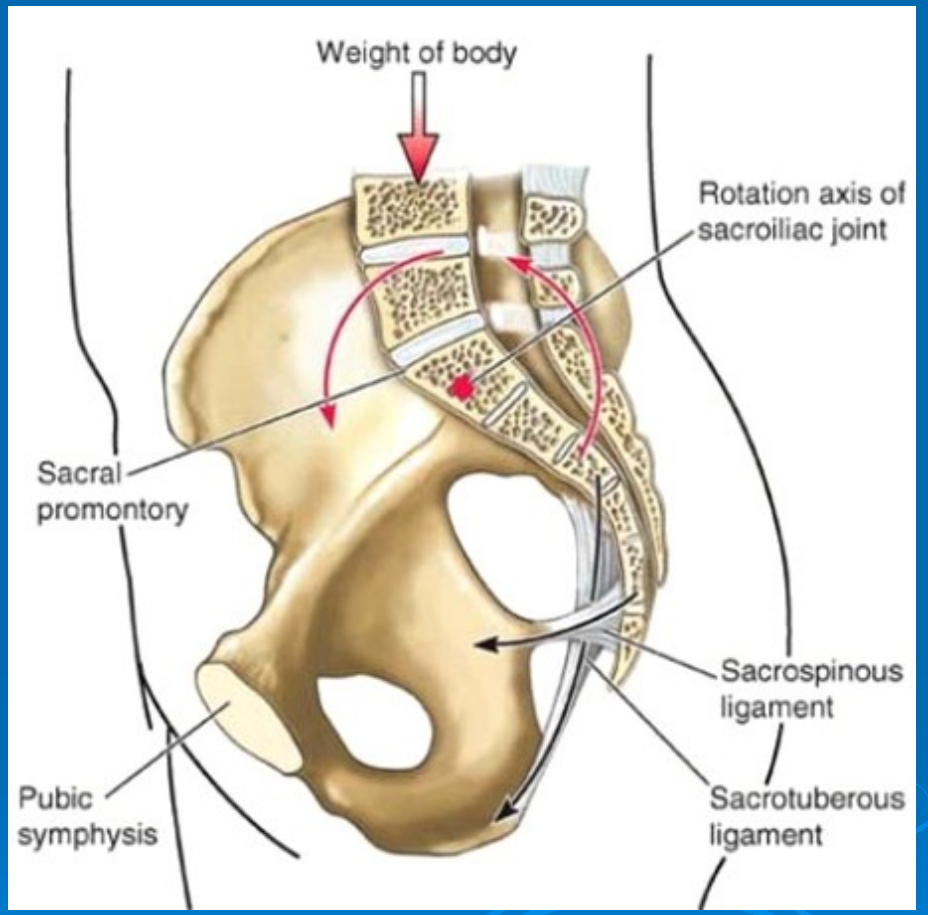
Pelvic Girdle

- formed by connection of the hip bones and the sacrum

Sacroiliac Joints

- compound joints
- synovial joint - anterior, between the auricular surfaces of the sacrum and ilium and covered with articular cartilage
- syndesmosis - posterior, between the tuberosities
- sacroiliac ligaments
- iliolumbar ligaments
- sacrotuberous ligaments
- sacrospinous ligament
- movement: is limited by interlocking of the articulating bones and the sacroiliac ligaments to slight gliding and rotary movements




Weight of body
Rotation axis of sacroiliac joint
Sacral promontory
Sacrospinous ligament
Pubic symphysis
Sacrotuberous ligament

Pubis Symphysis

- secondary cartilaginous joint
- fibrocartilaginous interpubic disc - wider in women
- superior pubic ligament
- inferior pubic ligament
- obturator membrane
- little movements

Pelvis

Greater pelvis (false)

- bounded by the iliac alae posterolaterally and S1 posteriorly

Lesser pelvis (true)

- bounded by the pelvic surfaces of the hip bones, sacrum, coccyx

Pelvic inlet (superior pelvic aperture)

- formed laterally by pectineal and arcuate lines, anteriorly by the crests of the pubes and posteriorly by sacrum

Pelvic outlet (inferior pelvic aperture)

- region between the subpubic angle, ischial tuberosities and apex of coccyx
- plane consists of two triangles with one common basis

Amplitudo pelvis

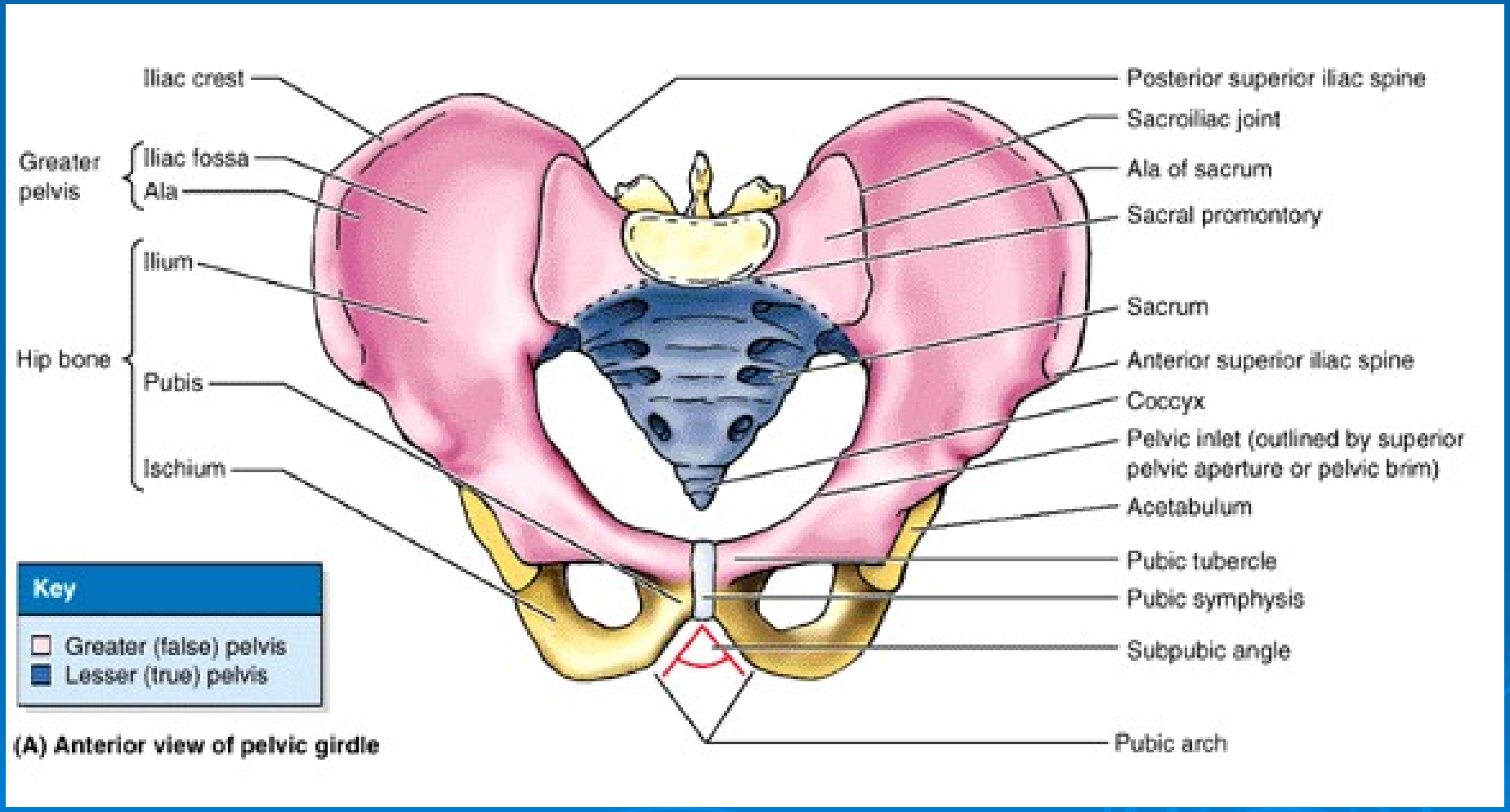
- demarcated by a line linking the interface between S2 and S3, the centre of acetabular basis, and the centre of symphysis
- approximately circular shape

Angustia pelvis

- bordered by inferior symphysis, ischial spine and apex of coccyx
- ovoid shape

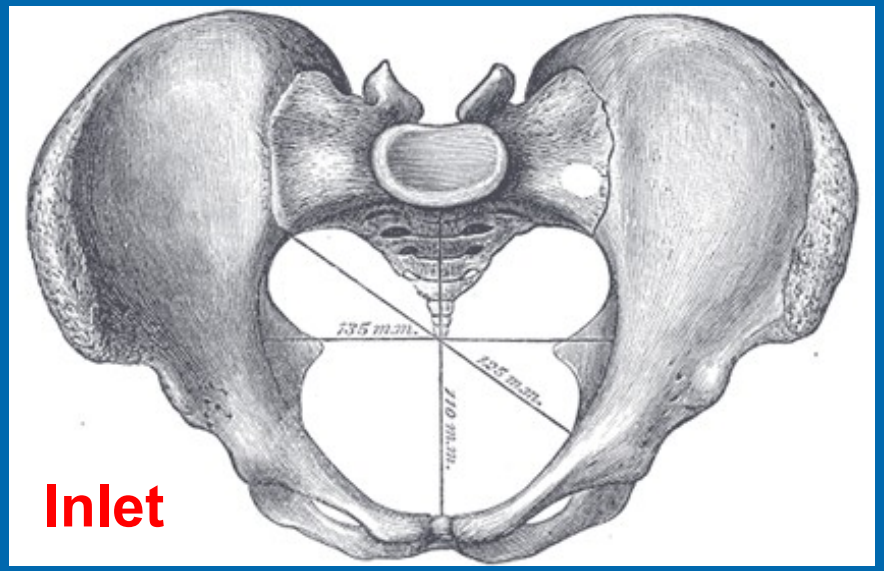
Pelvimetry

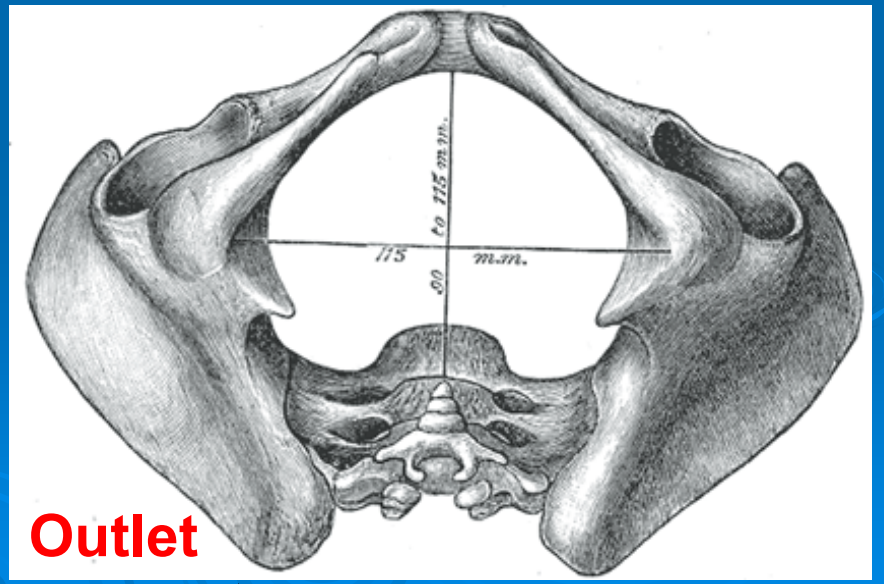
- interspinous distance - between anterior superior iliac spines
- intercristal distance - between the furthest lateral points of two iliac crest
- intertrochanteric distance - between two greater trochanters
- conjugata externa - between spinous process of L5 and upper edge of the symphysis



