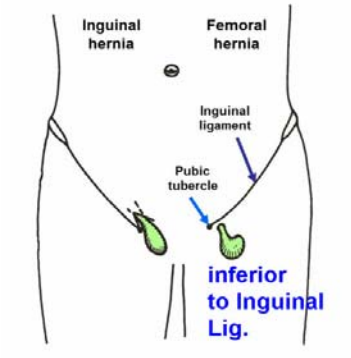
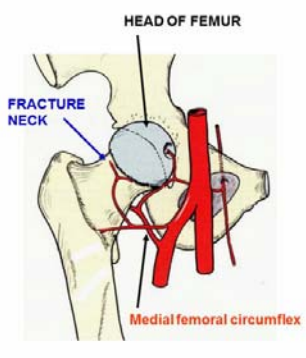
LOWER EXTREMITY CLINICAL/ANATOMICAL REVIEW

Clinical Condition	Anatomy	Cause	Symptom
Hip/Pelvis			
Femoral Hernia	Femoral ring is a weak point in abdomino-pelvic cavity; Lymphatic vessels course through Femoral ring to Femoral Canal in medial part of Femoral sheath (Sheath surrounds Fem. Art, Vein, Lymph)	Increase in pressure in abdomen (lifting heavy object, cough, etc.) can force loop of bowel into Femoral Canal (out Saphenous opening)	**Bulge in anterior thigh below Inguinal Ligament**
Hip Pointer	Anterior Superior Iliac spine (origin of Sartorius, Tens. Fasc. Lata m.) is subcutaneous	Fall on hip causes contusion at spine	**Bruise on hip**
Pulled Groin	Adductor muscles of thigh take origin from pubis	**Tear in Adductor muscles** can occur in contact sports	Pain in groin (at or near pubis)
Hamstring Pull	Hamstring muscles of post. thigh have common origin at Ischial Tuberosity	Excessive contraction (often in running) produces tear or avulsion of hamstring muscles from Ischial tuberosity	**Agonizing pain in posterior thigh** if muscles are avulsed
Gluteal Gait	Gluteus Medius and Minimus act to support body weight when standing (essential when opposite leg is lifted in walking)	Damage to Superior Gluteal Nerve or polio	Gluteal Gait (Trendelenberg Sign): **pelvis tilts to down toward non-paralyzed side** when opposite (non-paralyzed) leg is lifted in walking
Collateral circulation at hip	Cruciate anastomosis links Inf. Gluteal artery (from Int. Iliac.) and Profunda Femoris, **Med. and Lat. Fem. Circumflex**	**Damage to External Iliac or Femoral arteries (stab wounds, etc.**)	Bleeding (can **ligate between Internal Iliac and Profunda femoris**)
Avascular necrosis of head of femur	**Medial Femoral Circumflex artery** supplies head of femur (also small supply from Obturator Artery)	Falls (common in elderly) can produce **fracture of neck of femur** (treatment is hip replacement)	**Leg is rotated laterally** (by action of Gluteus Maximus and short posterior rotator muscles)
Dislocate Hip (head of femur displaced superiorly)	Hip joint ligaments usually strong	**Congenital** - Upper lip of acetabulum can fail to form	**Leg is rotated medially** (by action of Gluteus Medius and Minimus)

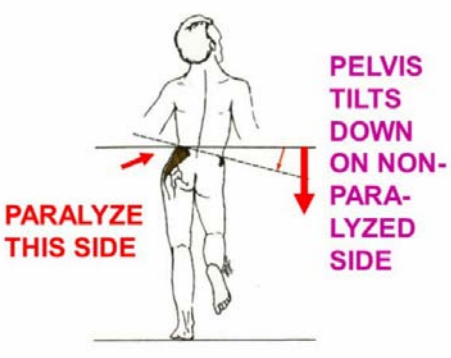
FEMORAL HERNIA



'HIP' FRACTURE

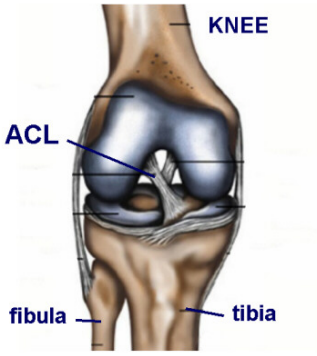


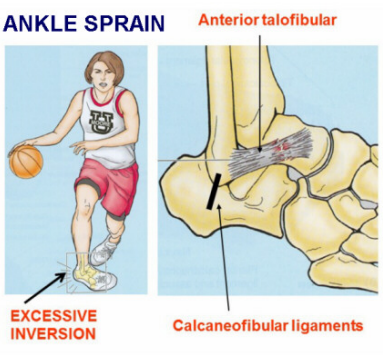
GLUTEAL GAIT - Sup. Gluteal. nerve damage



Clinical Condition	Anatomy	Cause	Symptom
KNEE			
Tear Anterior Cruciate Ligament (ACL)	Anterior Cruciate Ligament extends from Lateral Condyle of Femur to Ant. part of Intercondylar eminence of tibia; limits ant. movement of tibia	Rapidly rotate body when foot planted on ground	**Anterior drawer test - pull tibia anteriorly**
Terrible Triad	Medial Meniscus is firmly attached to Medial Collateral ligament	In sports, blow to lateral side of leg **tears Medial Meniscus, Medial Coll. Lig, ACL**	**Pain and high mobility** (ACL - positive Anterior Drawer test)
LEG, ANKLE and FOOT			
Foot drop	**Common Peroneal nerve** is subcutaneous at knee on head of fibula; **Deep Peroneal nerve** in anterior compartment;	**Blow to lateral leg** at head of fibula or sustained pressure in wearing a leg cast; Compartment syndrome	**Inability to dorsiflex foot**); cannot lift foot from ground in walking
Anterior Leg Syndrome	Fascia of anterior muscular compartment of leg is very tight	Exercise or fracture of tibia; **compress of Deep Peroneal nerve in anterior compartment**	**Foot drop** (inability to dorsiflex foot); cannot lift foot from ground in walking
Tarsal Tunnel Syndrome	Tendons and vessels pass under Flexor retinaculum on medial side of ankle (Tom, Dick and Harry: Tibialis posterior, Flexor Digitorum longus, Posterior Tibial Artery and Tibial Nerve, Flexor Hallucis longus)	**Swelling of tendons under flexor retinaculum** produces compression of Tibial Nerve	**Numbness of sole of foot and toes, weakness in flexion of toes**
Intermittent Claudication	Posterior Tibial artery (from Popliteal artery) supplies posterior compartment (leg)	**Atherosclerosis** produces narrowing of artery, limiting blood supply to leg and foot	**Painful cramps after exercise that subsides with rest**
Ankle sprain	Ligaments on lateral side of ankle are weaker than medial side	Excessive Inversion produces **stretch of Anterior Talofibular and Calcaneofibular ligaments**	**Pain on lateral side of ankle**
Pott's Fracture	Deltoid ligament on medial side of ankle is strong	Excessive eversion of ankle **fractures distal tibia (medial malleolus) and fibula**	Pain in ankle
Fallen Arch (Pes planus)	Medial arch of foot held by **Plantar Calcaneonavicular ligament**	Loss or decrease in medial arch; can be developmental or related to use	**Foot pain, particularly on medial side**

NOTE: DERMATOMES - L1 INGUINAL REGION; L4 BIG TOE, S1 LITTLE TOE
PATELLAR TENDON REFLEX - TEST L3-L4; ACHILLES TENDON REFLEX - TEST S1
FEMORAL TRIANGLE - STRUCTURES LAT. TO MED. - NAVL (Femoral Nerve, Artery, Vein, Lymphatics)





LOWER EXTREMITY PRACTICE QUESTIONS

1. ____ A skier went off a down hill course and caught one ski under a log. X ray after the accident showed that he had fractured the tibia. A cast was placed on the leg that went from the knee to the foot. When the cast was removed, the patient dragged his foot and was unable to lift it from the ground. This condition most likely resulted from pressure of the cast on which of the following nerves?

A. Femoral
B. Obturator
C. Superficial peroneal
D. Common peroneal
E. Tibial

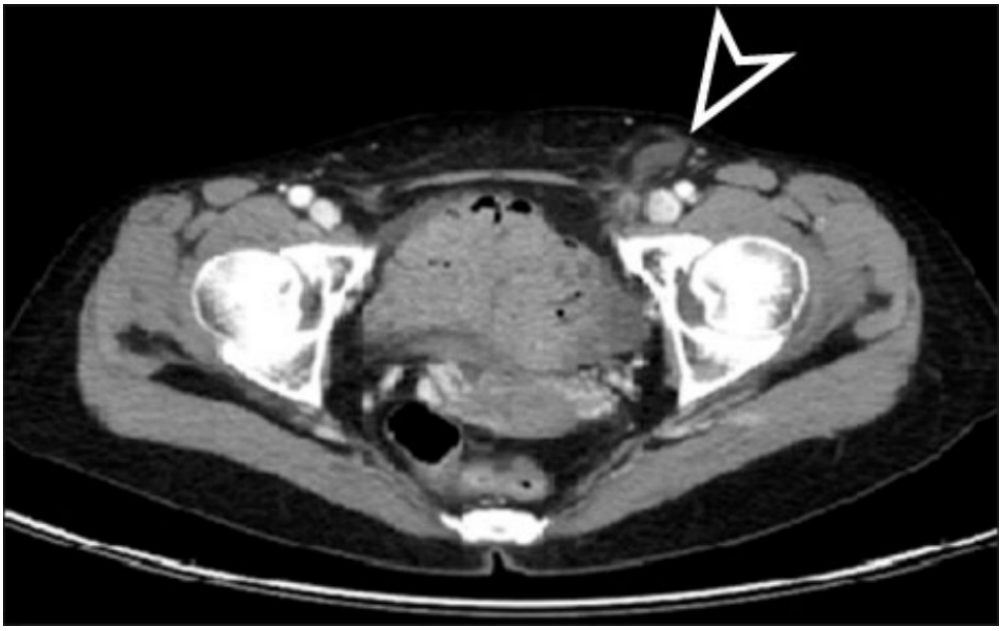
2. ____A football player was tackled from the lateral side while attempting an end around run in a tie game. The foot on that leg was planted on the ground and the tackle was made by another player who weighed 312 pounds and was running at the rate of 3.5 miles per hour. MRI of the patient's knee (above) shows a tear in which of the following structures (note position of patella)?

A. tibial collateral ligament

B. fibular collateral ligament
C. anterior cruciate ligament.
D. posterior cruciate ligament.
E. semitendinosus tendon

3. ____A cross country runner was attempting to pass another runner in a race and stepped off the path. His foot landed on a small stump resulting in hyperinversion of the foot. Subsequent x-ray showed no fractures of the tarsal bones, distal tibia or fibula but the ankle was swollen and painful. Which of the following structures was (were) most likely to have been damaged?

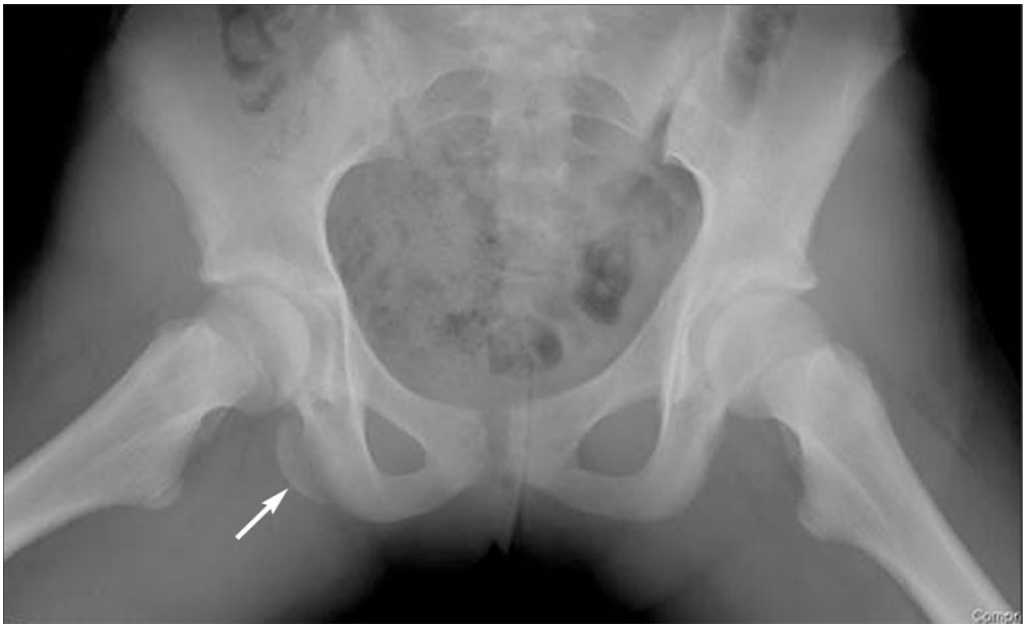
A. deltoid ligament.
B. long plantar ligament.
C. spring ligament.
D. calcaneofibular and anterior talofibular ligaments.
E. calcaneofibular and posterior talofibular ligaments.



4. ____A 63 year old grandmother lifted her 7 year old grandson and felt a sharp pain in her left thigh. She was admitted to the emergency room and examination by palpation detected a bulge below the level of the inguinal ligament on the left side. MRI imaging was performed. A transverse section (image above) showed structures projecting from the anterior thigh on the left The fascial layer that is immediately overlying the bulge is continuous with the

A. fascia of the Internal Oblique muscle
B. transversalis fascia
C. Camper's fascia

D. Rectus sheath
E. Iliotibial tract



5. ____A runner accelerated toward the finish line of a race and suddenly felt a pop on the back of his thigh. He then fell down in excruciating pain. Xray of the pelvis (image above) showed that a small piece of bone had been fractured and avulsed by muscle tendons. This piece of bone is part of which of the following structures?

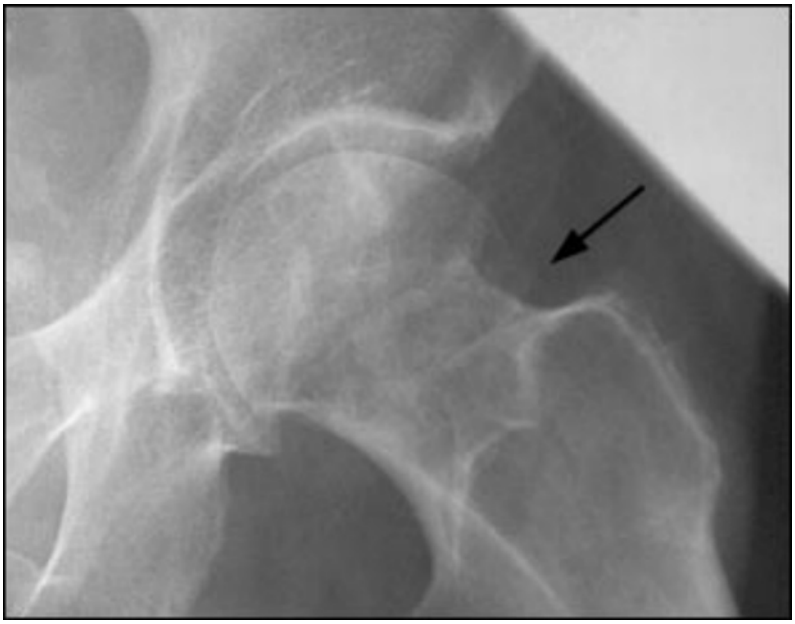
A. pubis
B. ischial spine
C. ischial tuberosity
D. acetabulum
E. ilium

6. ____ Following hip replacement surgery on the left side of the body, an adult patient complains that he has difficulty walking. He is also very unstable when standing if he lifts his right leg. When the patient is observed while walking in a physician's office, the pelvis sways considerably and tilts toward the right when the right leg is lifted. Which of the following nerves was likely to have been damaged in the hip surgery?