(A) Anterior view of pelvic girdle

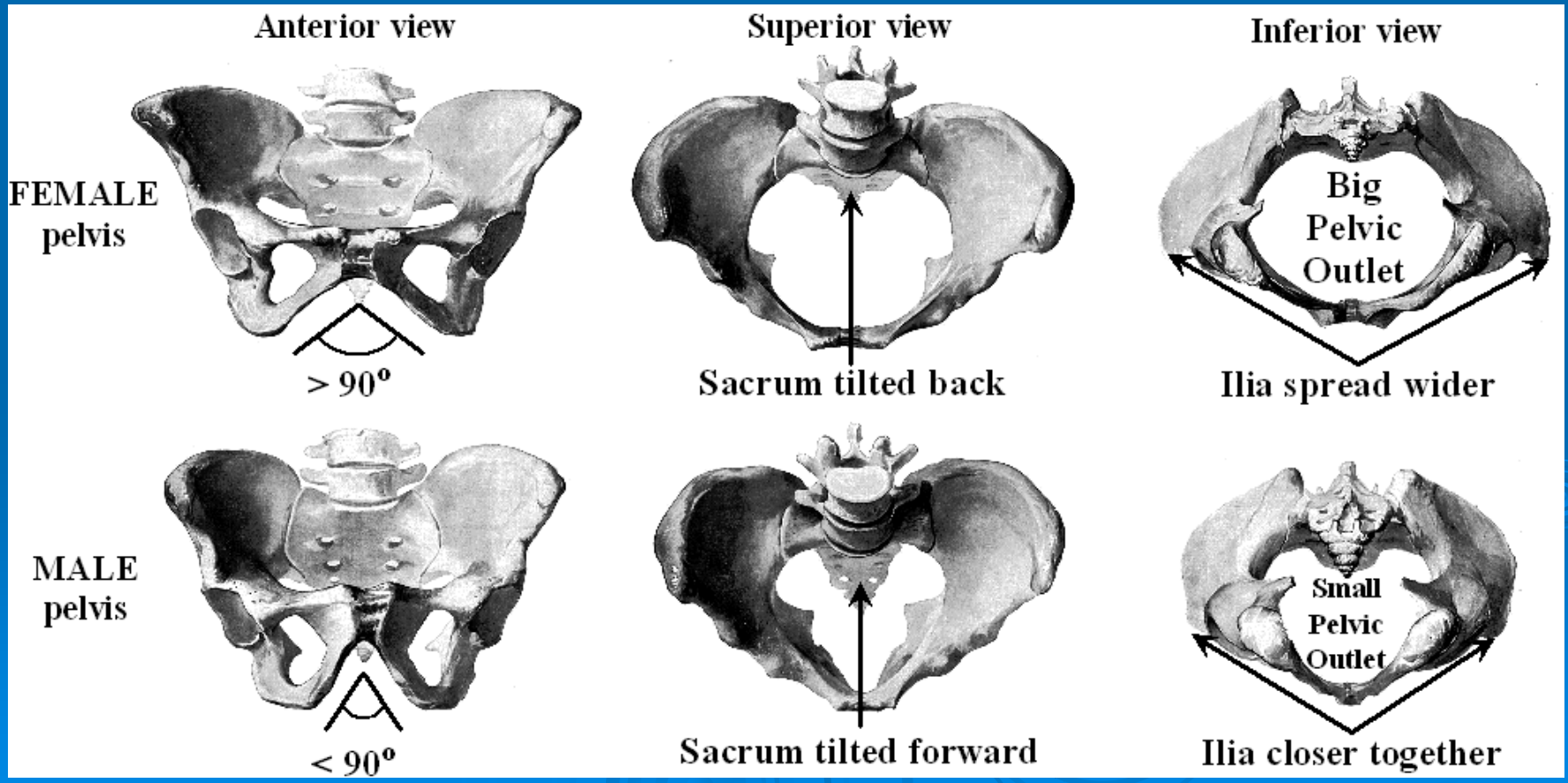

a
h
k
60–65°
b
c
d
e
f
g


135 m.m.
Inlet


to 125 m.m.
115
m.m.
Outlet

- **Female type of pelvis**

  pelvic inlet typically has a rounded oval shape and wide transverse diameter → successful vaginal delivery of a fetus

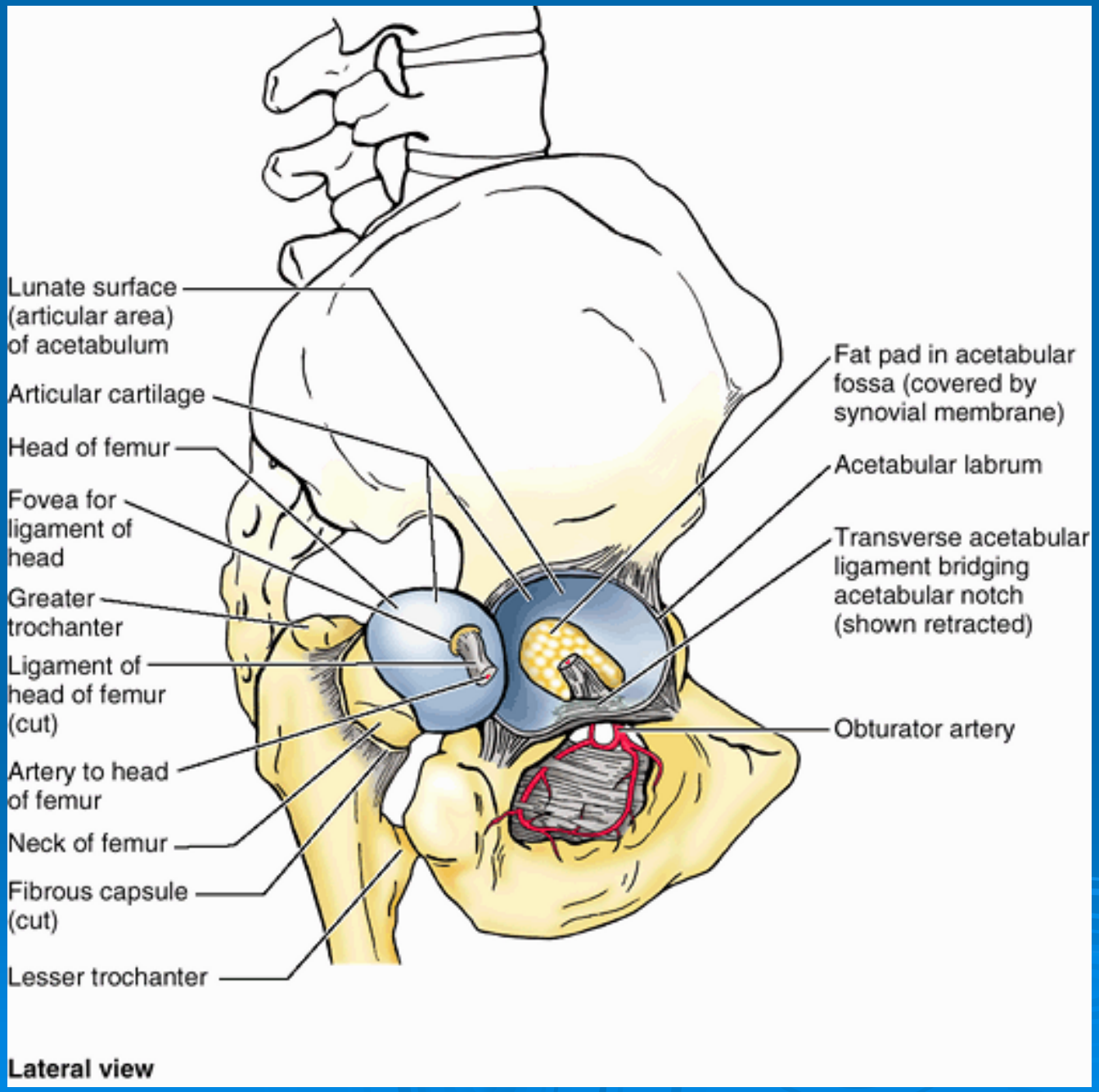


Bony Pelvis	Male (♂)	Female (♀)
General structure	Thick and heavy	Thin and light
Greater pelvis (pelvis major)	Deep	Shallow
Lesser pelvis (pelvis minor)	Narrow and deep, tapering	Wide and shallow, cylindrical
Pelvic inlet (superior pelvic aperture)	Heart-shaped, narrow	Oval and rounded; wide
Pelvic outlet (inferior pelvic aperture)	Comparatively small	Comparatively large
Pubic arch and subpubic angle	Narrow (<70°)	Wide (>80°)
Obturator foramen	Round	Oval
Acetabulum	Large	Small
Greater sciatic notch	Narrow (~70°); inverted V	Almost 90°

Coxal Articulation

Hip Joint

- the connection between the lower limb and pelvic girdle
- multiaxial ball-and-socket
- designed for stability over a wide range of movement
- **the head of the femur** is covered with articular cartilage, except for the fovea for the ligament of the femoral head
- **the acetabulum** - horseshoe-shaped
- the acetabular rim - semilunar articular part covered with the lunate surface of the acetabulum (articular cartilage)
- the acetabular labrum
- the transverse acetabular ligament
- the acetabular fossa - centrally, a deep non-articular part



Lateral view

Articular Capsule

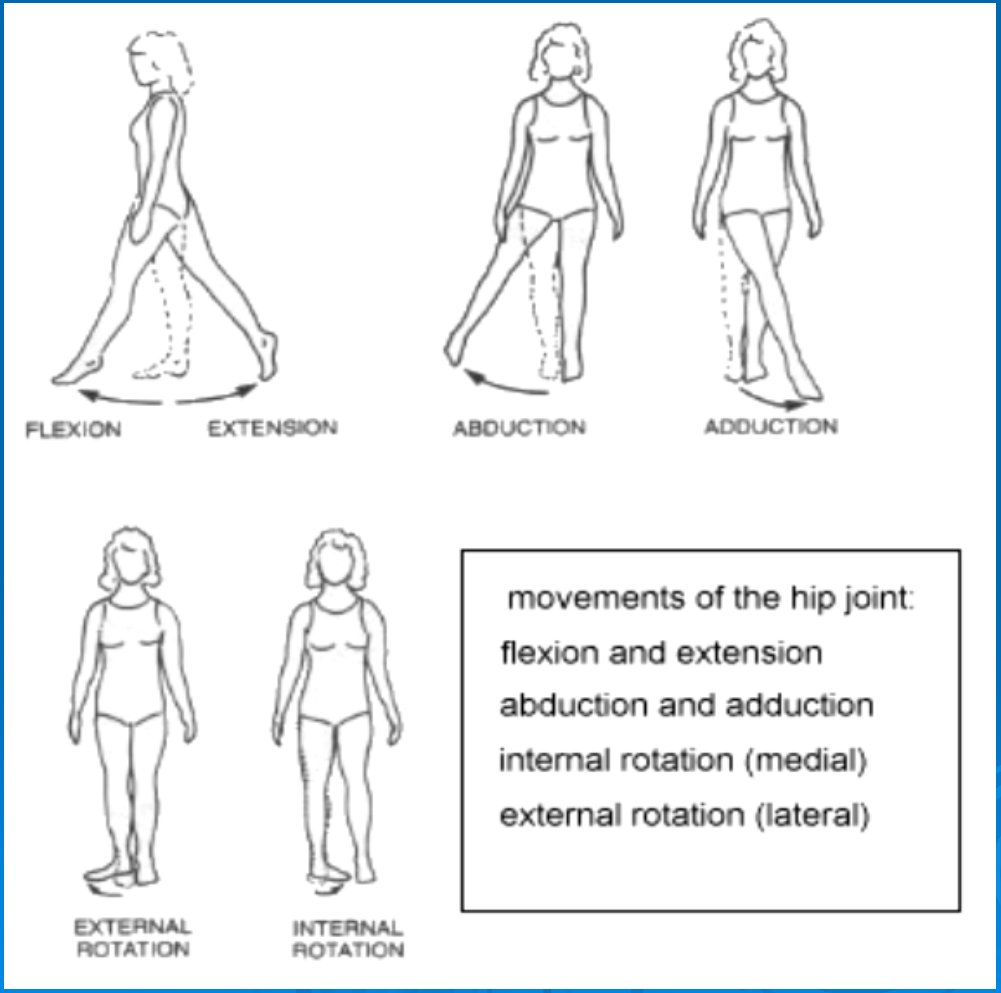
- fibrous capsule - loose external fibrous layer
- synovial membrane - internal layer
- take a spiral course (from the hip bone to the intertrochanteric line)
- prox: just peripheral to the rim and transverse acetabular lig.
- ant: intertrochanteric line
- post: close to intertrochanteric crest

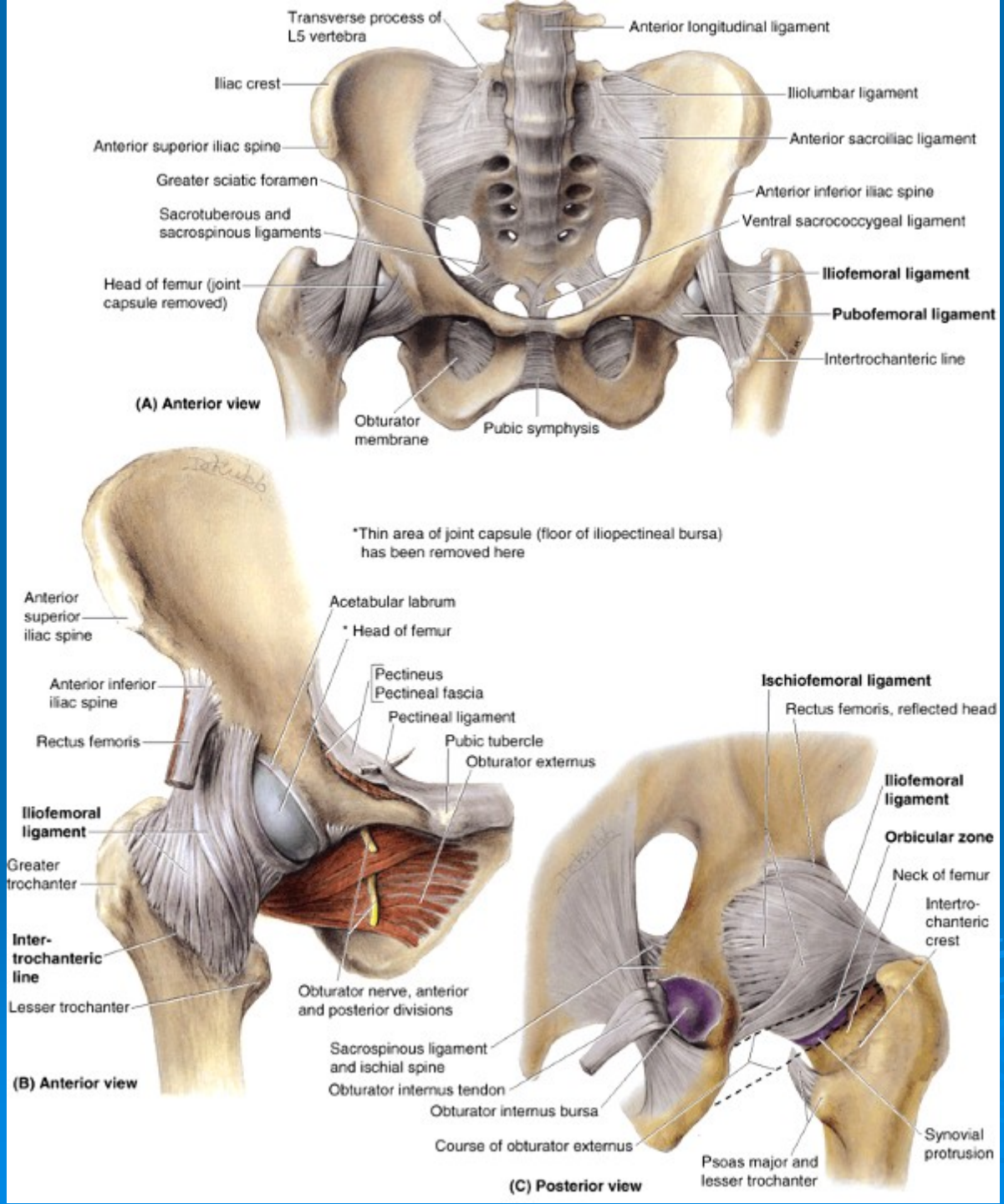
Capsular Ligaments

- bursa iliopectinea
- iliofemoral ligament
- ischiofemoral ligament
- pubofemoral ligament

⇨ Zona orbicularis

- movement: flexion, extension, abduction, adduction, external rotation, internal rotation and circumduction