A. Left Inferior Gluteal Nerve
B. Right Inferior Gluteal Nerve
C. Left Sciatic Nerve
D. Left Superior Gluteal Nerve
E. Right Superior Gluteal Nerve

7. ____ While on a hunting trip, a teenage patient falls and the hunting knife in his belt penetrates his upper thigh. After being rushed to an emergency room, Inspection of the wound shows a deep cut 1.5 inches below the inguinal ligament that is bleeding profusely. The physician suspects that the femoral artery has been severed and ligates the Femoral artery immediately below the inguinal ligament. The lower limb is still able to receive a sufficient supply of arterial blood because of which of the following anastomoses.

A. Inferior Gluteal artery with the Medial and Lateral Femoral Circumflex arteries.
B. Internal Pudendal artery with the Medial and Lateral Femoral Circumflex arteries.
C. Superficial Circumflex Iliac artery with the Inferior Gluteal artery.
D. Inferior Epigastric artery with the Medial and Lateral Femoral Circumflex arteries.
E. Inferior Epigastric artery with the Inferior Gluteal artery.



8. ____ A 76-year-old woman is walking down the stairs of her house and falls. She is in pain and has difficulty walking but she does not see a physician. After one week, the pain has become unbearable and she goes to the emergency room of her local hospital. An xray of the thigh (image above) shows a fracture in the neck of the femur and degenerative changes in the femoral head. The blood supply from which of the following arteries is likely to be compromised by the fracture and result in insufficient blood supply to the head of the femur?

A. Lateral Femoral Circumflex artery

B. Medial Femoral Circumflex artery
C. Inferior Epigastric artery
D. Inferior Gluteal artery
E. Superficial External Pudendal artery

9. ____ A carpenter is working on a building site and a large beam falls on the lateral side of his foot. An xray image of the foot (above) shows fractures to the lateral bones of the foot. Healing of the fracture indicated by the arrow at right could be complicated because the tendon of leg muscle inserts at this point. Which of the following muscles inserts at the point indicated by the right arrow (Note: not in review sheet but this was a question on the last board exam)?

A. Tibialis posterior
B. Peroneus longus
C. Tibialis anterior
D. Peroneus brevis
E. Extensor digiti minimi

10. ____ A patient complains that the medial side of the sole of his foot is painful when he stands or walks. The xray of his foot (above) shows a substantial decrease in the height of the medial arch. Weakness in which the following structures could produce this condition?

A. Plantar calcaneonavicular ligament
B. Long plantar ligament
C. Anterior talofibular ligment
D. Deltoid ligament
E. Posterior talofibular ligament

11. ____ A young female is in a serious automobile accident that occurs as a head-on collision. She is taken to an emergency room and physical examination shows an asymmetry in the position of the greater trochanter of the femur. The trochanter on right is elevated relative to the left sides. The position of the leg and foot is also abnormal on the right side. Xray of the hip is taken (image above) and shows no fractures in the femur on either side. Which of the following describes the position of the leg and foot on the right side?

A. foot and leg are rotated laterally
B. foot and leg are rotated medially
C. foot and leg are flexed
D. foot and leg are extended
E. foot is everted

LOWER EXTREMITY ANSWER KEY

1. D
2. C
3. D
4. B
5. C
6. D
7. A
8. B
9. D
10. A
11. B

REVIEW OF LOWER EXTREMITY

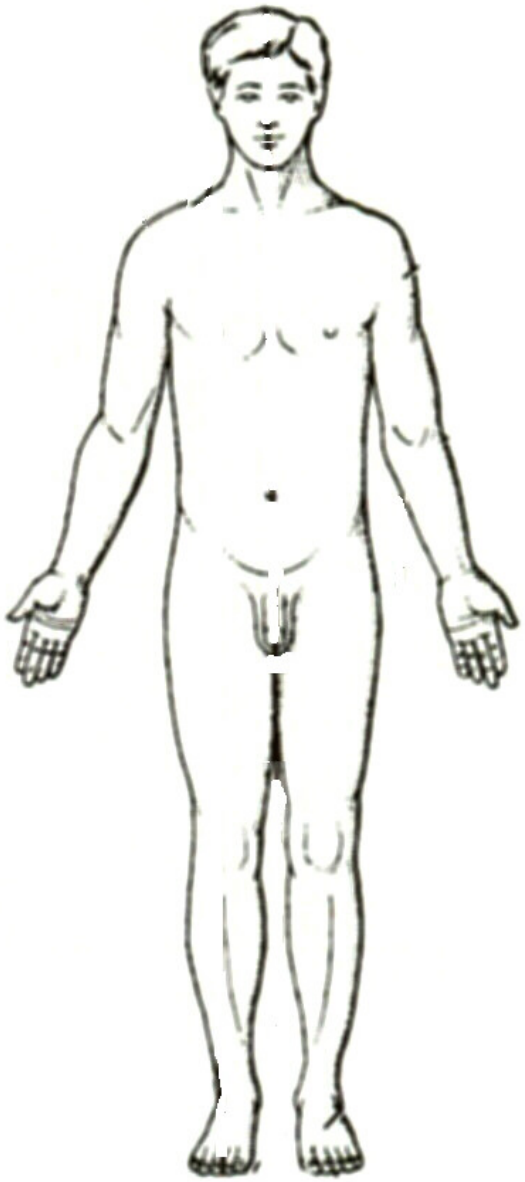
I. OVERVIEW - UPPER AND LOWER EXTREMITY ROTATION, DERMATOME MAP, REFLEXES

II. REGIONS - HIP, KNEE, ANKLE, FOOT

DEVELOPMENT OF EXTREMITIES: ROTATION

CLAPPING BABY'S HANDS AND FEET

Arms and legs initially have same orientation, perpendicular to spinal column (think of a baby sitting - palms touch, soles of feet touch).



upper extremity rotates laterally

THUMB IS LATERAL

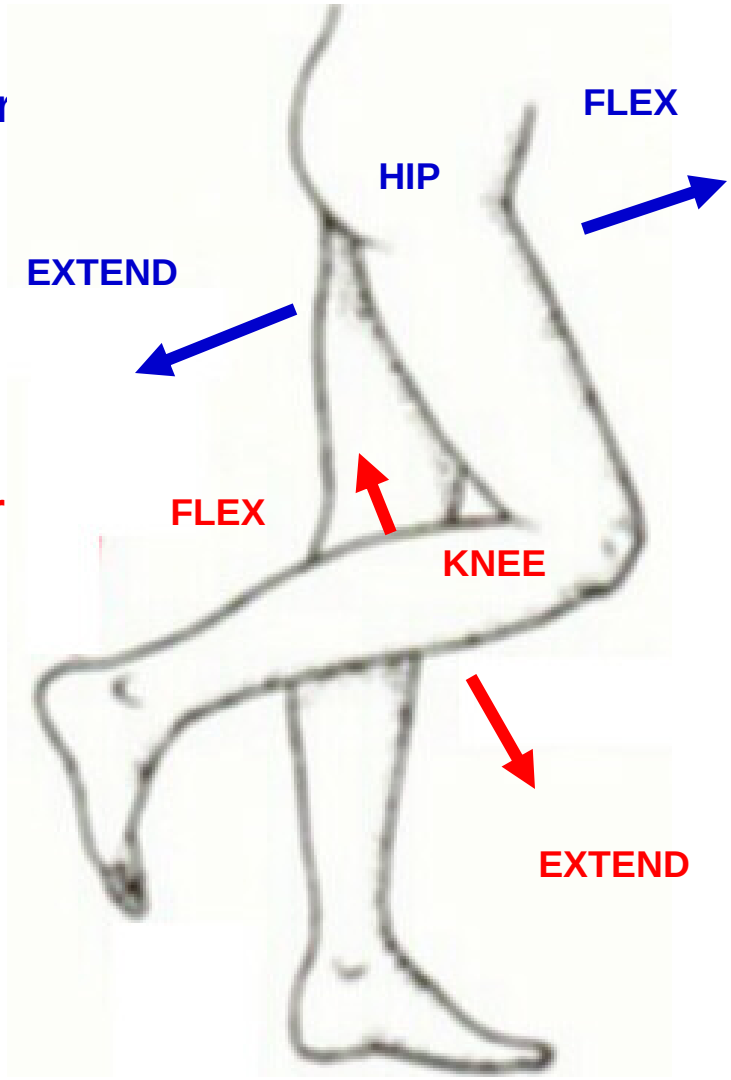
lower extremity rotates medially

BIG TOE IS MEDIAL

MOVEMENTS OF LOWER LIMB

Hip joint - ball and socket
Flexion - Anterior
Extension - Posterior
Adduction - Medial
Abduction - Lateral
Rotation - movement about long axis of femur

Knee joint - condylar joint
Flexion - Posterior
Extension - Anterior
Rotation (small) - movement about long axis of leg (tibia)



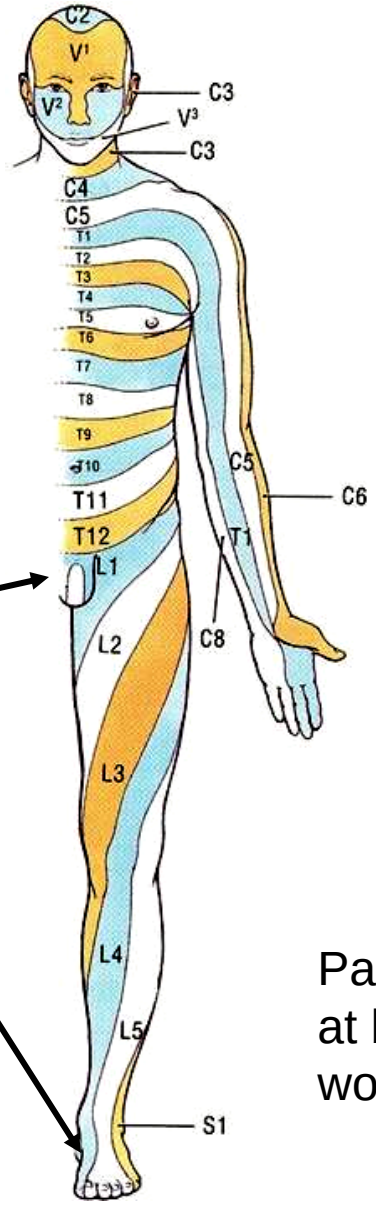
Ankle and Foot

Inversion - sole faces medially

Eversion - sole faces laterally

DERMATOME MAP IN ADULT - REFLECT ROTATION

DERMATOMES OF LOWER EXTREMIY



Hand - higher spinal levels lateral

C6 thumb lateral
C8 little finger medial

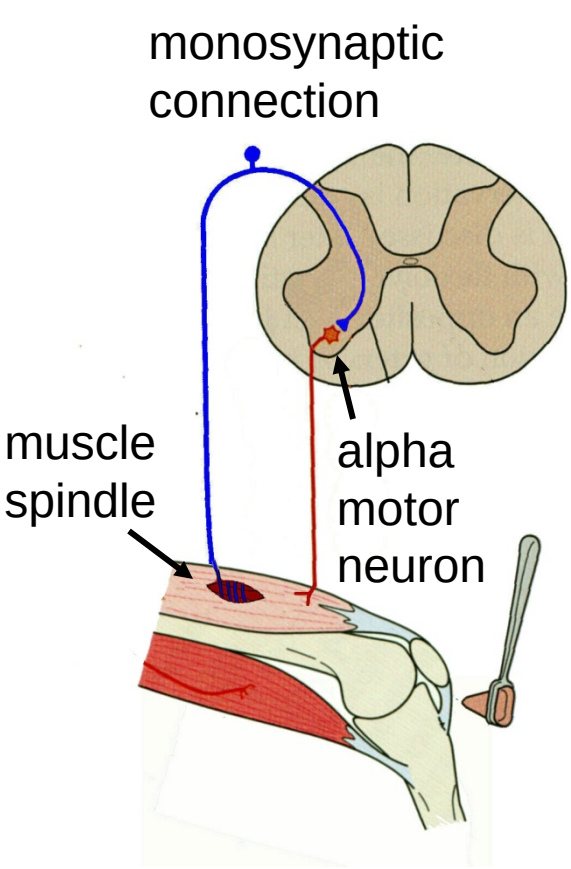
L1- inguinal ligament
L3, L4 - anterior knee (patella)
L4 - medial side of foot, big toe
S1 - lateral side of foot
S1, S2 - posterior side of leg and thigh

Foot - higher spinal levels medial

L4 big toe medial
S1 little toe lateral

Patient: Complete lack of sensation at big toe. Which spinal nerve would be compressed? L4

STRETCH (TENDON TAP) REFLEXES OF LOWER EXTREMITY



TENDON TAP (STRETCH OR DEEP TENDON) REFLEXES - TEST SPINAL LEVEL

KNEE JERK - QUADRICEPS MUSCLE

L3, L4

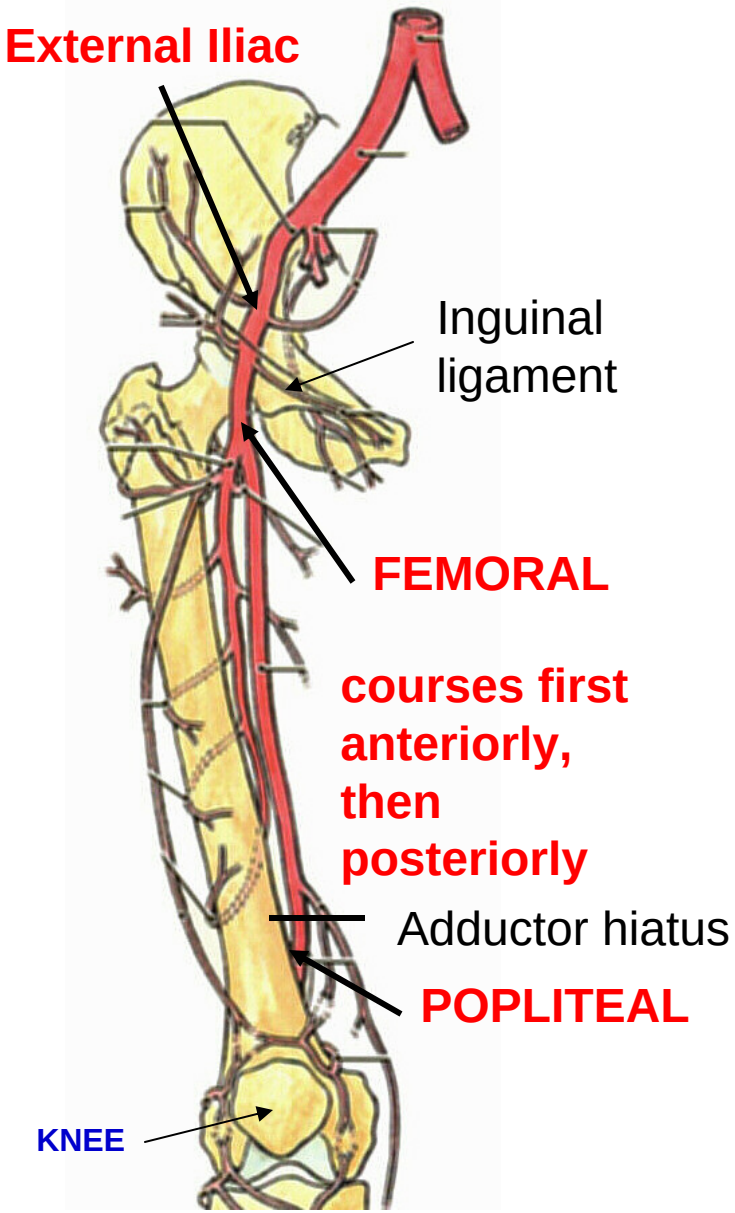
ANKLE JERK - GASTROCNEMIUS MUSCLE

S1

CLINICAL - Patient has numbness of skin overlying little toe. Ankle jerk reflexes reduced. What spinal level affected? S1

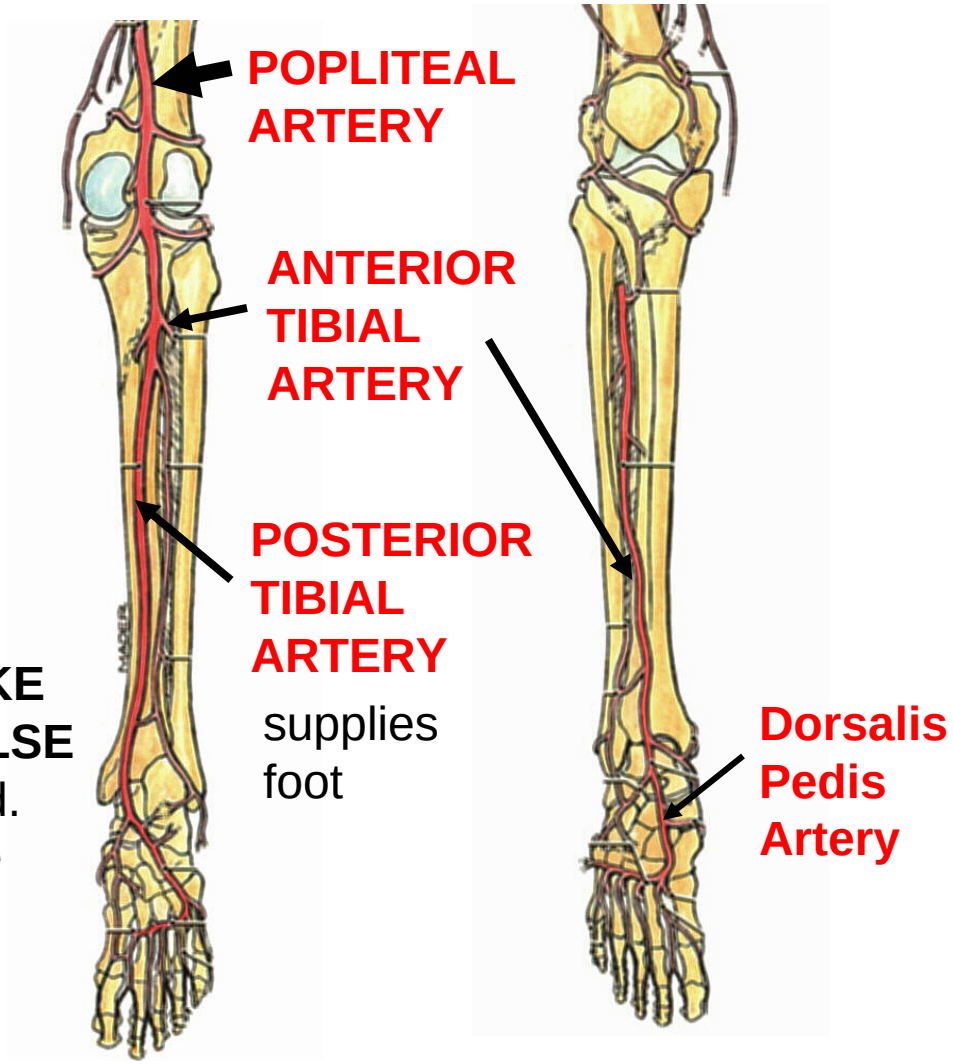
OVERVIEW OF ARTERIAL SUPPLY: COURSE REFLECTS ROTATION

HIP (ANTERIOR VIEW)



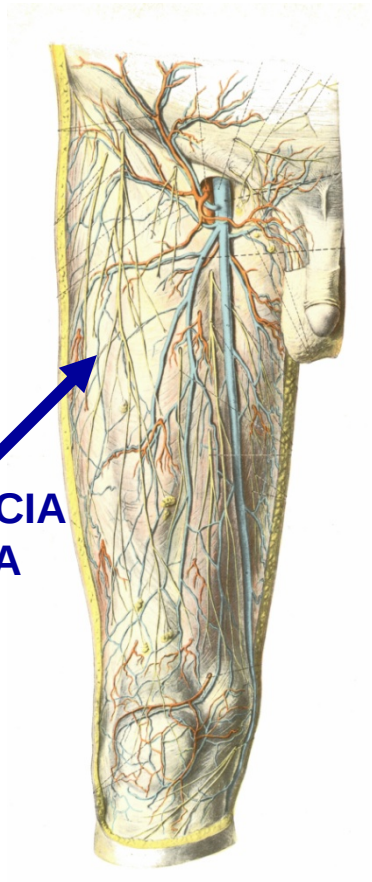
LEG AND FOOT

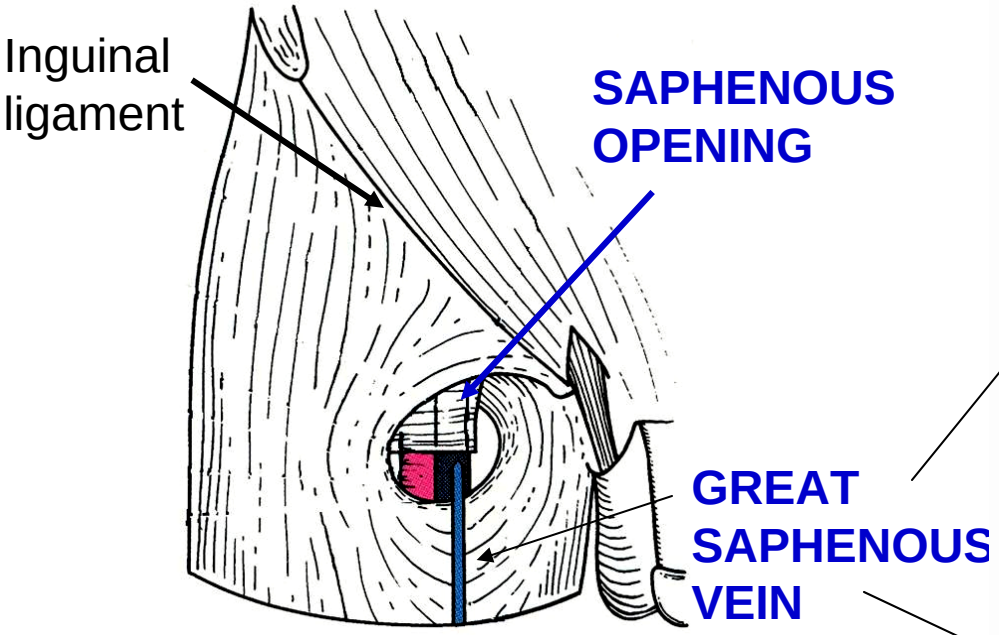
POST. VIEW ANT. VIEW



TAKE PULSE med. side

HIP: FEMORAL HERNIA





FASCIA LATA- deep fascia of thigh is thick; superiorly attached to the pelvis, Scarpa's fascia and the inguinal ligament.

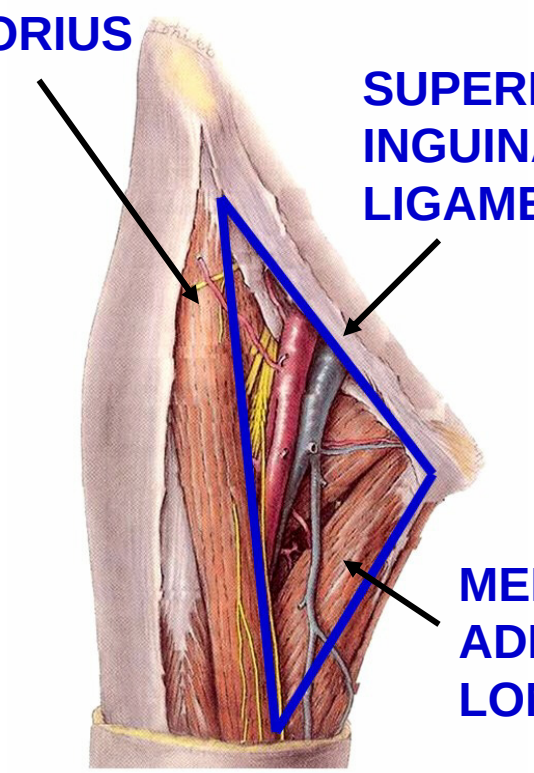
Saphenous opening - allows for passage of Great Saphenous vein; located inferior to inguinal ligament, anterior to Femoral artery and vein

GREAT SAPHENOUS VEIN courses on medial side of leg (SMALL SAPHENOUS VEIN is on post side of leg)

FEMORAL TRIANGLE

LATERAL - SARTORIUS

SUPERIOR - INGUINAL LIGAMENT

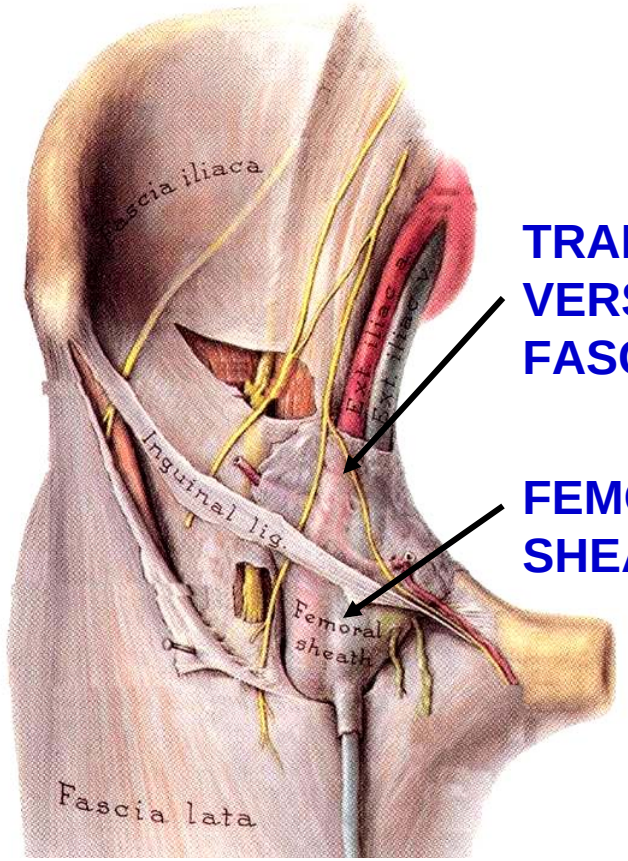


MEDIAL - ADDUCTOR LONGUS

CONTAINS - LATERAL TO MEDIAL FEMORAL NERVE, ARTERY VEIN, LYMPHATICS -

REMEMBER **NAVL**

FEMORAL SHEATH



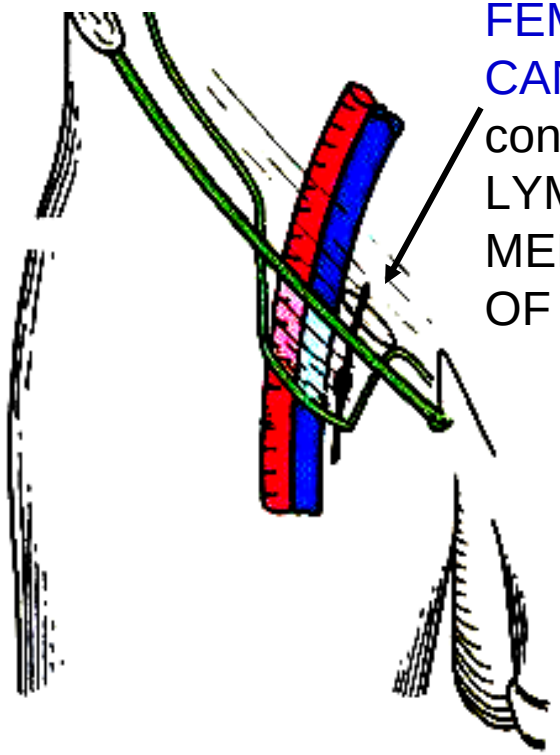
TRANS-VERSALIS FASCIA

FEMORAL SHEATH

- SHEATH IS CONTINUATION OF TRANSVERSALIS FASCIA OF ABDOMEN
- SURROUNDS ARTERY, VEIN, LYMPHATICS NOT NERVE

FEMORAL CANAL

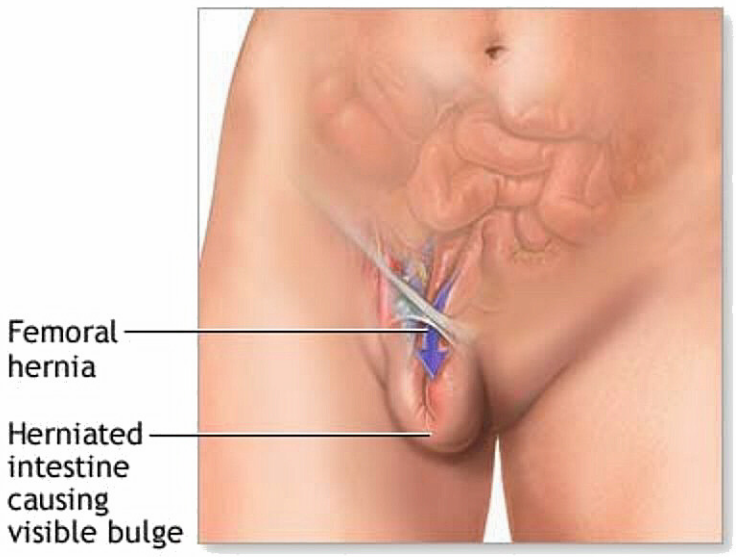
transversalis fascia



FEMORAL CANAL - contains LYMPHATICS IN MEDIAL PART OF SHEATH

Femoral Canal - is contained in medial part of femoral sheath; contains lymph vessels from lower limb that drain to external iliac nodes ; opening is called **Femoral Ring**.

FEMORAL HERNIA



Femoral Hernia - Femoral ring is point of potential weakness of abdomino/pelvic wall; loop of bowel can protrude into Femoral Canal and become strangulate; more common in females (inguinal hernias more common in males).

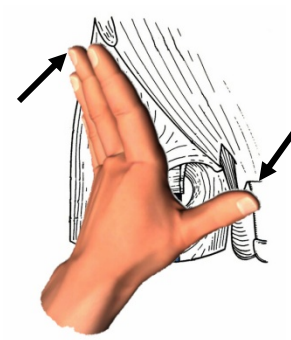
CLINICAL QUESTION:

Mother of 4 children lifts heavy load and feels bulge on anterior groin or thigh.