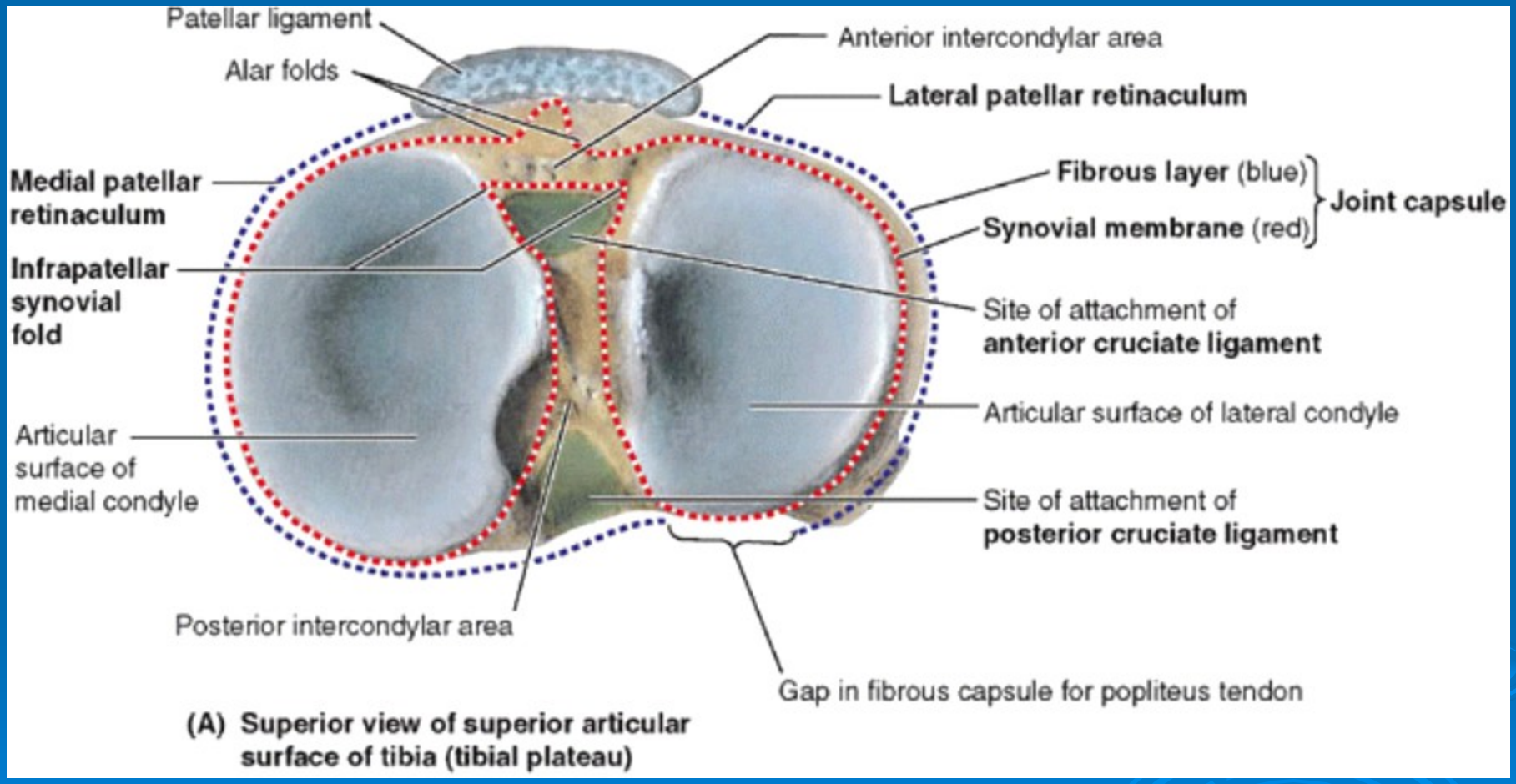

Transverse process of L5 vertebra
Anterior longitudinal ligament
Iliac crest
Iliolumbar ligament
Anterior superior iliac spine
Anterior sacroiliac ligament
Greater sciatic foramen
Anterior inferior iliac spine
Sacrotuberous and sacrospinous ligaments
Ventral sacrococcygeal ligament
Head of femur (joint capsule removed)
Iliofemoral ligament
Pubofemoral ligament
Intertrochanteric line
(A) Anterior view
Obturator membrane
Pubic symphysis
*Thin area of joint capsule (floor of iliopectineal bursa) has been removed here
Anterior superior iliac spine
Acetabular labrum
* Head of femur
Anterior inferior iliac spine
Pectineus
Pectineal fascia
Pectineal ligament
Rectus femoris
Pubic tubercle
Obturator externus
Iliofemoral ligament
Greater trochanter
Inter-trochanteric line
Lesser trochanter
Obturator nerve, anterior and posterior divisions
(B) Anterior view
Ischiofemoral ligament
Rectus femoris, reflected head
Iliofemoral ligament
Orbicular zone
Neck of femur
Intertro-chanteric crest
Sacrospinous ligament and ischial spine
Obturator internus tendon
Obturator internus bursa
Course of obturator externus
Synovial protrusion
Psoas major and lesser trochanter
(C) Posterior view

Knee Joint

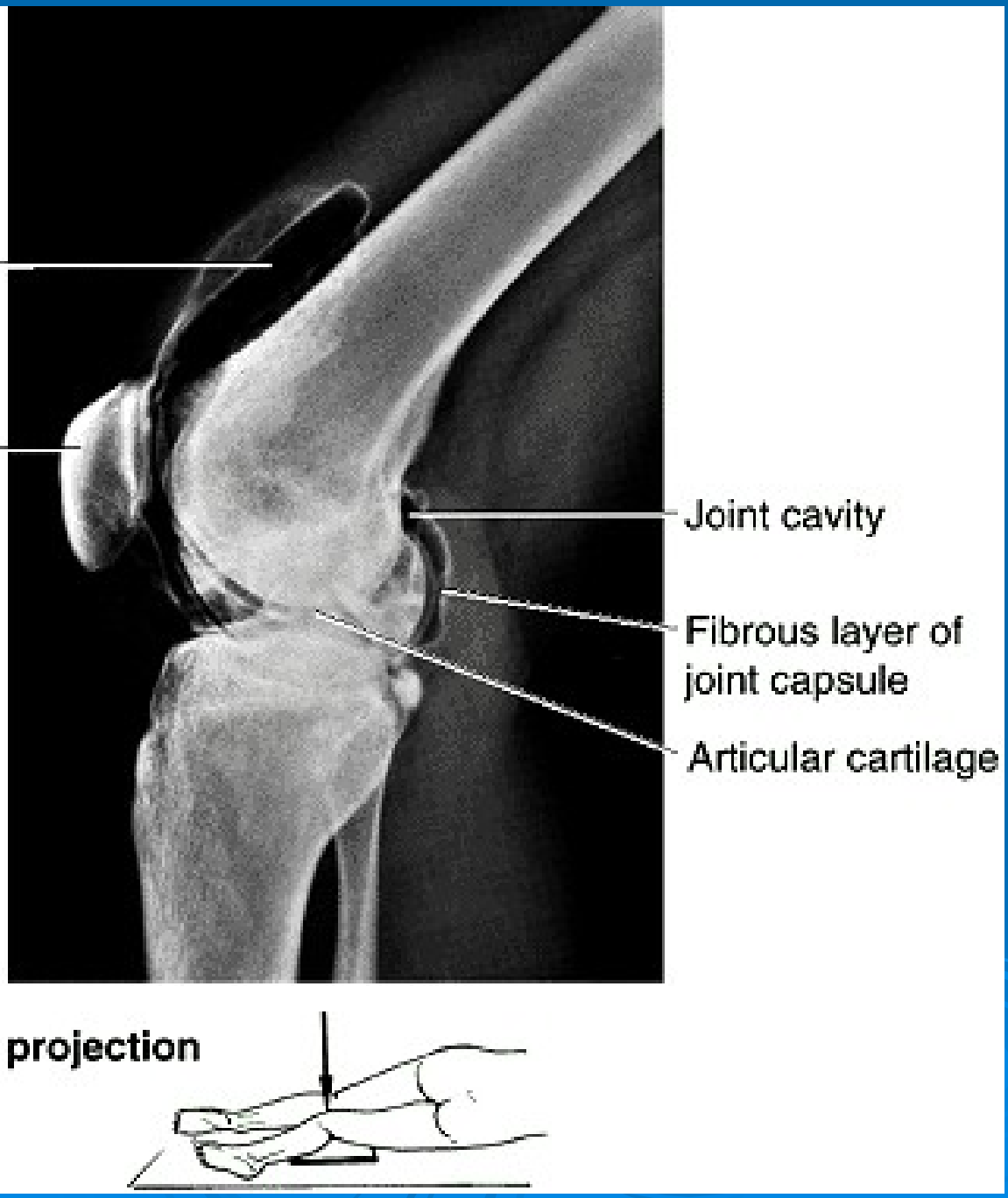
- largest and most superficial joint
- hinge type with interposing fibrocartilage discs/menisci
- medial and lateral femorotibial articulations
- femoropatellar articulation

Articular Capsule

- fibrous layer - few thickened parts, capsular ligaments, bur for the main part it´s thin and incomplete in some areas
- synovial membrane - lines all internal surfaces of the articular cavity not covered with articular cartilage. Centrally it becomes separated from the fibrou layer
- bursae: suprapatellar, semimembranosus, subtendinous

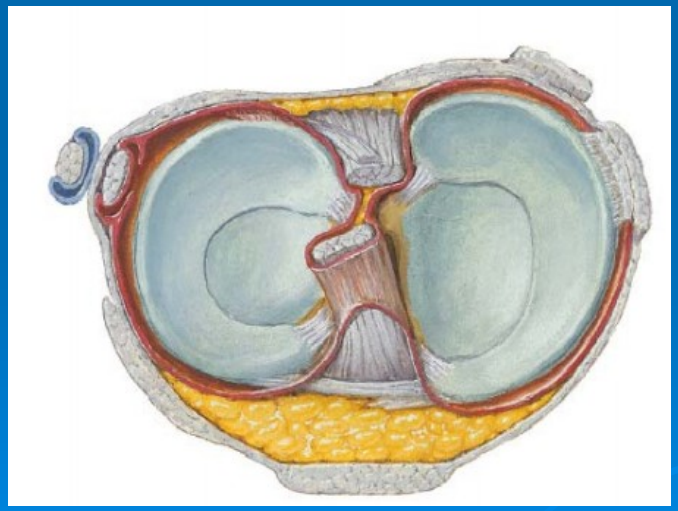


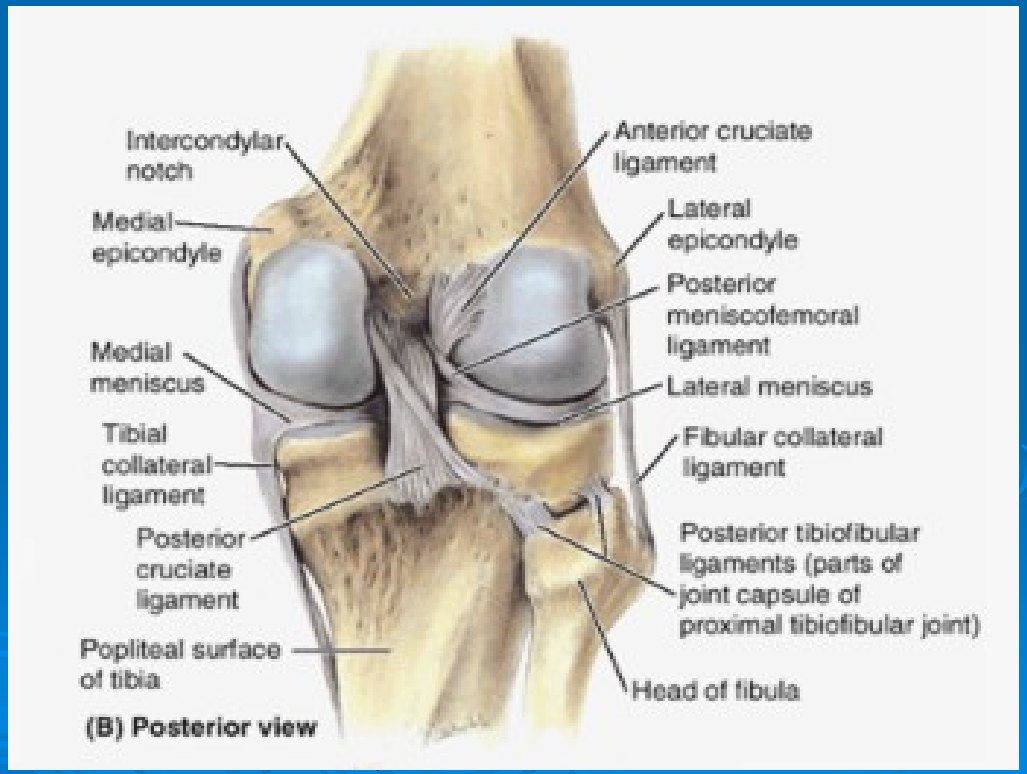
(A) Superior view of superior articular surface of tibia (tibial plateau)


Suprapatellar bursa
Patella
Joint cavity
Fibrous layer of joint capsule
Articular cartilage
Lateral projection

Extracapsular Ligaments

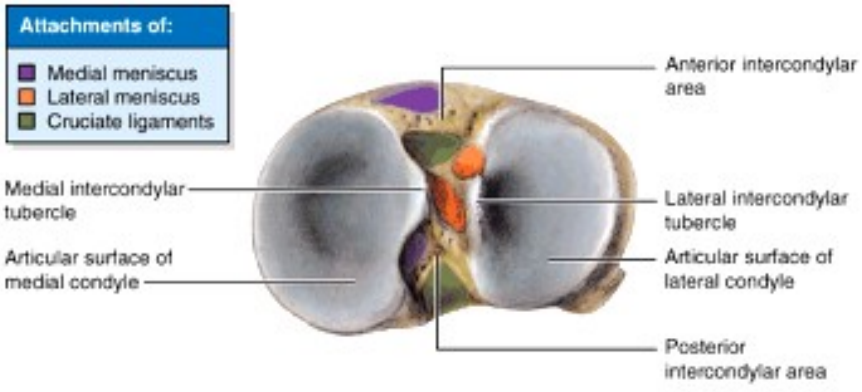
- patellar ligament
- medial and lateral patellar retinaculum
- medial and lateral collateral ligaments
- oblique popliteal ligament
- arcuate popliteal ligament



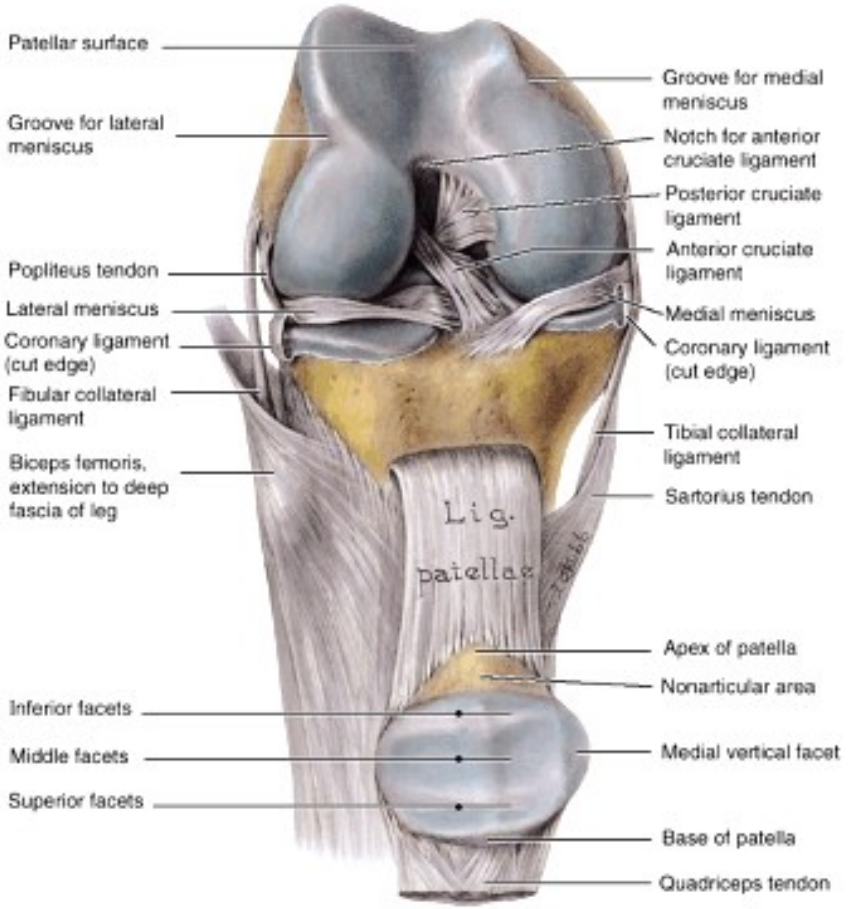


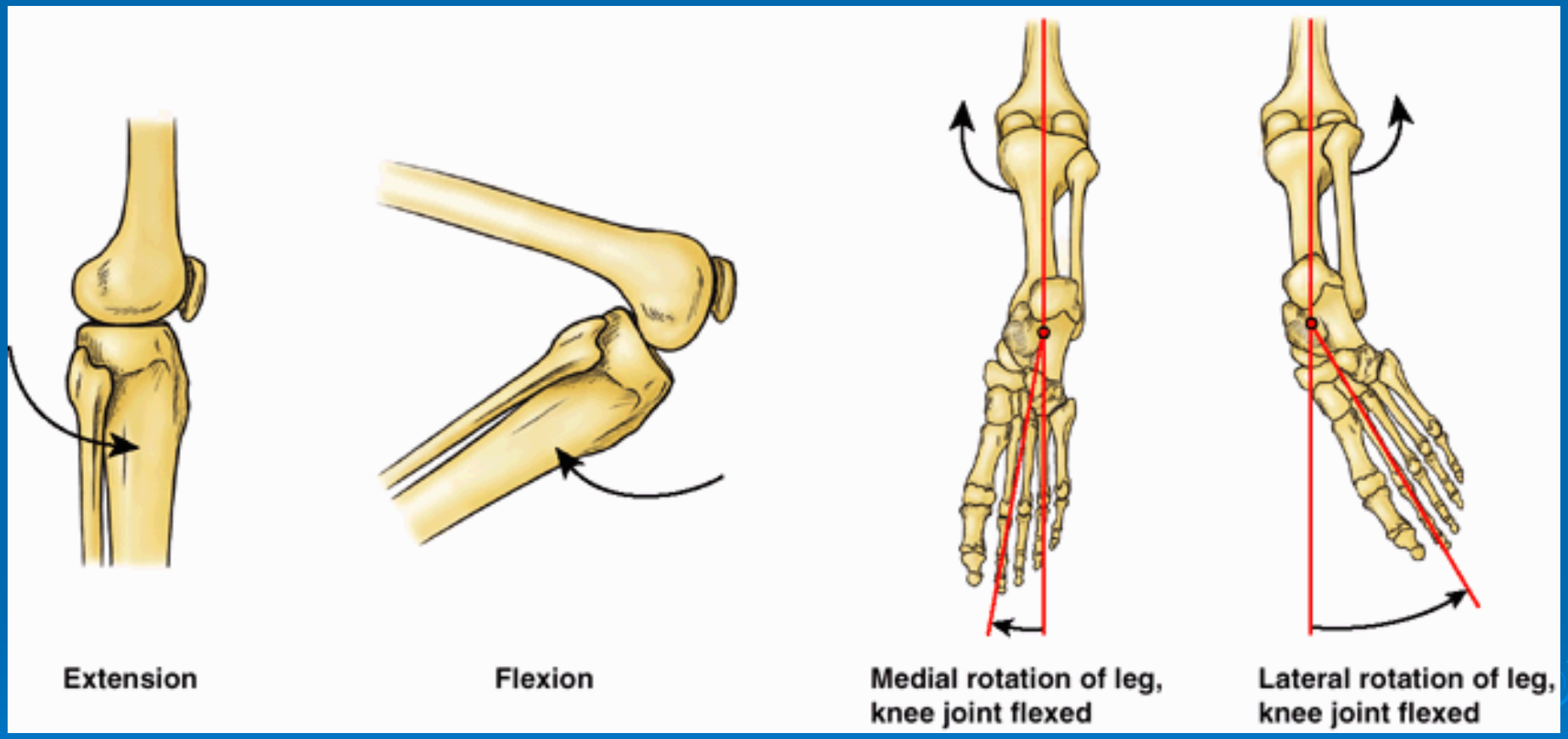
Intra-Articular Ligaments

- consist of the cruciate ligaments and menisci
- anterior and posterior cruciate ligaments – crisscross within the joint capsule but outside the synovial cavity
- **medial and lateral menisci**
- crescentic plates of fibrocartilage on the articular surface of the tibia that deepen the surface and play role in shock absorption
- attached at their ends to the intercondylar area of the tibia
- transverse ligament of the knee joints
- medial meniscus - C-shaped
- lateral meniscus - nearly circular and smaller