CAUSES OF FEMORAL HERNIA:

1) carrying or pushing heavy loads
2) more frequent in older females
3) more common in women who have had one or more pregnancies
4) overweight (obese)
5) cough
6) constipation

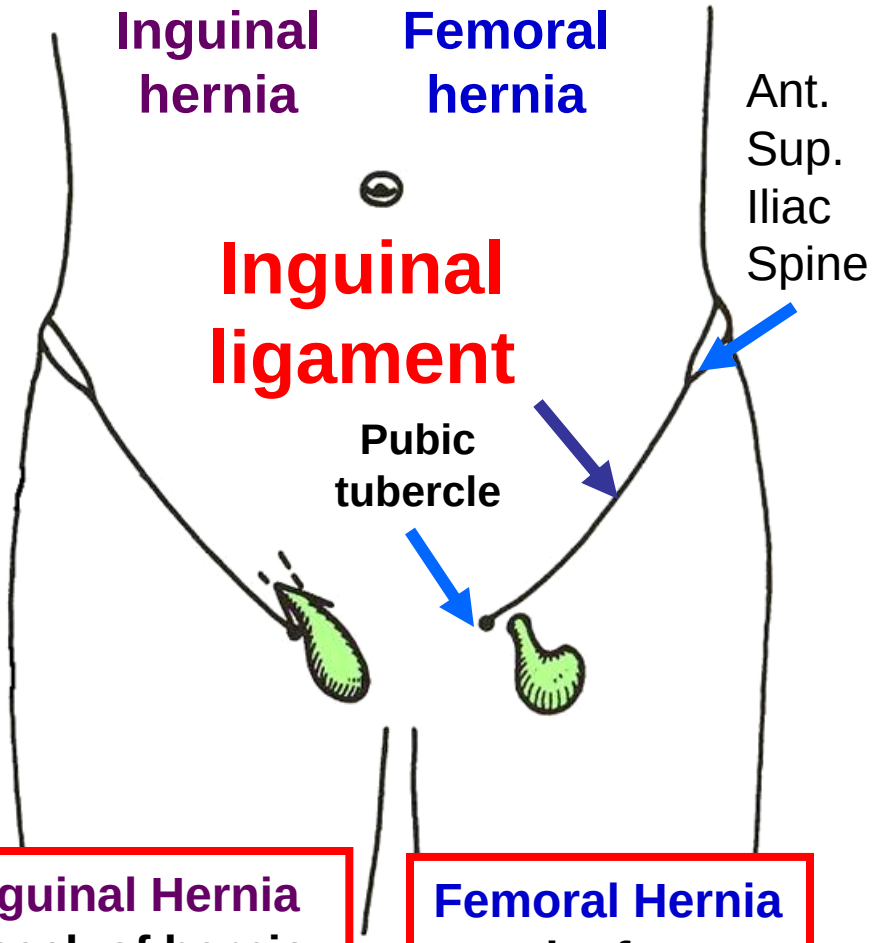
index finger on ASIS



thumb on pubic tubercle

to locate - VEE TECHNIQUE

Differentiating Femoral and Inguinal Hernias - reference is INGUINAL LIGAMENT

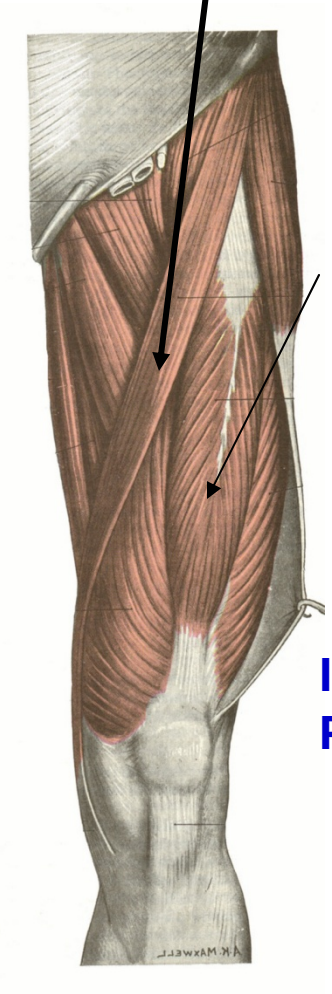


Inguinal Hernia - neck of hernia is ABOVE inguinal ligament.

Femoral Hernia - neck of hernia is BELOW inguinal ligament

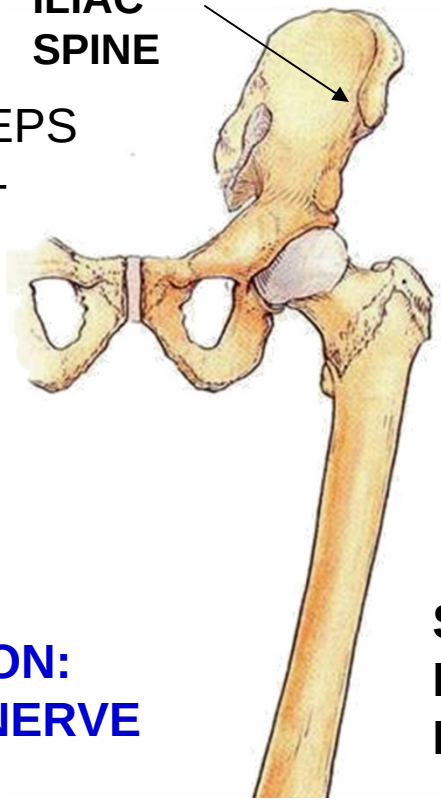
ANTERIOR THIGH: 'HIP POINTER'

SARTORIUS -
Origin - Ant. Sup. Iliac Spine
Insert - Tibia



QUADRICEPS FEMORIS -
Insert - to Patella to Tibia

ANT. SUP. ILIAC SPINE



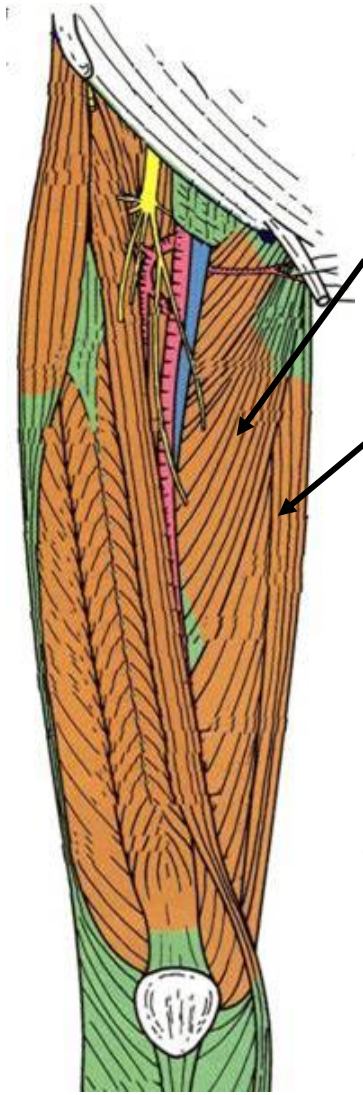
INNERVATION: FEMORAL NERVE

Clinical Note: Contusion of muscles at **Anterior Superior Iliac spine** (origin of Sartorius and Tensor Fascia Lata) is called a **Hip Pointer - Symptom - Bruise on Hip**

SOCCER PLAYER FALL

MUSCLES OF MEDIAL THIGH: PULLED GROIN

Clinical: PULLED GROIN - Tear of Adductor Muscle group at PUBIS; PLAYING SPORTS, INTENSE PAIN IN GROIN, DIFFICULTY WALKING

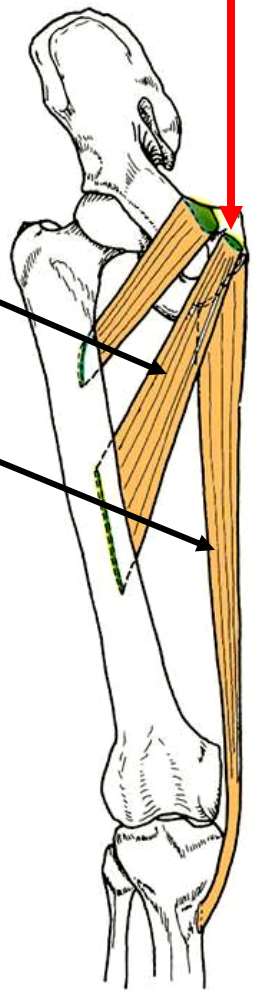


ADDUCTORS:
LONGUS
BREVIS

GRACILIS

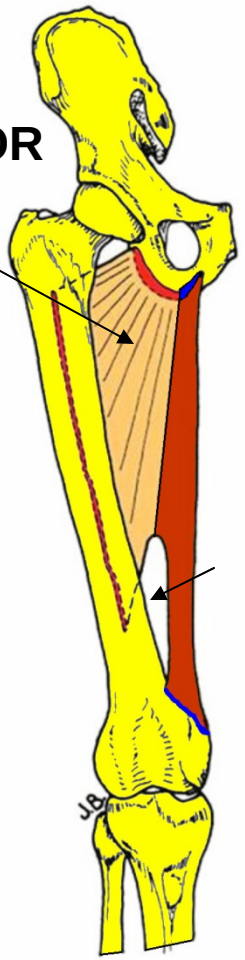
ORIGIN:
PUBIS

INNERVATION:
OBTURATOR
NERVE



ADDUCTOR MAGNUS

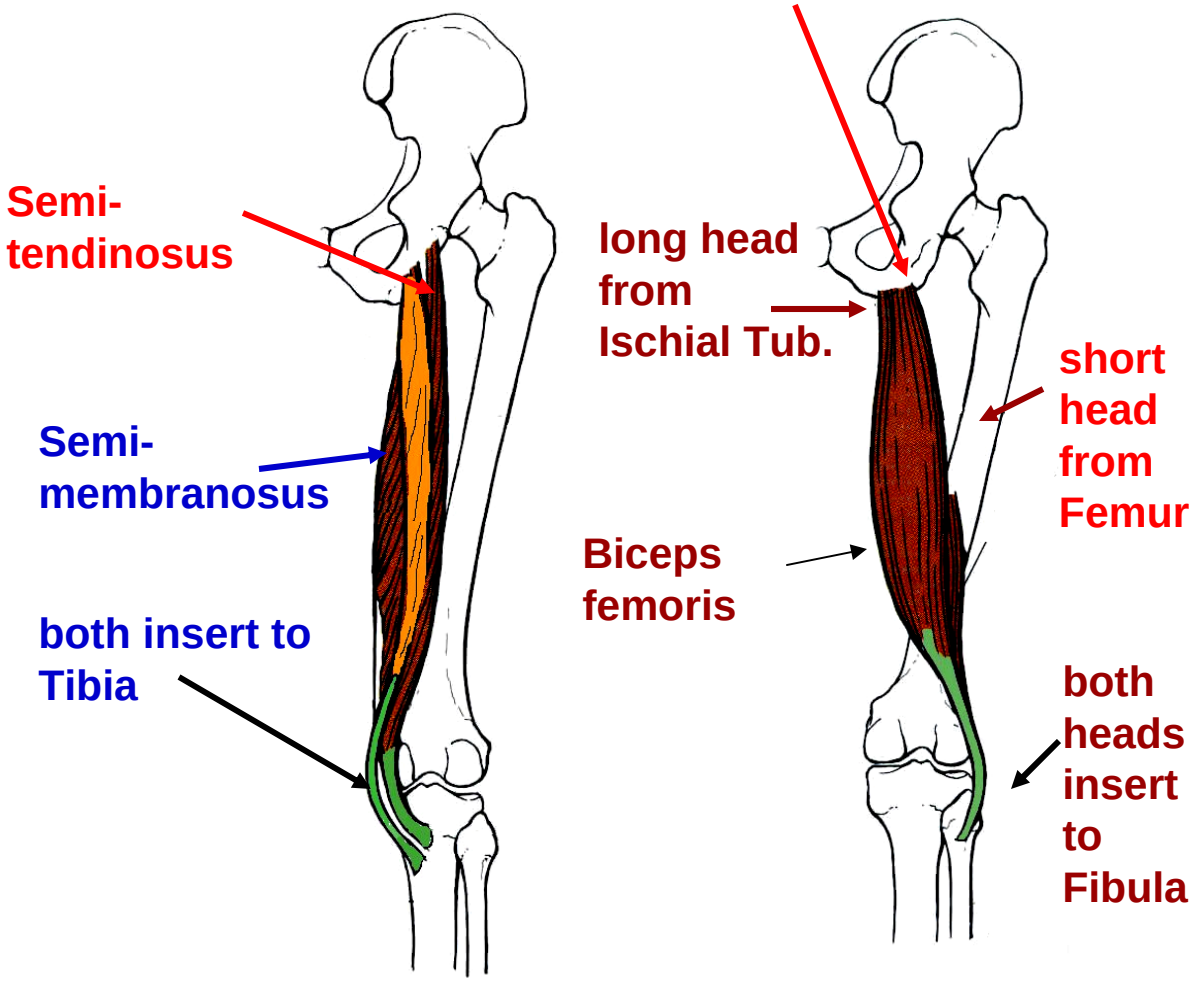
ORIGIN:
PUBIS,
ISCHIAL
TUBER-
OSITY



HIATUS - passage FEM. A. AND V.

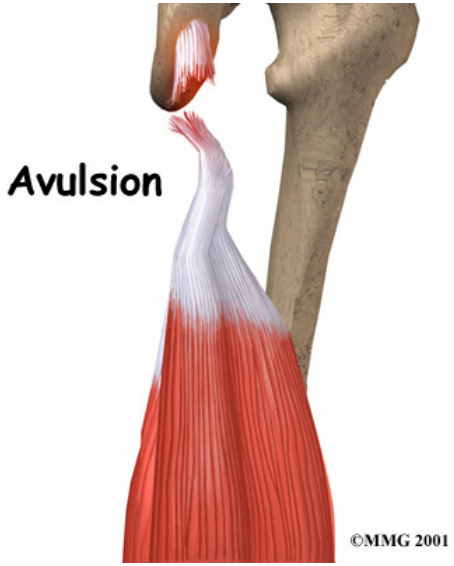
POSTERIOR THIGH - PULLED HAMSTRINGS

ORIGIN ALL - Ischial Tuberosity



Action - All Extend thigh and flex leg except Biceps Short head only flex leg

PULLED HAMSTRINGS - TEAR MUSCLE OR AVULSE FROM ISCHIAL TUBEROSITY



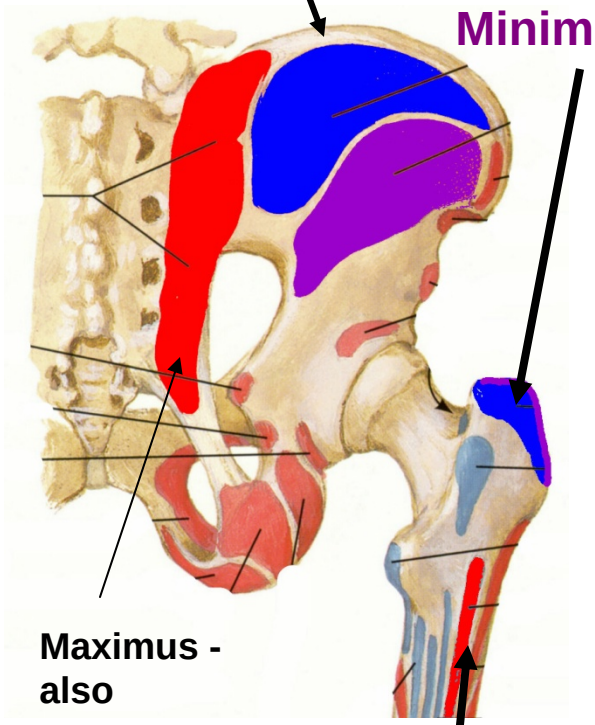
Clinical - ex. Tear when running; sudden excruciating pain in back of thigh

GLUTEAL MUSCLES

ORIGIN - ILIUM

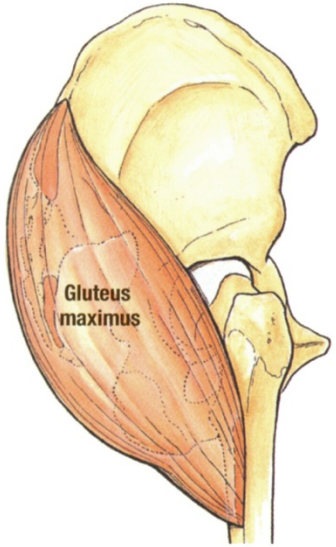
Medius +

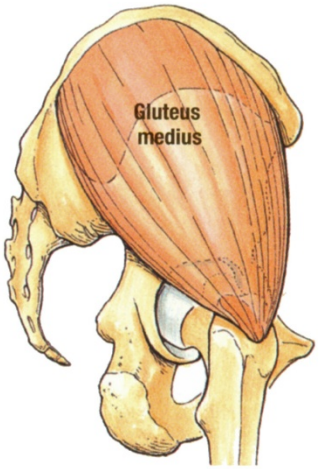
Minimus

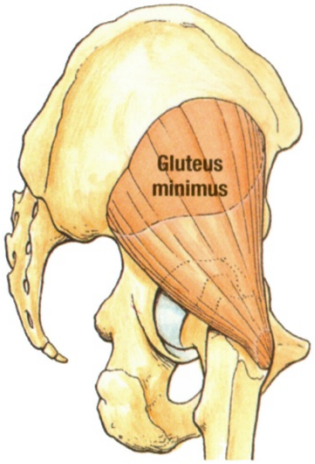


Maximus - also sacrum, coccyx sac.tub.lig

Maximus







Gluteus Maximus

I - Femur, IT tract

Act - Extend, Laterally rotate

Inn - Inferior Gluteal N.