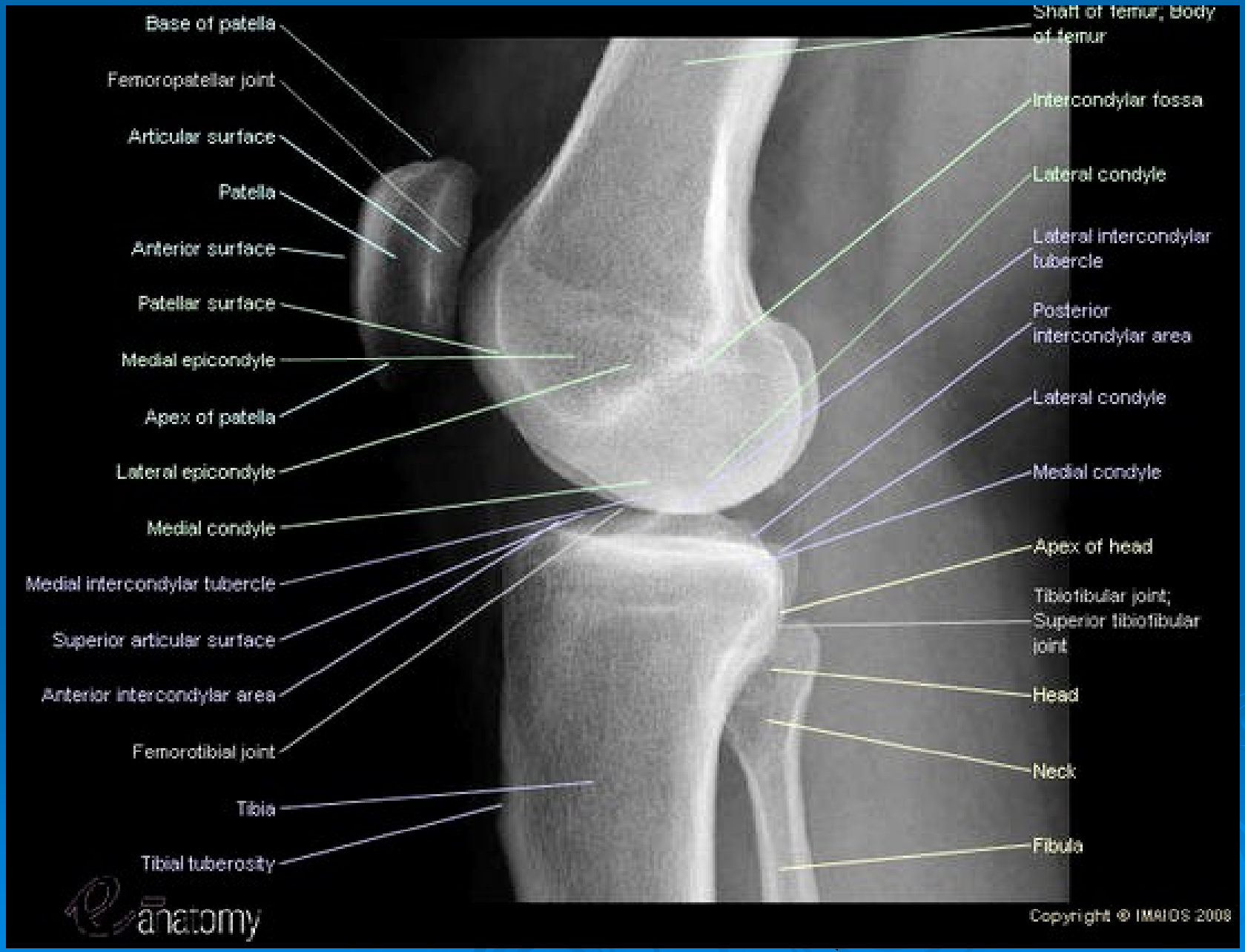


(A) Superior view of superior articular surface of tibia (tibial plateau)





- movement: flexion, extension, external and internal rotation


Base of patella
Femoropatellar joint
Articular surface
Patella
Anterior surface
Patellar surface
Medial epicondyle
Apex of patella
Lateral epicondyle
Medial condyle
Medial intercondylar tubercle
Superior articular surface
Anterior intercondylar area
Femorotibial joint
Tibia
Tibial tuberosity
Shaft of femur; Body of femur
Intercondylar fossa
Lateral condyle
Lateral intercondylar tubercle
Posterior intercondylar area
Lateral condyle
Medial condyle
Apex of head
Tibiofibular joint; Superior tibiofibular joint
Head
Neck
Fibula
anatomy
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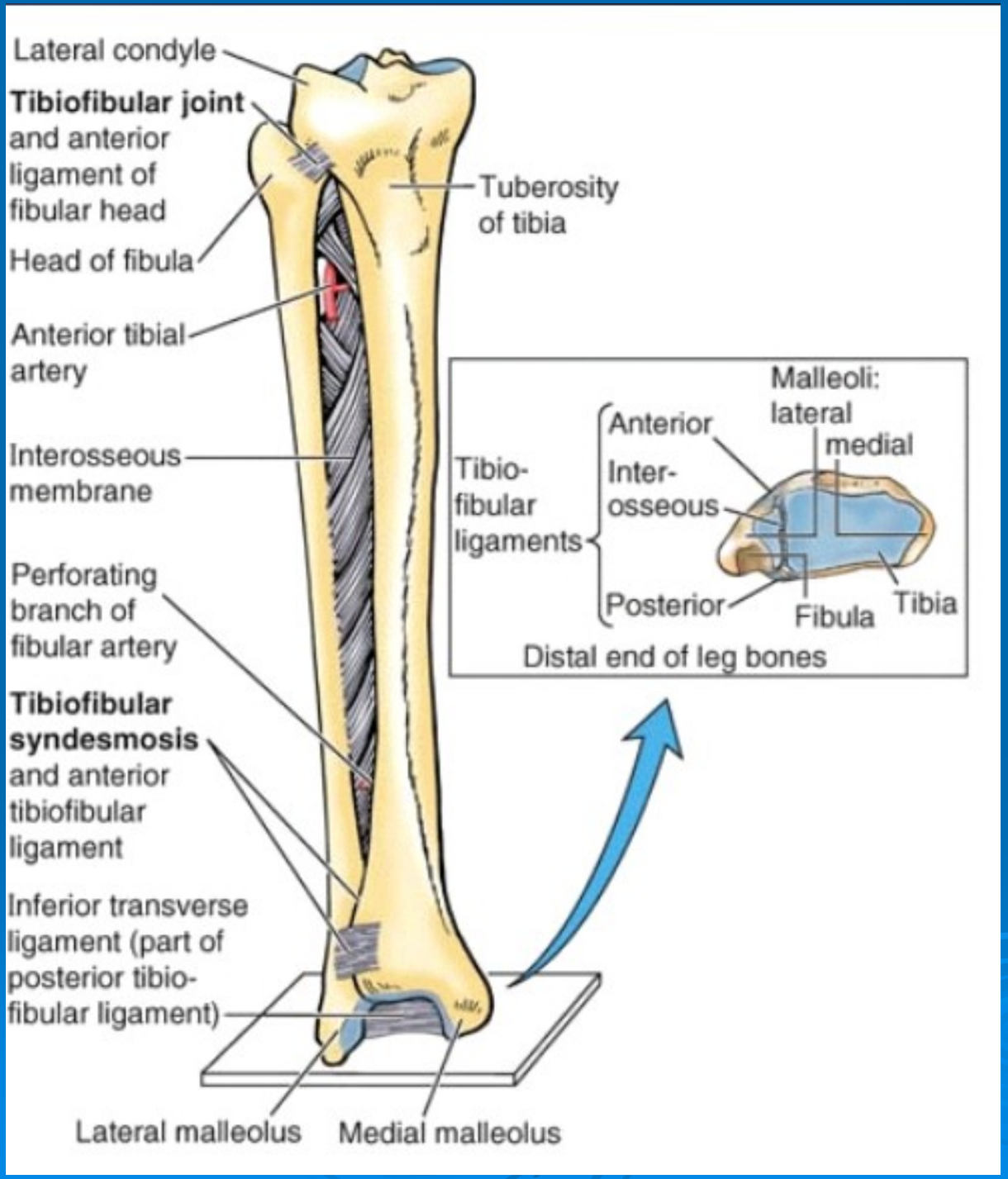
Tibiofibular Joints

Superior Tibiofibular Joint (plane)

- between the flat facet on the fibular head and a similar articular facet on the lateral tibial condyle
- minimal movement
- anterior and posterior ligaments of the head of the fibula

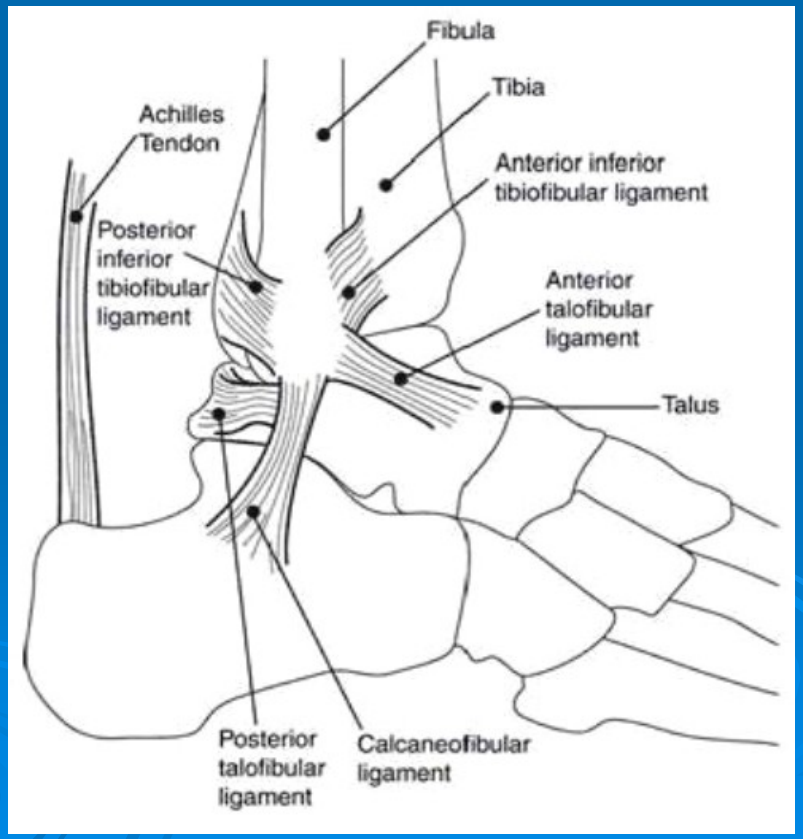
Inferior Tibiofibular Joint (syndesmosis = fibrous joint)

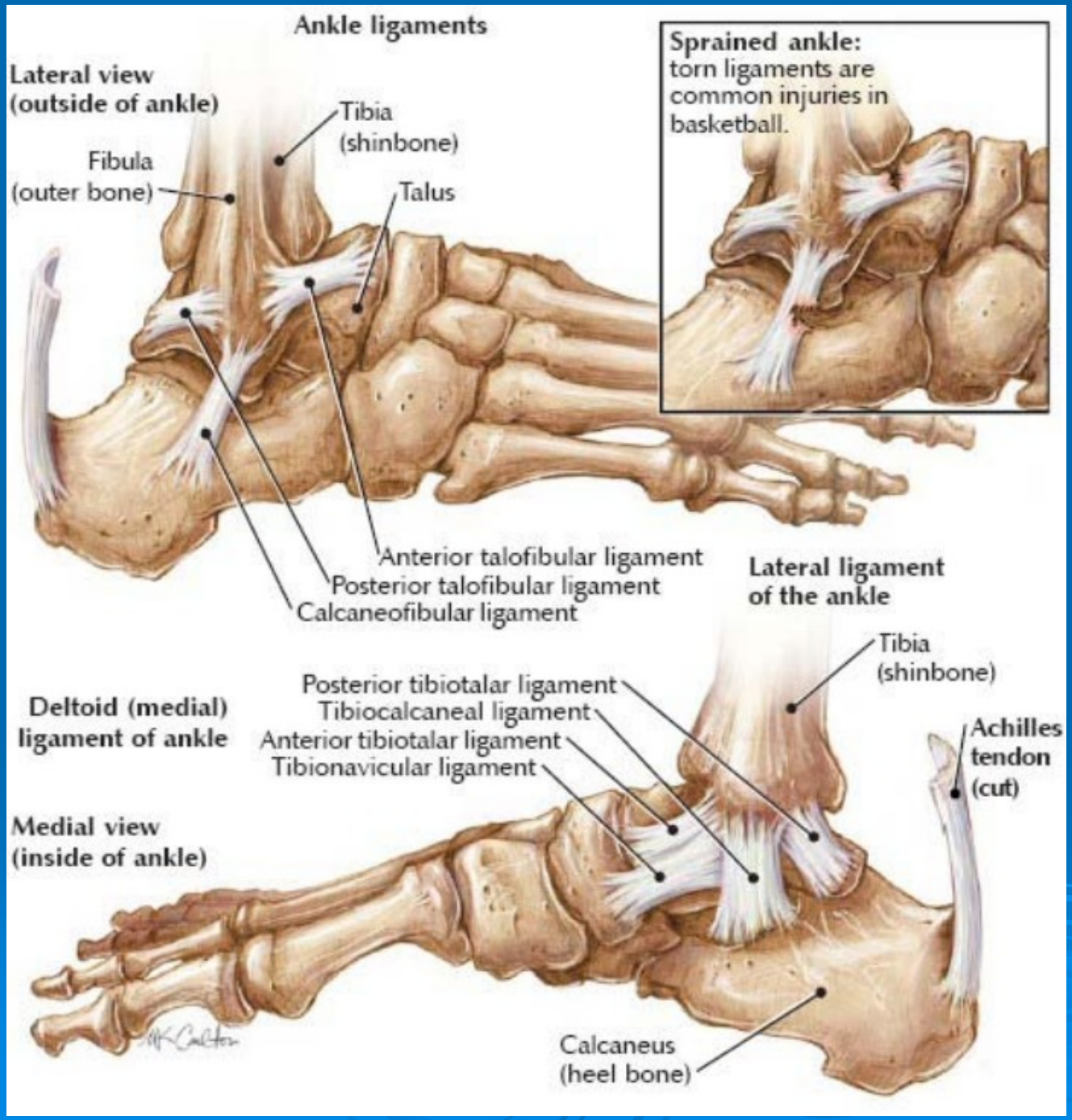
- fibrous union of the tibia and fibula
- the integrity is essential for the stability of the ankle joint
- minimal movement
- interosseous membrane
- anterior and posterior tibiofibular ligaments


Lateral condyle
Tibiofibular joint and anterior ligament of fibular head
Head of fibula
Anterior tibial artery
Interosseous membrane
Perforating branch of fibular artery
Tibiofibular syndesmosis and anterior tibiofibular ligament
Inferior transverse ligament (part of posterior tibio-fibular ligament)
Lateral malleolus
Medial malleolus
Tuberosity of tibia
Malleoli: lateral
medial
Anterior
Inter-osseous
Posterior
Tibio-fibular ligaments
Fibula
Tibia
Distal end of leg bones

Talocrural Articulation

- hinge type
- the distal ends of the tibia and the fibula form a malleolar mortise into which the trochlea of the talus fits
- **lateral collateral ligament** - consists of anterior and posterior talofibular ligaments and calcaneofibular ligament
- **medial collateral ligament**
- movement: dorsiflexion and plantarflexion




Ankle ligaments
Lateral view
(outside of ankle)
Tibia
(shinbone)
Fibula
(outer bone)
Talus
Sprained ankle:
torn ligaments are
common injuries in
basketball.
Anterior talofibular ligament
Posterior talofibular ligament
Calcaneofibular ligament
Lateral ligament
of the ankle
Tibia
(shinbone)
Posterior tibiotalar ligament
Tibiocalcaneal ligament
Anterior tibiotalar ligament
Tibionavicular ligament
Deltoid (medial)
ligament of ankle
Achilles
tendon
(cut)
Medial view
(inside of ankle)
Calcaneus
(heel bone)

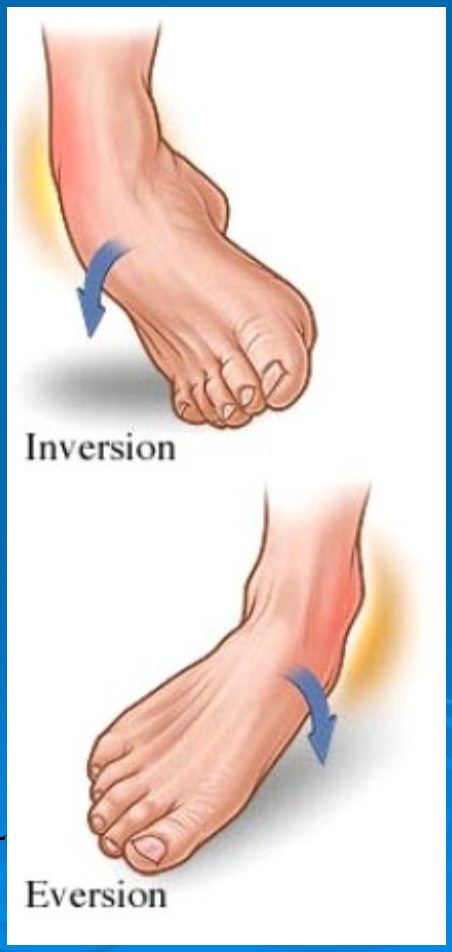
Articulations of Foot

Subtalar and Talocalcaneonavicular (TCN) Joints

- subtalar joint forms posterior and TCN joint forms anterior part
- the articular surfaces of the talus, calcaneus and the navicular
- movement: inversion and eversion

Transverse Tarsal Joint

- compound joint formed by two separate joints aligned transversely
- talonavicular joint
- calcaneocuboid joint
- cuneonavicular joint
- cuneocuboid joint
- movement: inversion and eversion