Gluteus Medius

I - Femur (Greater Trochanter)

Act - Abduct, Medially rotate

Gluteus Minimus

I - Femur (Greater Trochanter)

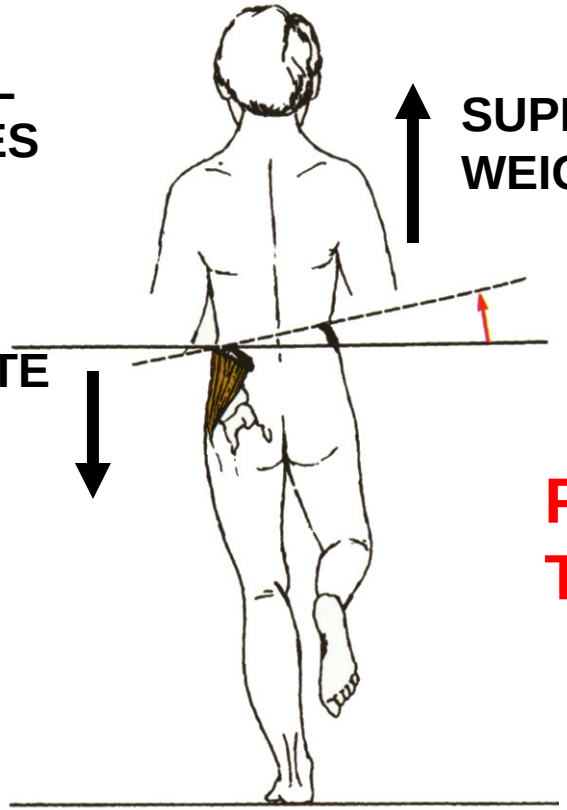
Act - Abduct, Medially rotate

Inn both - Superior Gluteal N.

GLUTEAL GAIT

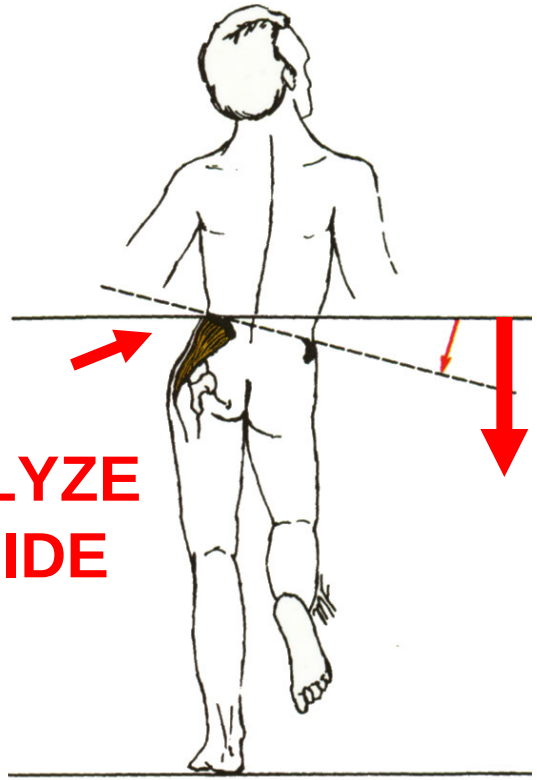
Clinical - caused by injury to Superior Gluteal nerve or poliomyelitis (also congenital dislocation of hip joint). Paralyze Gluteus Medius and Minimus. In walking, pelvis tilts down on non-paralyzed side when lift foot of opposite, non-paralyzed leg.

NORMAL MUSCLES PULL WHEN LIFT OPPOSITE LEG



SUPPORT WEIGHT

PARALYZE THIS SIDE



PELVIS TILTS DOWN ON NON-PARA-LYZED SIDE

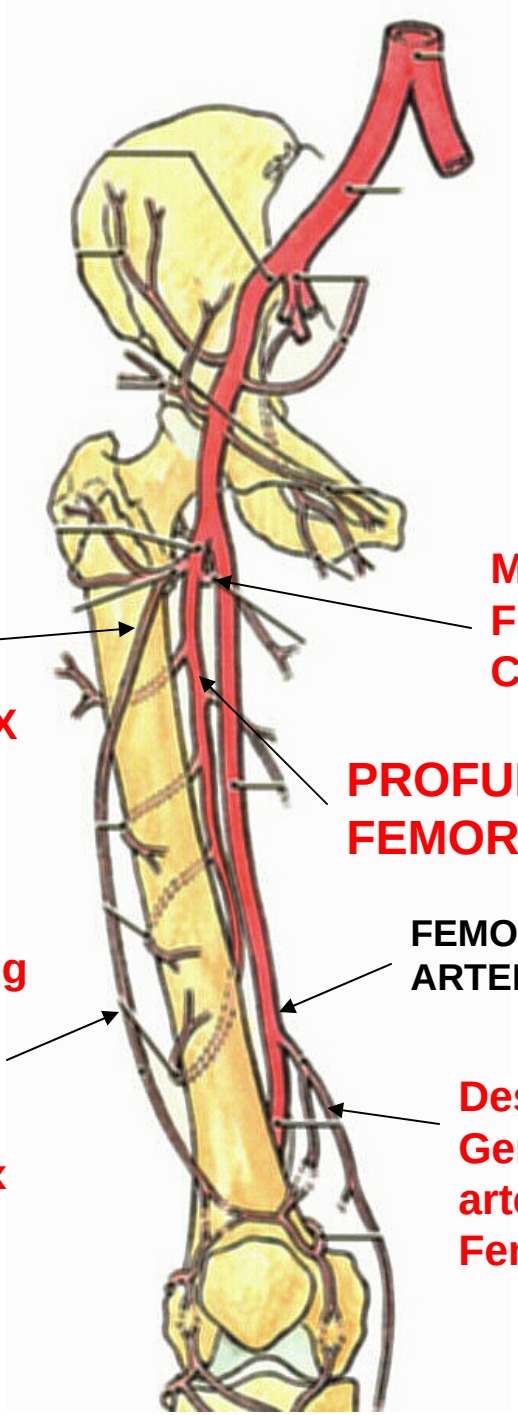
Positive Trendelenburg sign - WHEN LIFT OPPOSITE LEG, PELVIS TILTS DOWN ON (NON-PARALYZED) OPPOSITE SIDE.

FEMORAL ARTERY

Profunda Femoris - largest branch of femoral; branches:

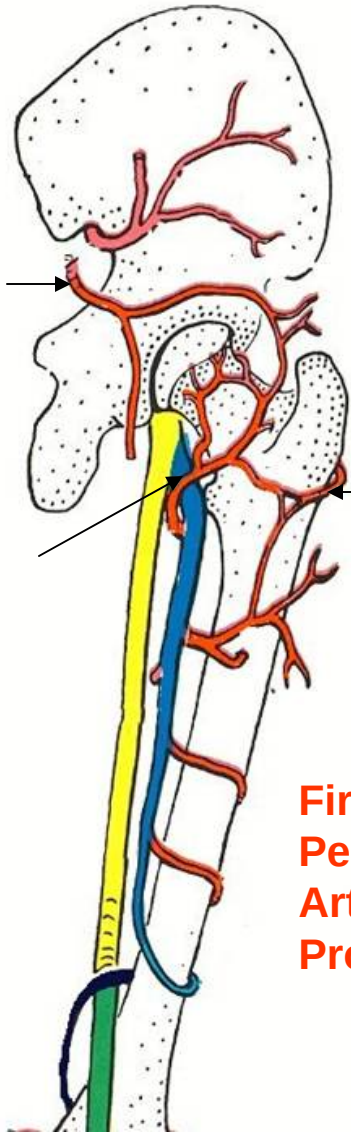
a. Medial Femoral Circumflex - provides most of blood supply to head of femur.

b. Lateral Femoral Circumflex - supplies lateral side of thigh, neck of femur; has **Descending branch** that is part of Genicular anastomosis at knee joint.



CLINICAL: CRUCIATE ANASTOMOSIS

POST. SIDE



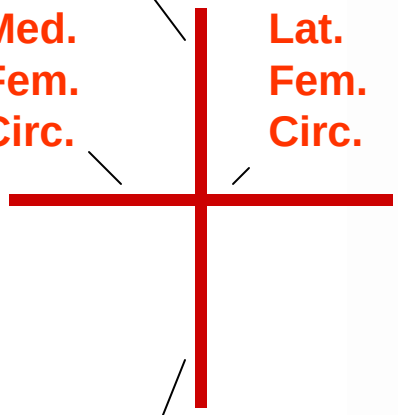
Inferior Gluteal - from Int. Iliac

Med. Femoral Circ.

Lat. Femoral Circ.

First Perforating Artery - from Profunda

CROSS-SHAPED

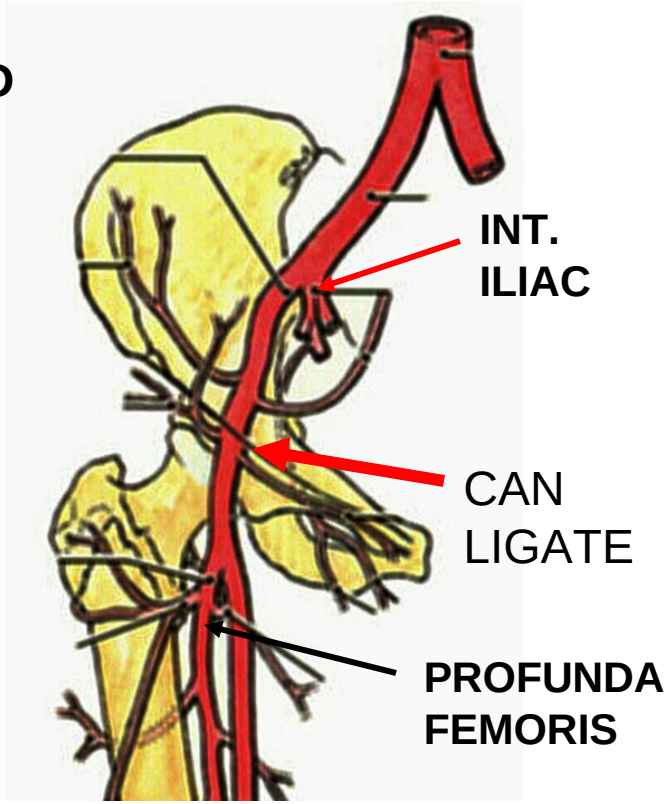


Inf. Glut.

Med. Fem. Circ.

Lat. Fem. Circ.

First Perforating A.



INT. ILIAC

CAN LIGATE

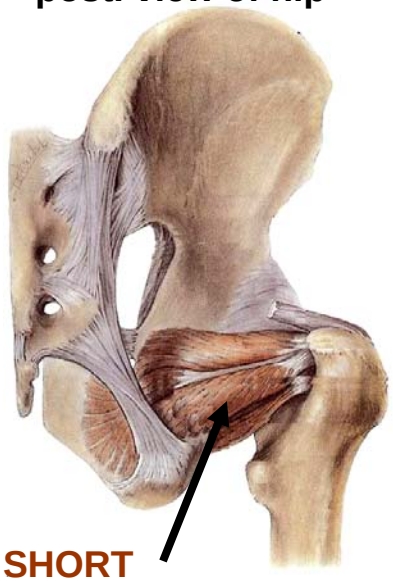
PROFUNDA FEMORIS

Clinical - Stab wound or bleeding in Femoral Artery
Can: Ligate External Iliac or Femoral between
1) Internal Iliac
2) Profunda femoris

FRACTURE OF NECK OF FEMUR

Note: **Fracture of neck of femur** - common in the elderly; leg is rotated laterally due to action of gluteus maximus and short rotators of hip.

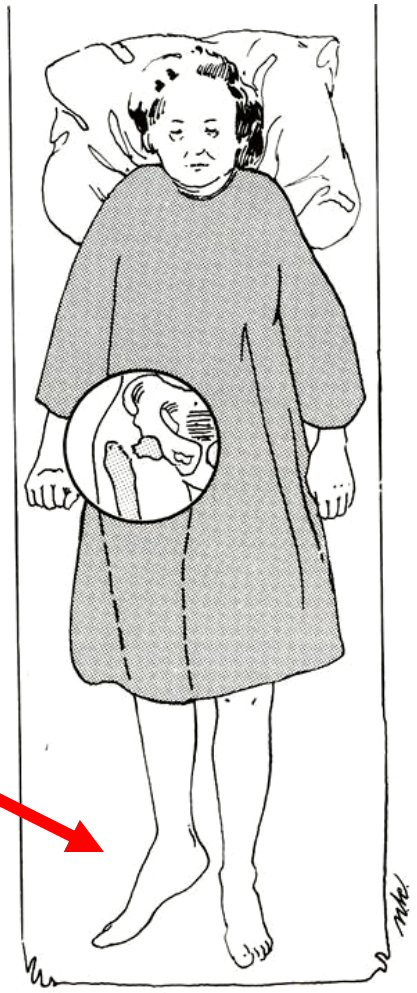
post. view of hip

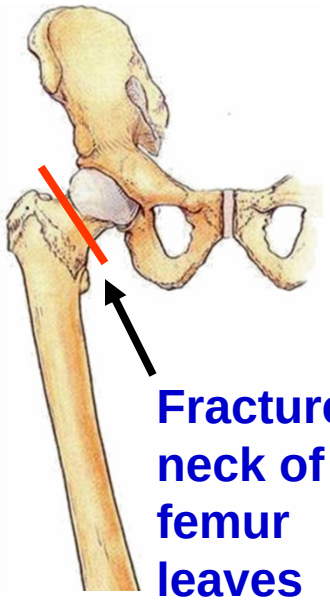


SHORT LATERAL ROTATORS OF HIP

laterally rotate femur

Leg is rotated laterally

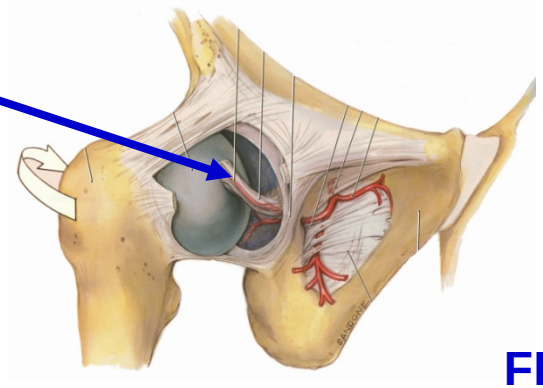


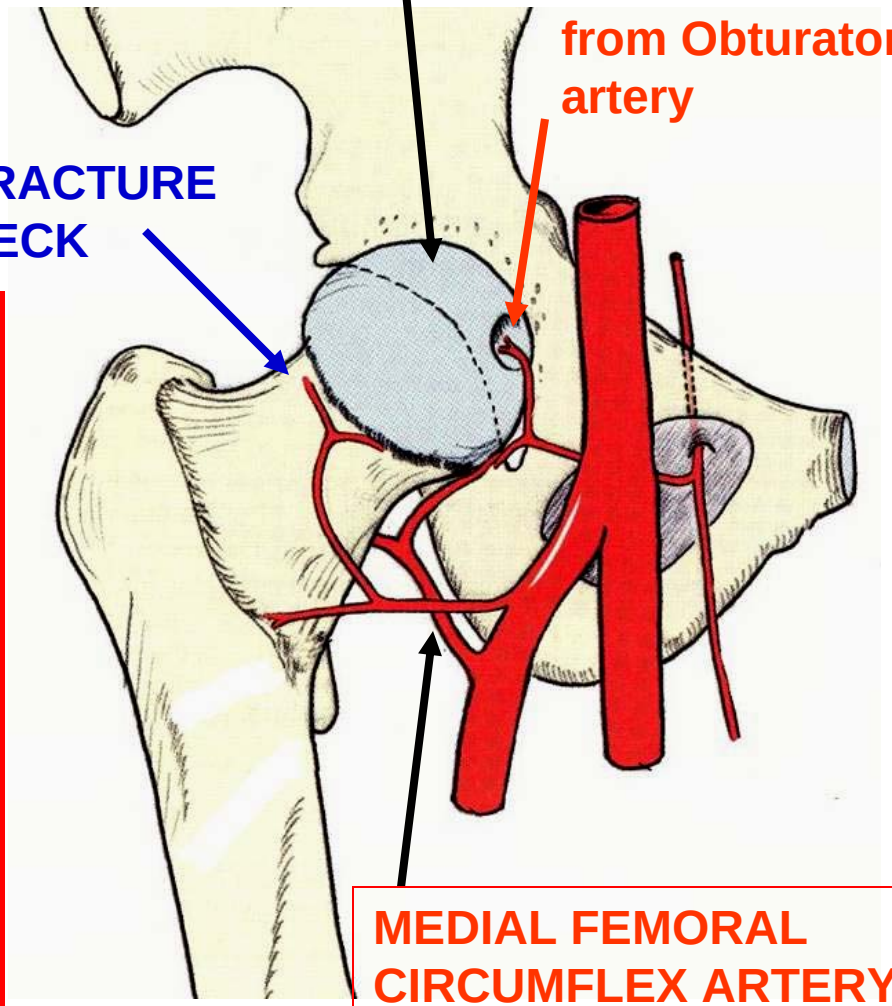


Fracture of neck of femur leaves Greater Trochanter attached to femur

FRACTURE CAN PRODUCE AVASCULAR NECROSIS OF HEAD OF FEMUR

Obturator Artery branches through Ligament of head of femur

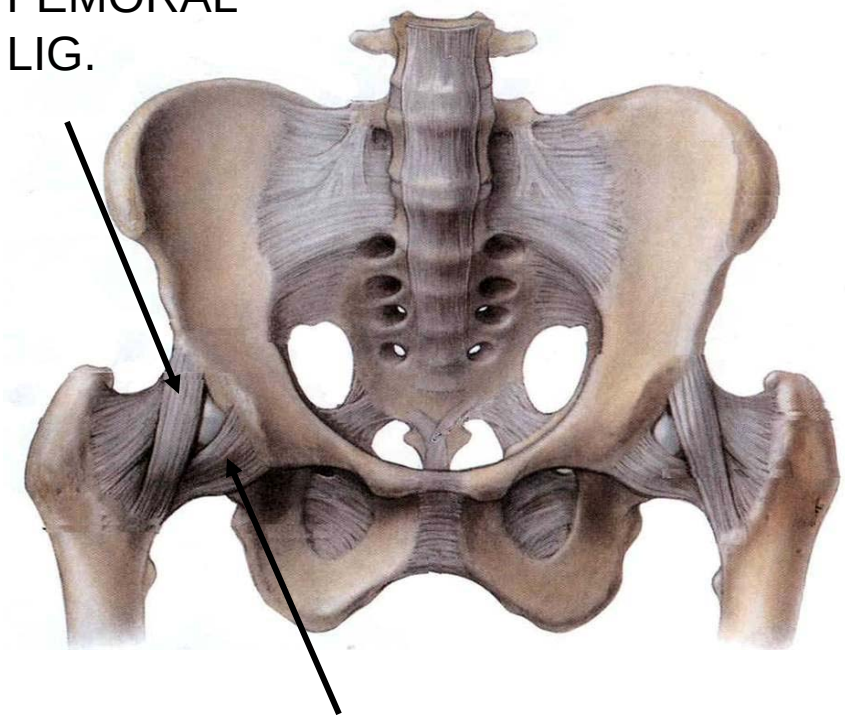




Note: **Fracture of neck of femur** - head and neck of femur receive blood from branches of **Obturator artery** (through ligament of head) and branches of **Medial and lateral femoral circumflex**; after fracture, supply from circumflex arteries is disrupted; if obturator supply is inadequate, **avascular necrosis may occur requiring artificial replacement of head and neck of femur**.

HIP JOINT - LIGAMENTS STRONG

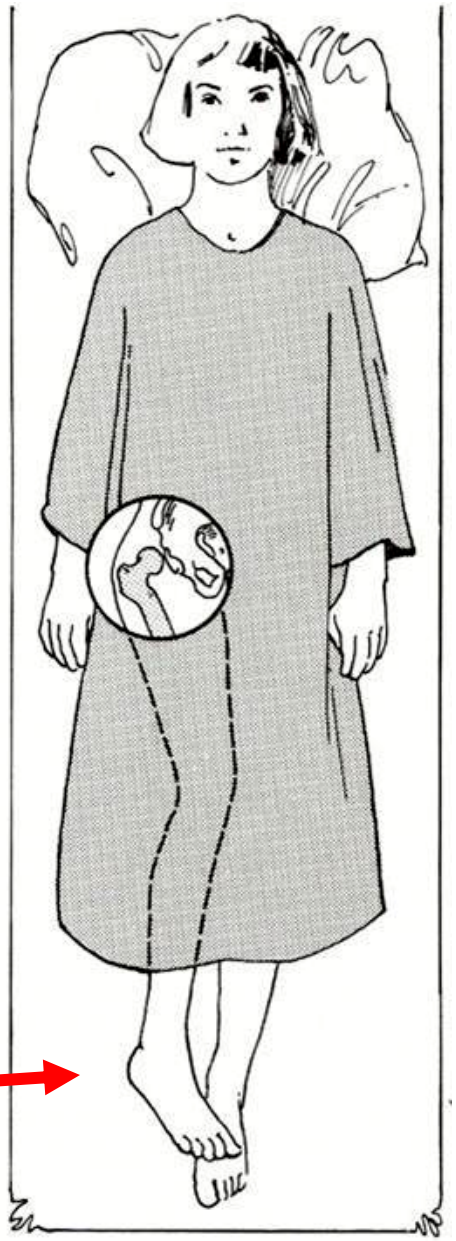
ILIO-FEMORAL LIG.



PUBOFEMORAL LIGAMENT

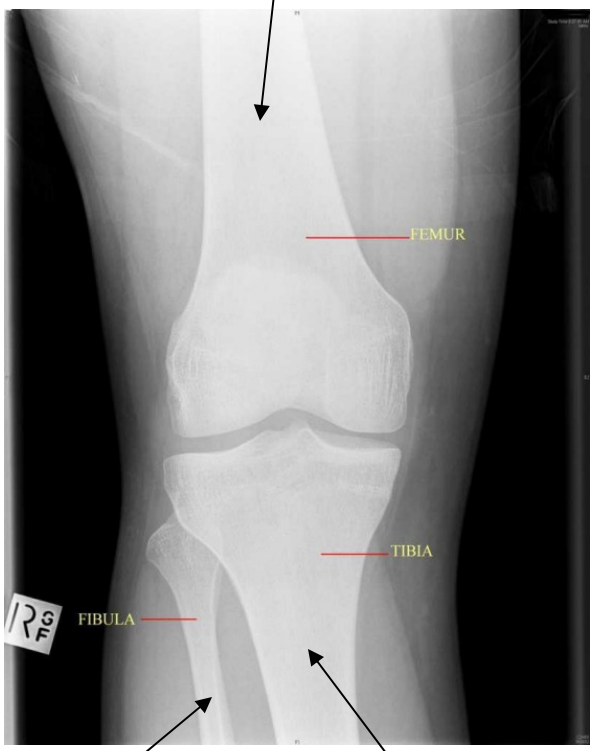
DISLOCATE HIP JOINT

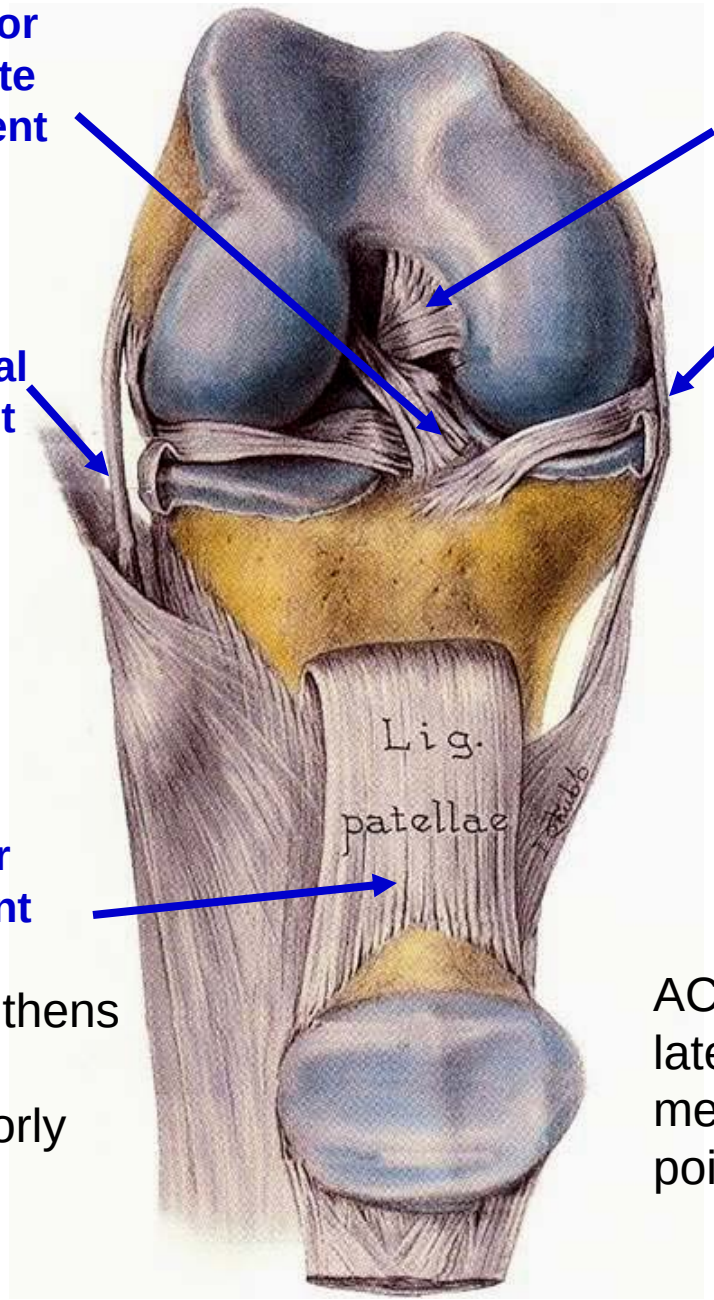
Note: **Dislocation** - traumatic dislocation is rare due to strength of intrinsic ligaments; **congenitally, upper lip of acetabulum may fail to form and head of femur may dislocate superiorly**; leg is **rotated medially** (action gluteus medius and minimus); also appears to be shorter