Tarsometatarsal Joints

- movement: gliding

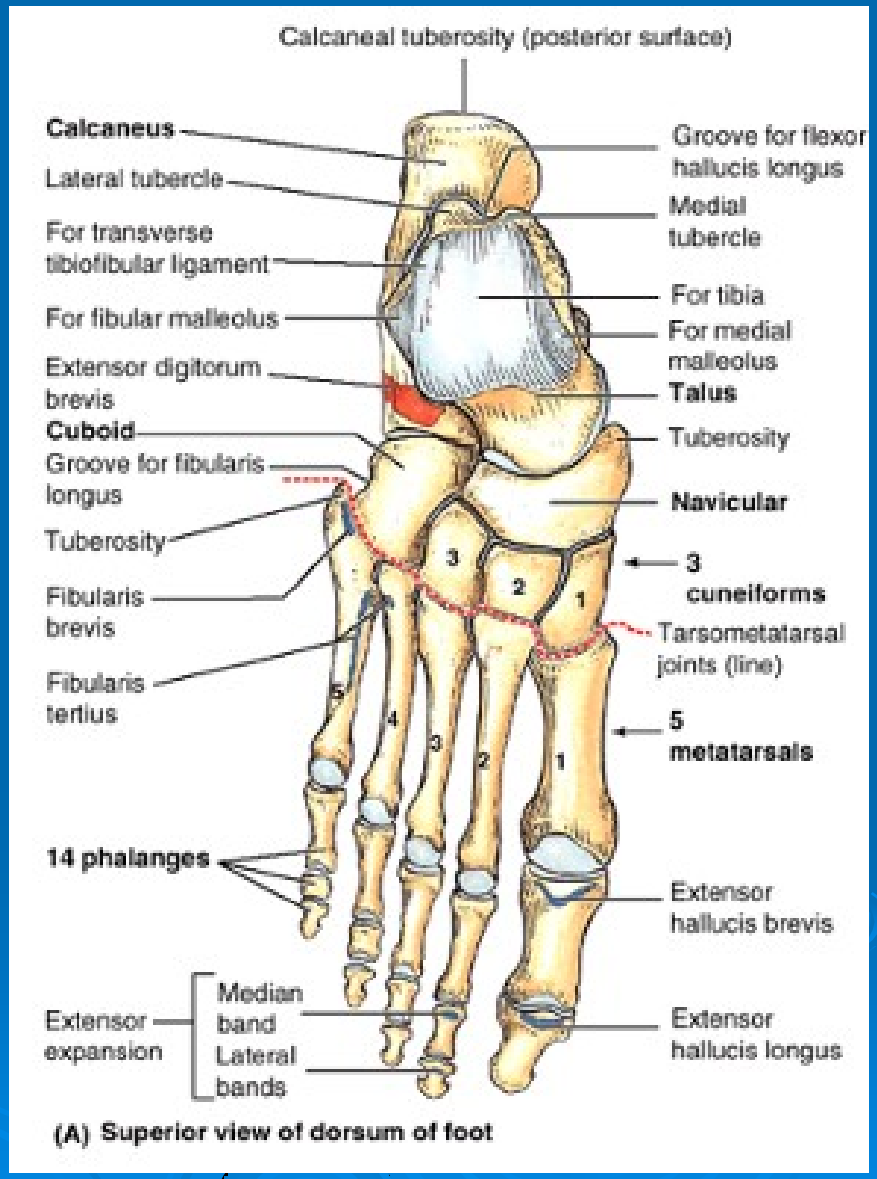
Intermetatarsal Joints

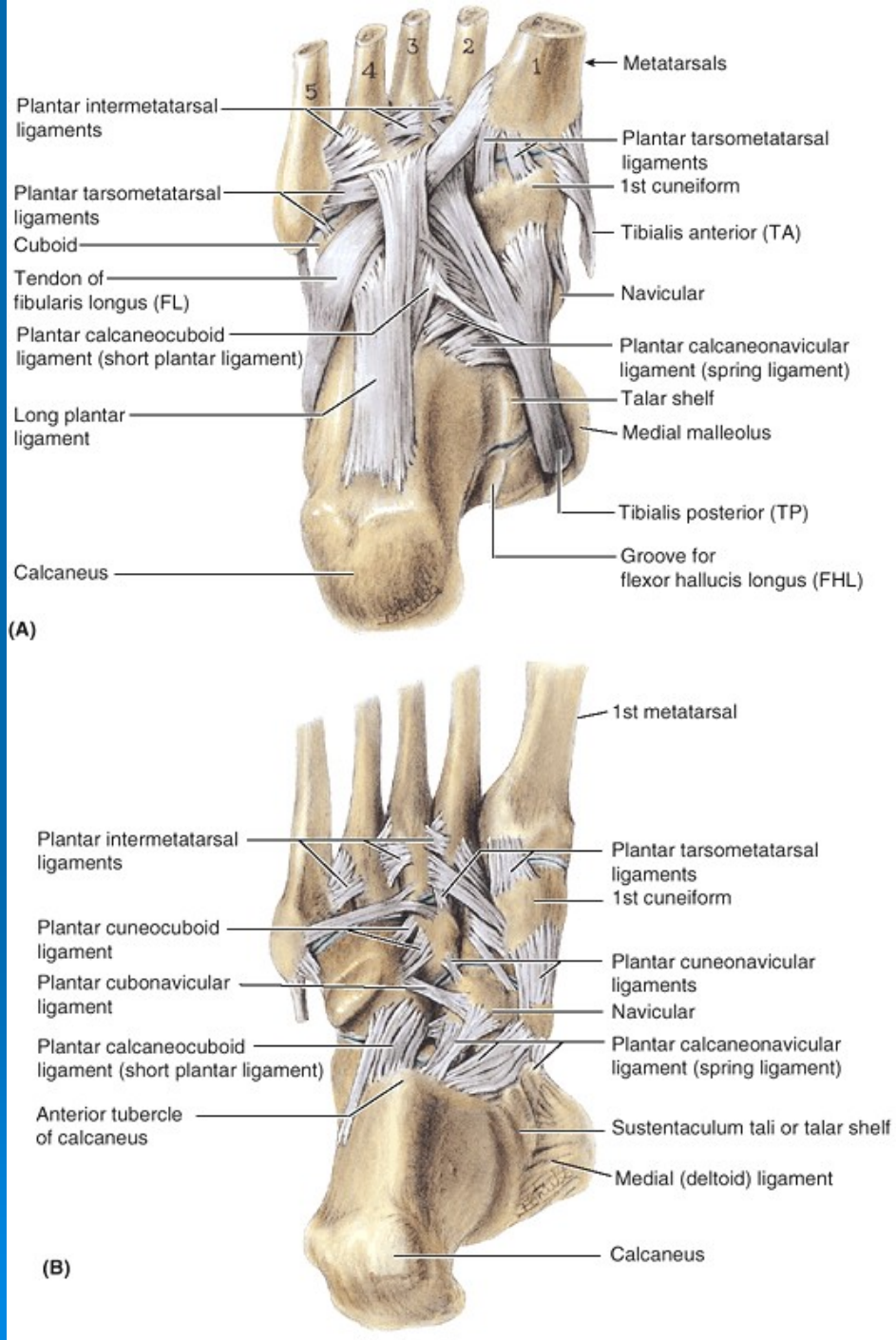
Metatarsophalangeal Joints

- ball-and-socket type
- collateral ligaments
- deep metatarsal transverse lig.
- movement: flexion, extension

Interphalangeal Joins

- hinge type
- collateral ligaments
- movement: flexion, extension

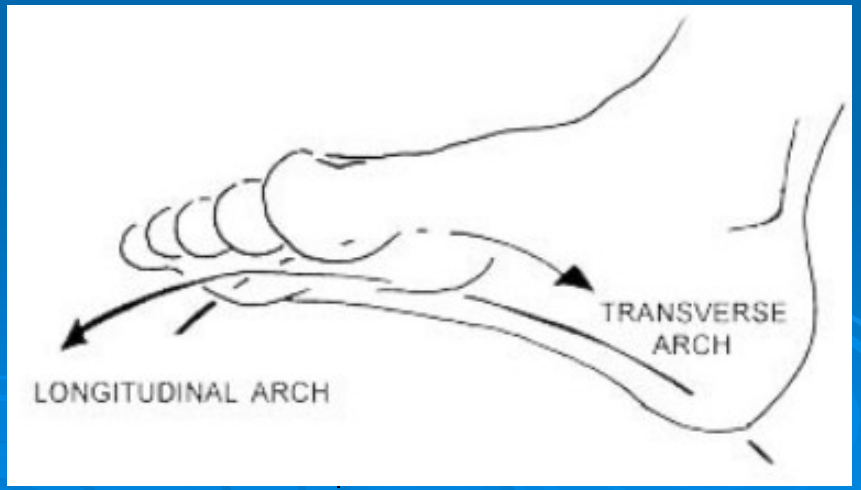




Plantar views

Arches of Foot

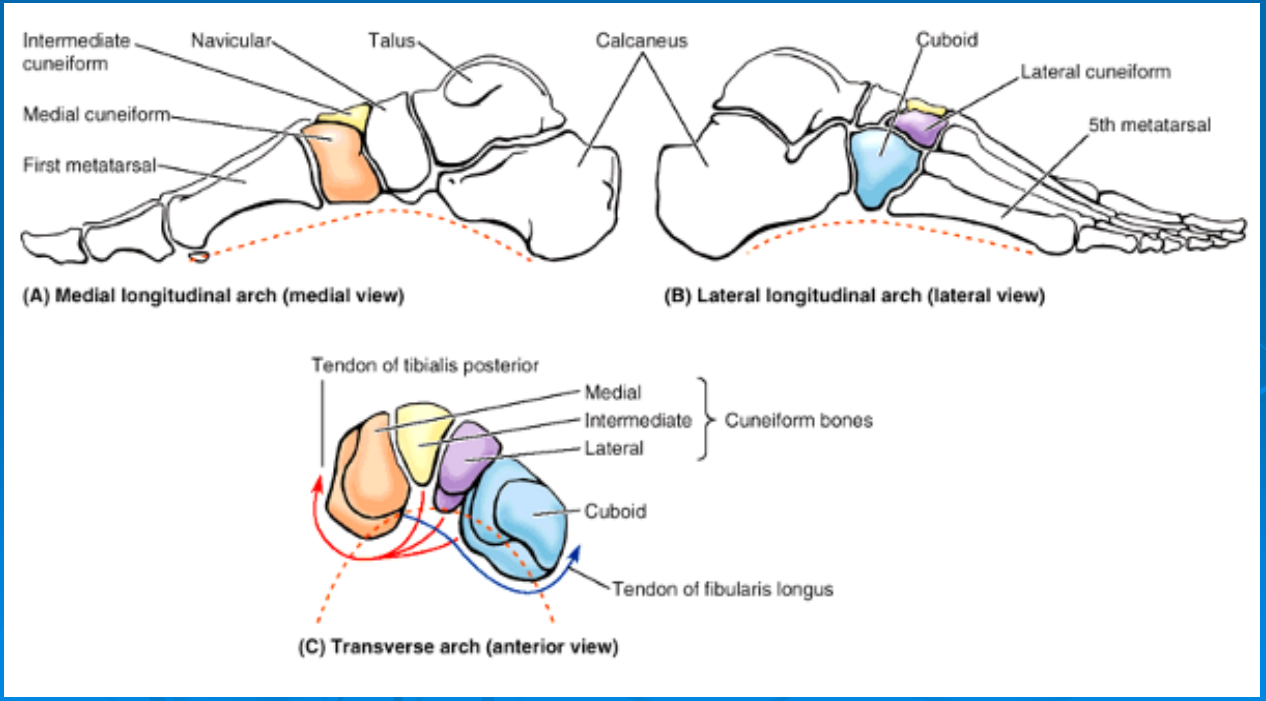
- because is composed of numerous bones connected by ligaments, it´s flexibility that allows it to deform with each ground contact, thereby absorbing much of shock
- tarsal and metatarsal bones are arranged in longitudinal and transverse arches supported by tendons → increase the weight bearing capabilities and resiliency of the foot



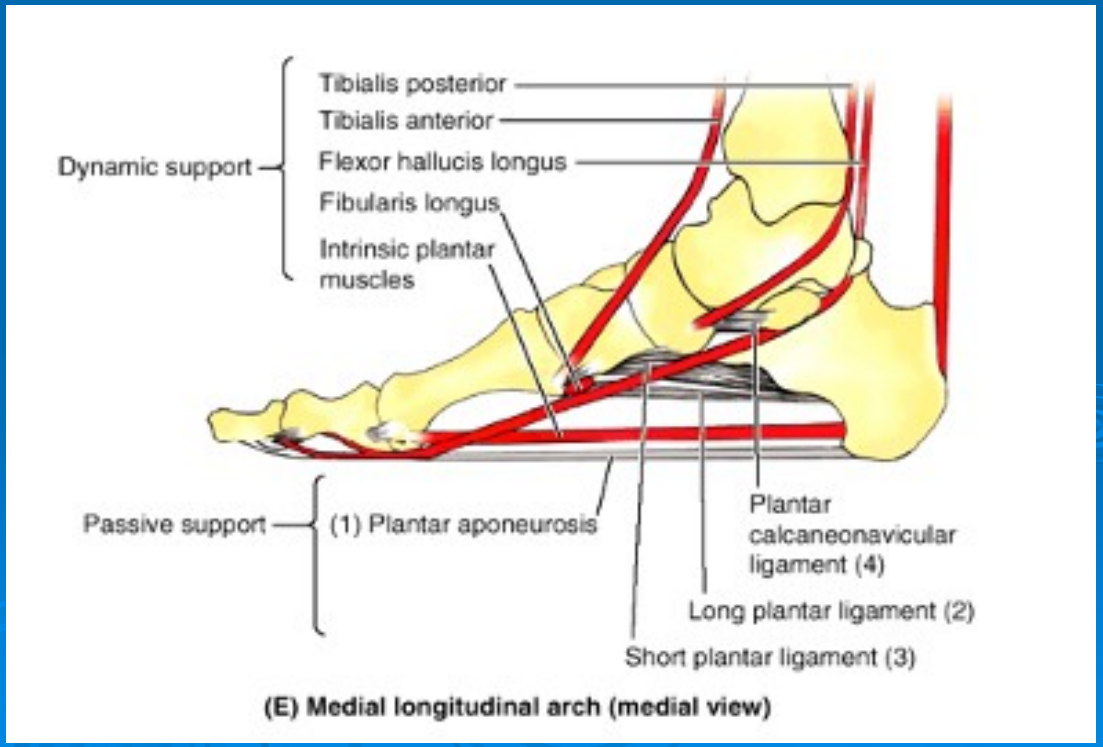
Longitudinal Arch

- medial longitudinal arch - calcaneus, talus, navicular, three cuneiforms and three metatarsals
- lateral longitudinal arch - calcaneus, cuboid and lateral two metatarsals

Transverse Arch



- passive factors involved in forming and maintaining the arches:
- the shape of the united bones
- plantar calcaneonavicular ligament
- long plantar ligament
- plantar calcaneocuboid ligament
- plantar aponeurosis



(E) Medial longitudinal arch (medial view)