Leg is rotated medially and appears to be shorter

KNEE JOINT - femur abuts against tibia; fibula not part of joint

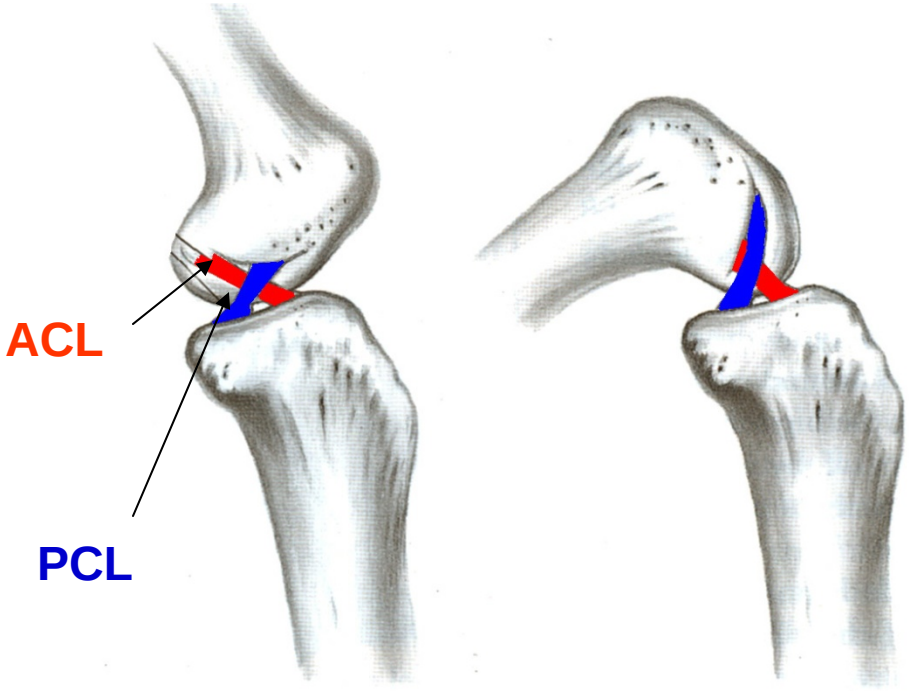


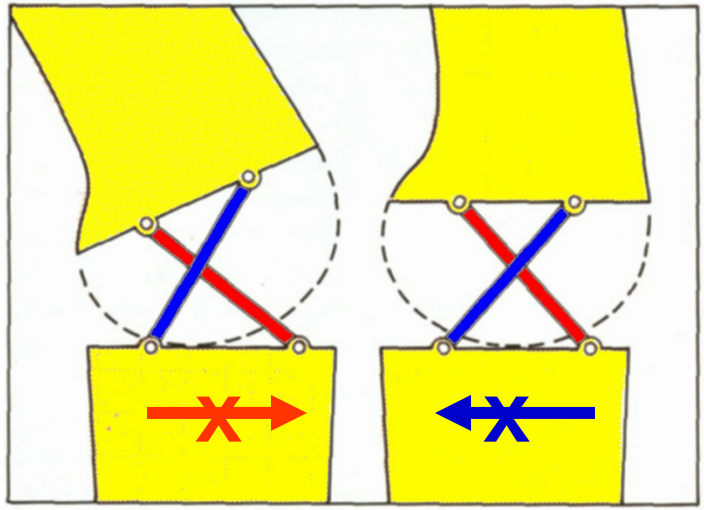


strengthens joint anteriorly

ACL - lateral to medial; points forward

ANTERIOR AND POSTERIOR CRUCIATE LIGAMENTS ALLOW FOR FREE FLEXION AND EXTENSION OF KNEE



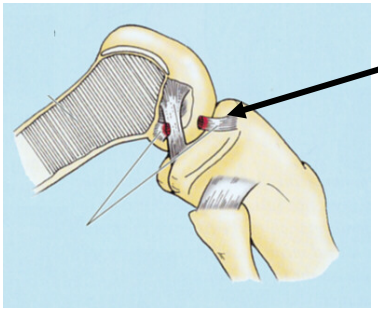


ACL - PREVENTS ANTERIOR MOVEMENT OF TIBIA

PCL - PREVENTS POSTERIOR MOVEMENT OF TIBIA

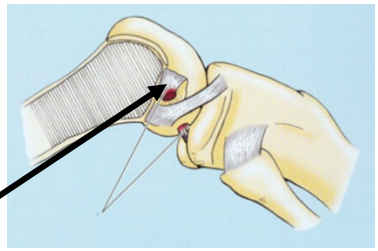
TESTS FOR TEARS IN CRUCIATE LIGAMENTS

ANTERIOR DRAWER SIGN - pull tibia anteriorly

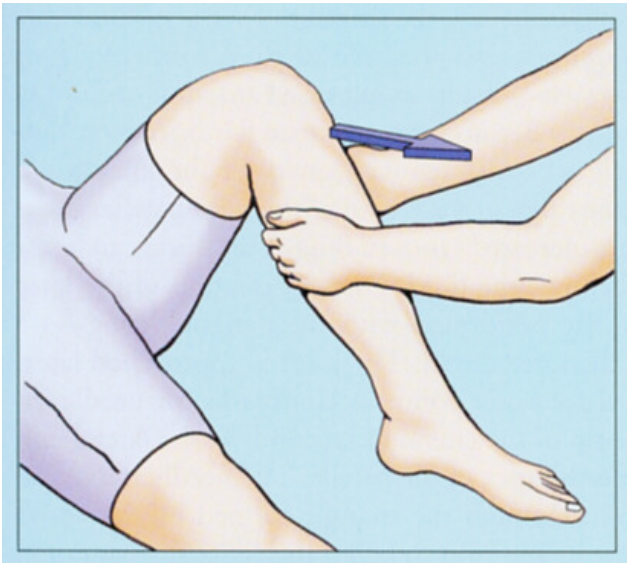


Tear Anterior Cruciate

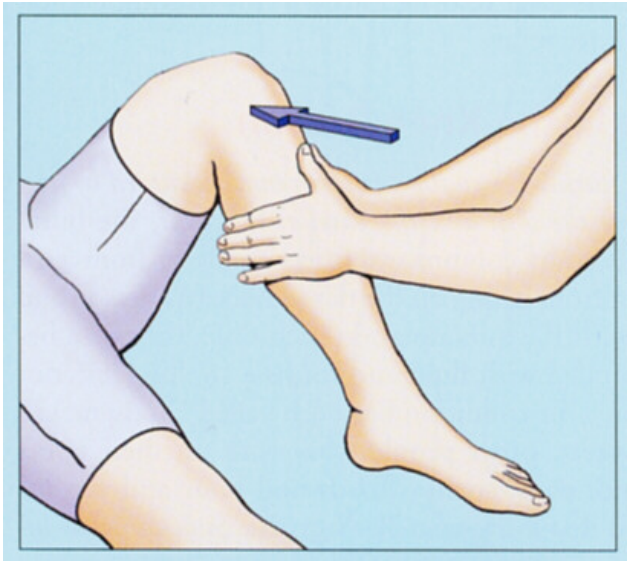
POSTERIOR DRAWER SIGN



Tear Posterior Cruciate

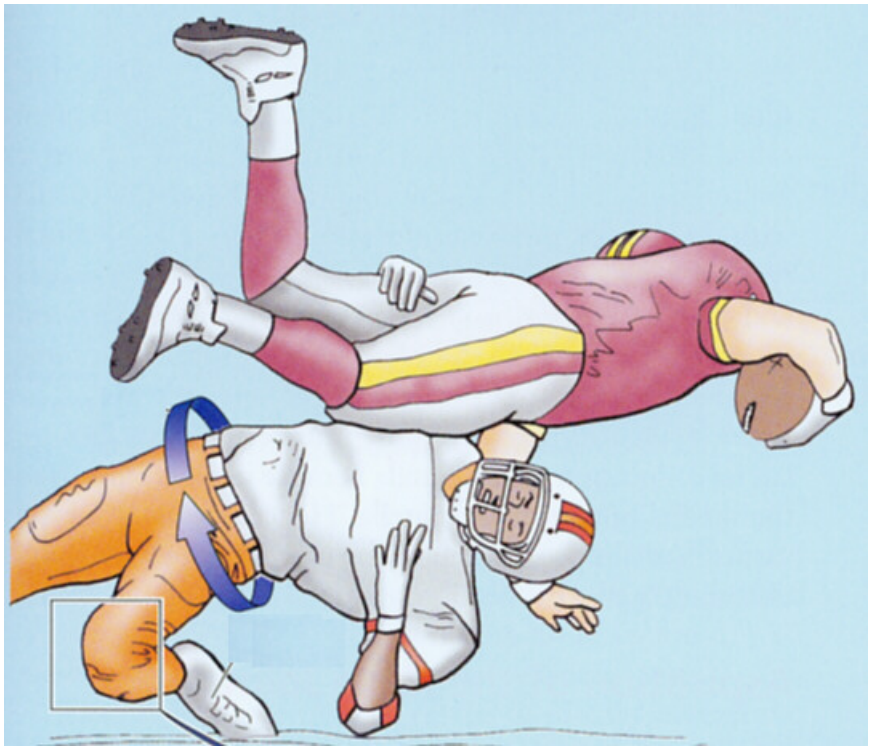


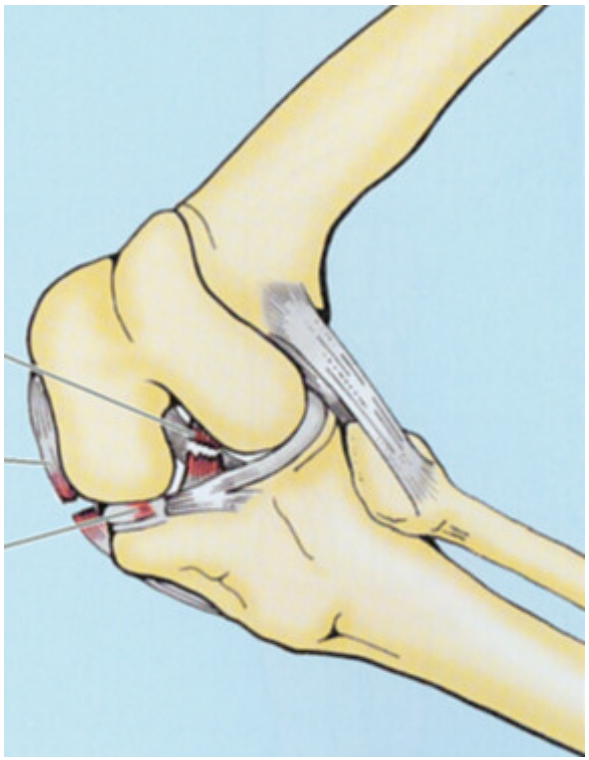
Tear Anterior Cruciate Ligament - can **draw tibia anteriorly**.



Tear Posterior Cruciate Ligament - can **push tibia posteriorly**

TERRIBLE TRIAD OF KNEE JOINT

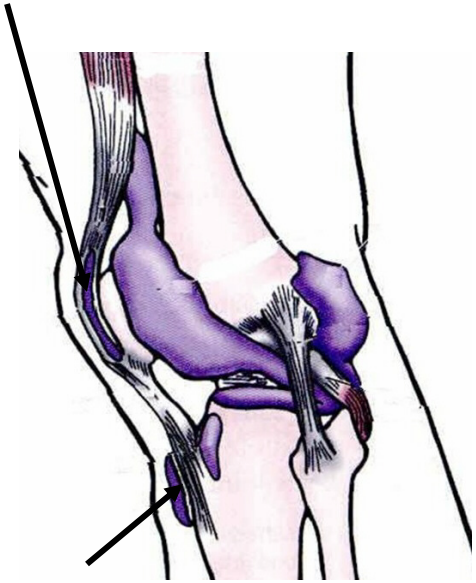




Clinical Note: **Terrible Triad of the Knee joint**: Knee joint is stable in extension but ligaments are slackened by joint flexion; **blow to lateral side** of the knee when the leg is flexed (as can occur in football tackles) or rotate and force lateral movement of body; can tear **Tibial (Medial) collateral ligament, Anterior cruciate ligament and Medial meniscus** (because it is firmly fixed to the medial collateral ligament).

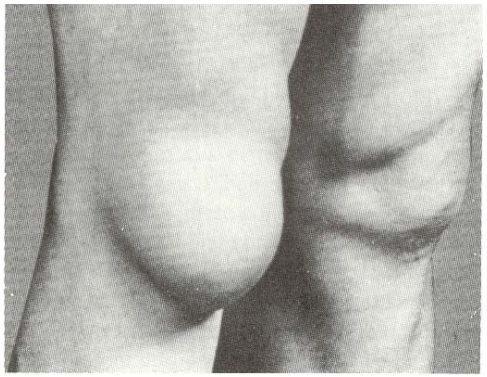
BURSAE OF KNEE CAN BECOME INFLAMMED

Prepatellar bursa in subcutaneous tissue between skin and patella; **inflammation - HOUSEMAID'S KNEE**



Superficial infrapatellar bursa between skin and patellar ligament - **CLERGYMAN'S KNEE**

Inflammation of Prepatellar bursa - HOUSEMAIDS KNEE



HOUSEMAID'S KNEE.

CLERGYMAN'S KNEE

LEG

ANTERIOR

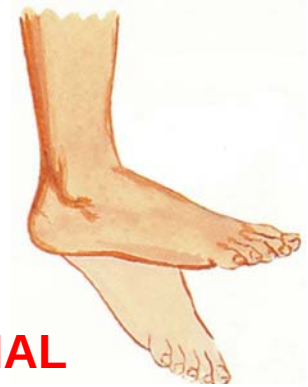
Extensors
Tibialis Anterior

DORSIFLEX FOOT

INN - DEEP PERONEAL NERVE

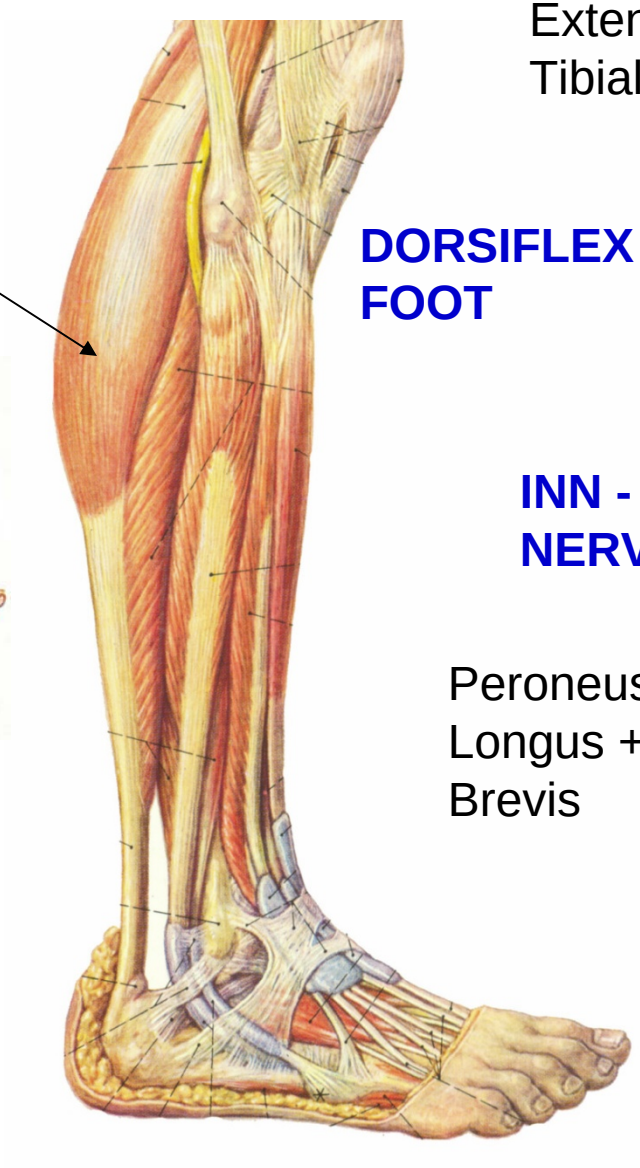
POSTERIOR

Gastrocnemius
Soleus
Flexors
Tibialis Posterior



PLANTAR FLEX FOOT

INN - TIBIAL NERVE



Peroneus Longus + Brevis

LATERAL

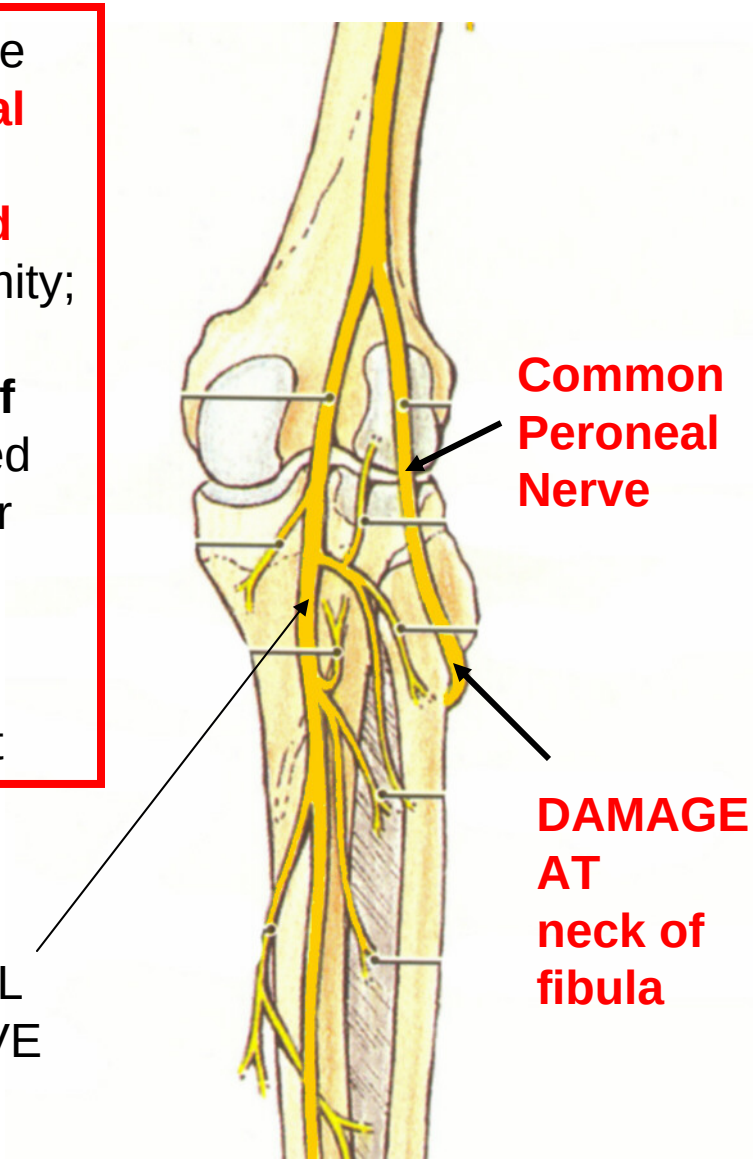
EVERT FOOT

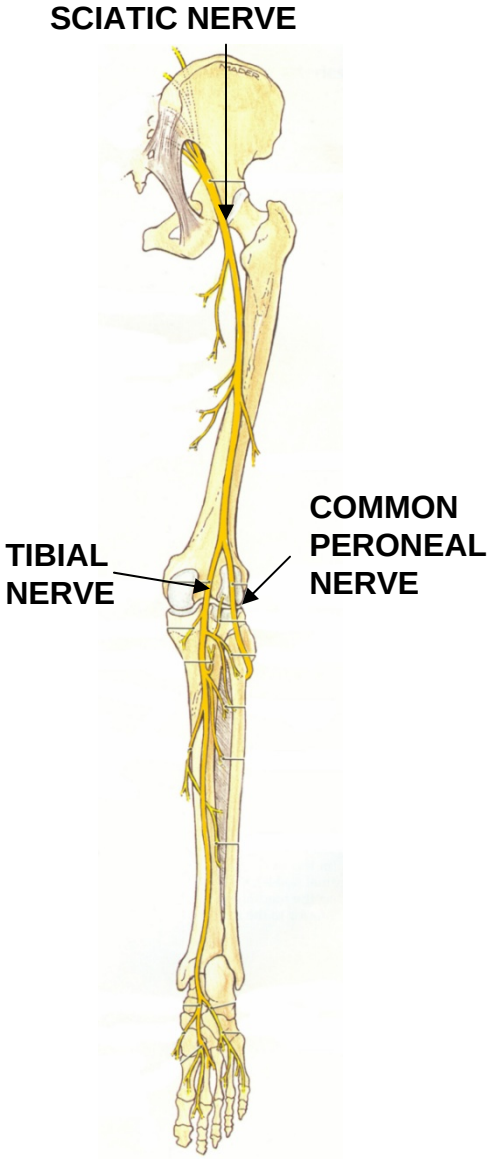
INN - SUPERFICIAL PERONEAL NERVE

DAMAGE TO COMMON PERONEAL NERVE - FOOT DROP

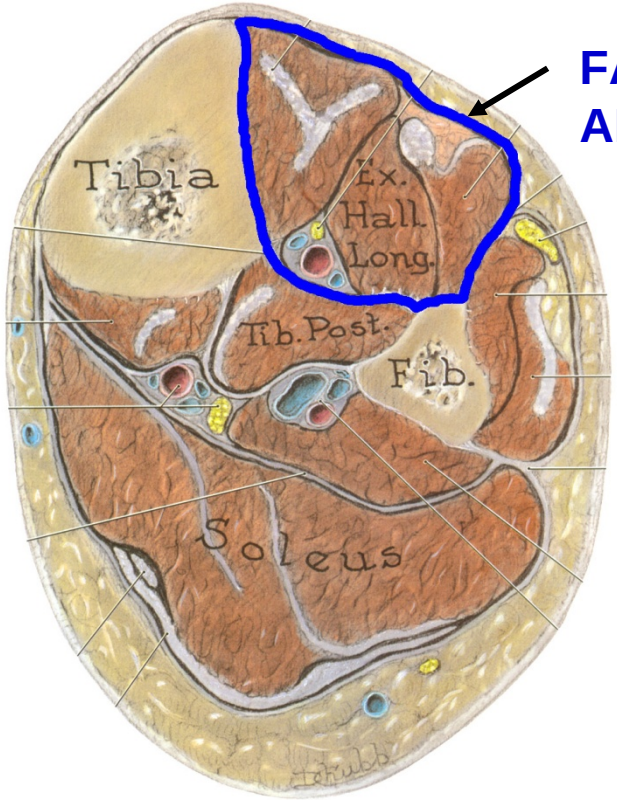
Clinical Note: Damage to **Common Peroneal Nerve - most commonly damaged nerve** in lower extremity; very superficial when winds around **neck of fibula**; can be severed by fracture of fibula or damaged from tight plaster cast; sign is **FOOT DROP**; patient cannot lift foot

FOOT DROP



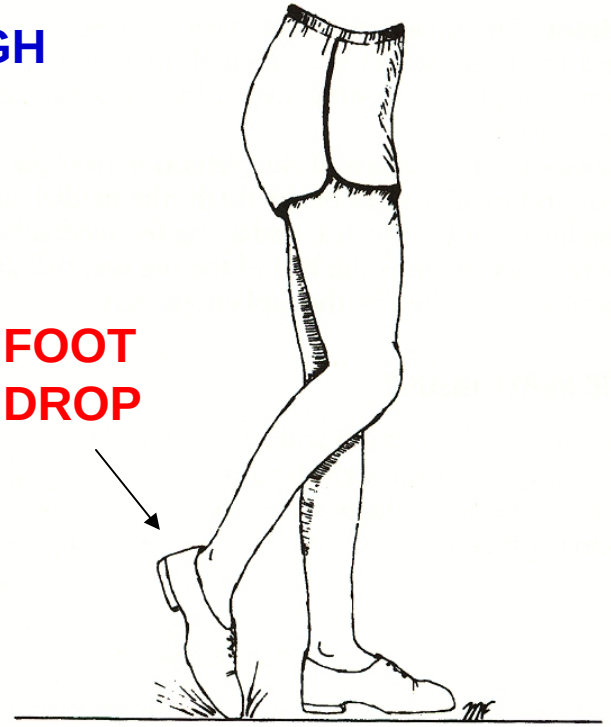


ANTERIOR LEG SYNDROME



FASCIA IS TOUGH AND TIGHT

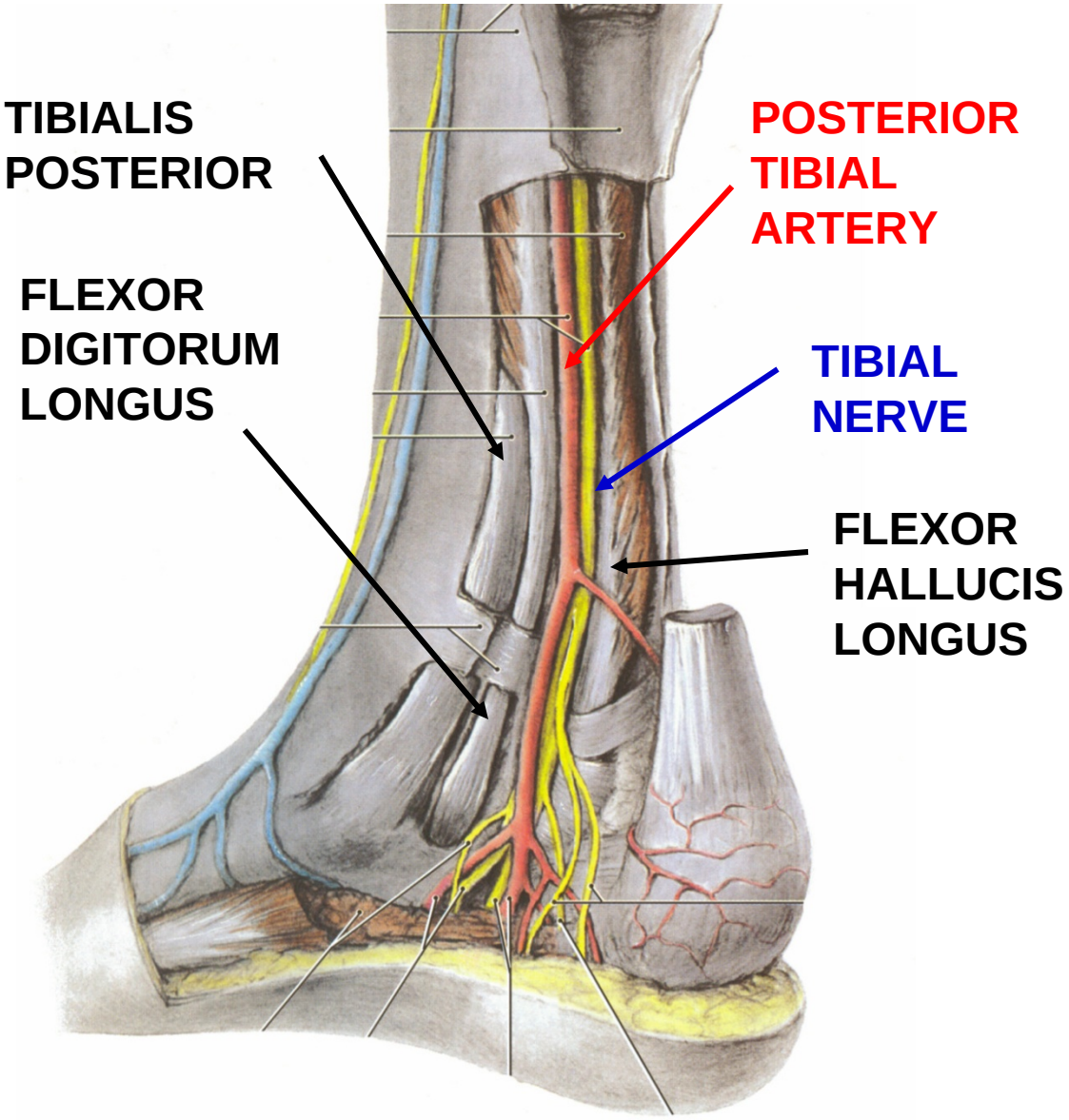
FOOT DROP



Clinical Note: **Anterior Leg Syndrome** - fascia surrounding anterior leg muscles is very tough and tight; muscles can swell in compartment due to exercise or when fracture tibia; symptom is **FOOT DROP** (=loss of dorsiflexion of foot) due to compression of **Deep Peroneal Nerve**; treated by fasciotomy (surgically splitting fascia). (Note: 'shin splints' is different term, inflammation of the periosteum of the tibia)

DEEP MUSCLES: TOM, DICK AND HARRY

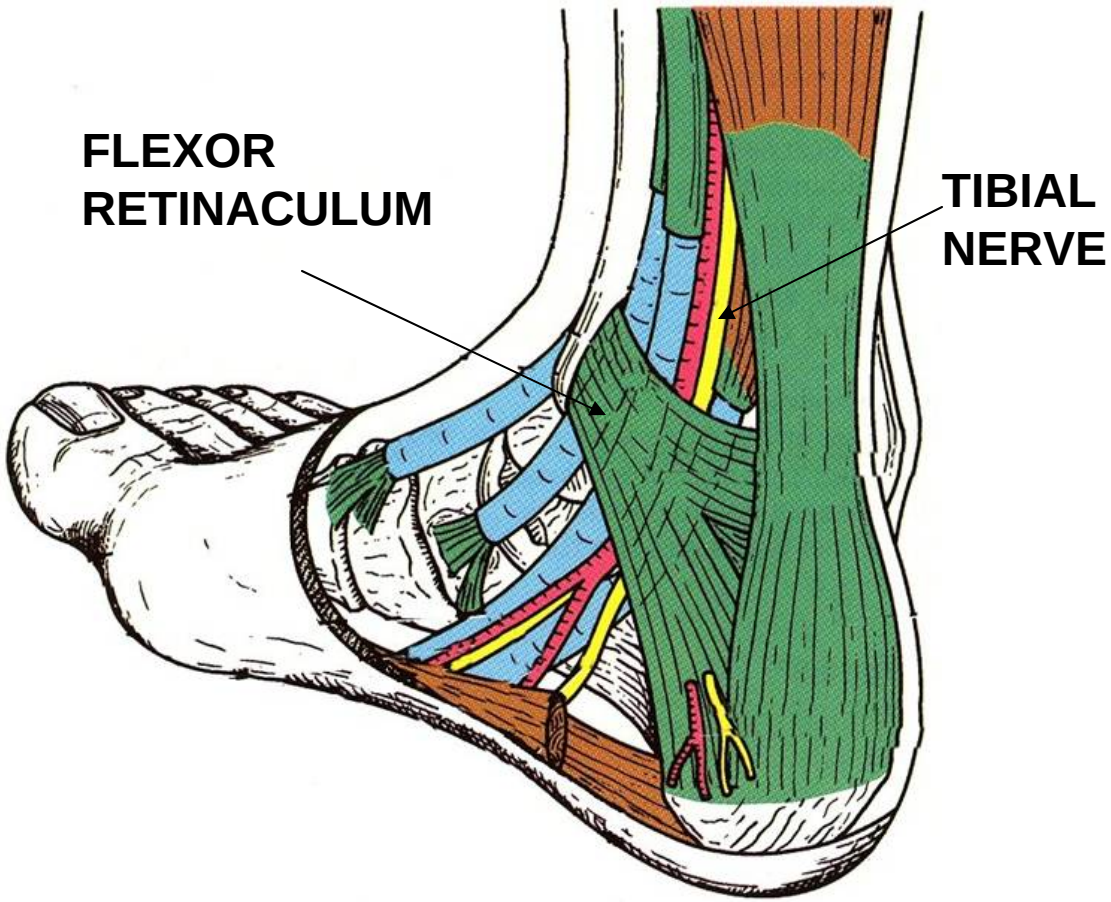
ORDER OF STRUCTURES ON MEDIAL SIDE OF ANKLE - **TOM, DICK AND HARRY** - **T**ibialis posterior (tendon), Flexion **D**igitorum Longus, Posterior Tibial **A**rtery, Tibial **N**erve and Flexor **H**allucis Longus.



Note: Order is important as accidents can happen that sever tendons (i.e. ax strikes ankle when chopping wood).

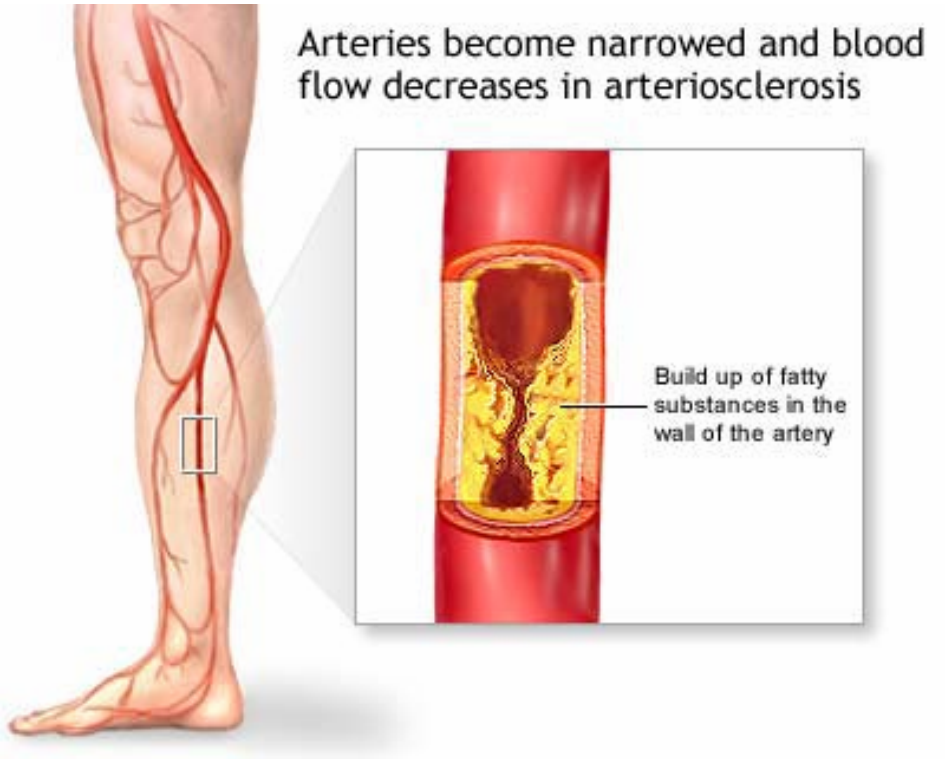
FLEXOR RETINACULUM AND TARSAL TUNNEL SYNDROME

Note: **Flexor Retinaculum** - tendons of deep muscles pass beneath flexor reticulum on medial side of ankle joint; muscle tendons are covered **synovial sheaths** under retinaculum



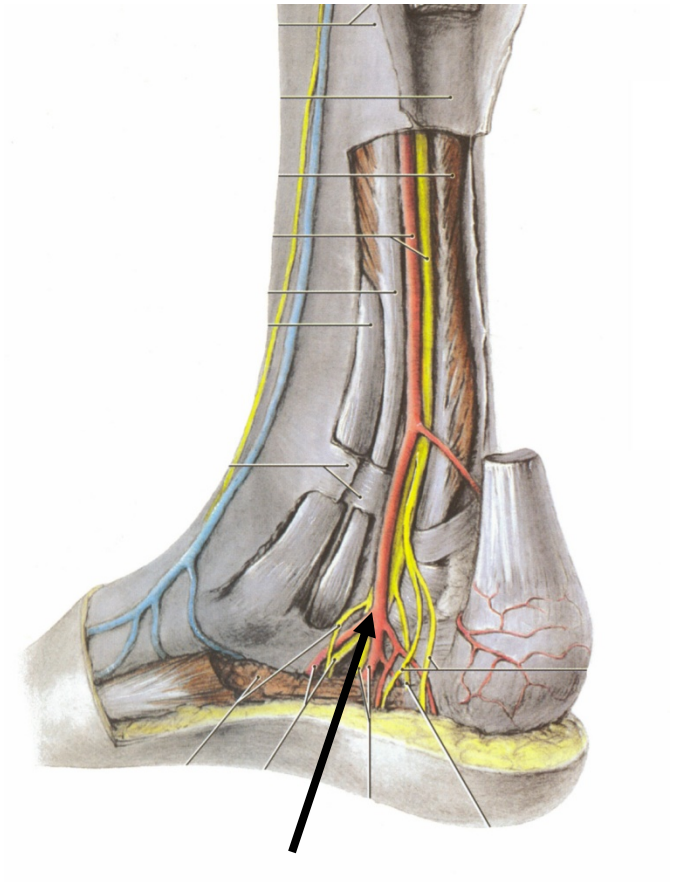
Clinical Note: **Tarsal Tunnel Syndrome** - Tarsal Tunnel is area beneath flexor retinaculum; Tarsal Tunnel Syndrome results from **swelling of synovial sheaths**; can compress **Tibial Nerve**; symptoms are **numbness of sole of foot, toes and weakened flexion of toes** (intrinsic muscles of foot).

INTERMITTENT CLAUDICATION



Note: **Intermittent Claudication** (L. claudico, limping) - Narrowing of posterior tibial artery due to arteriosclerosis; produces ischemia; patients have painful cramps when walking but subsides after rest.

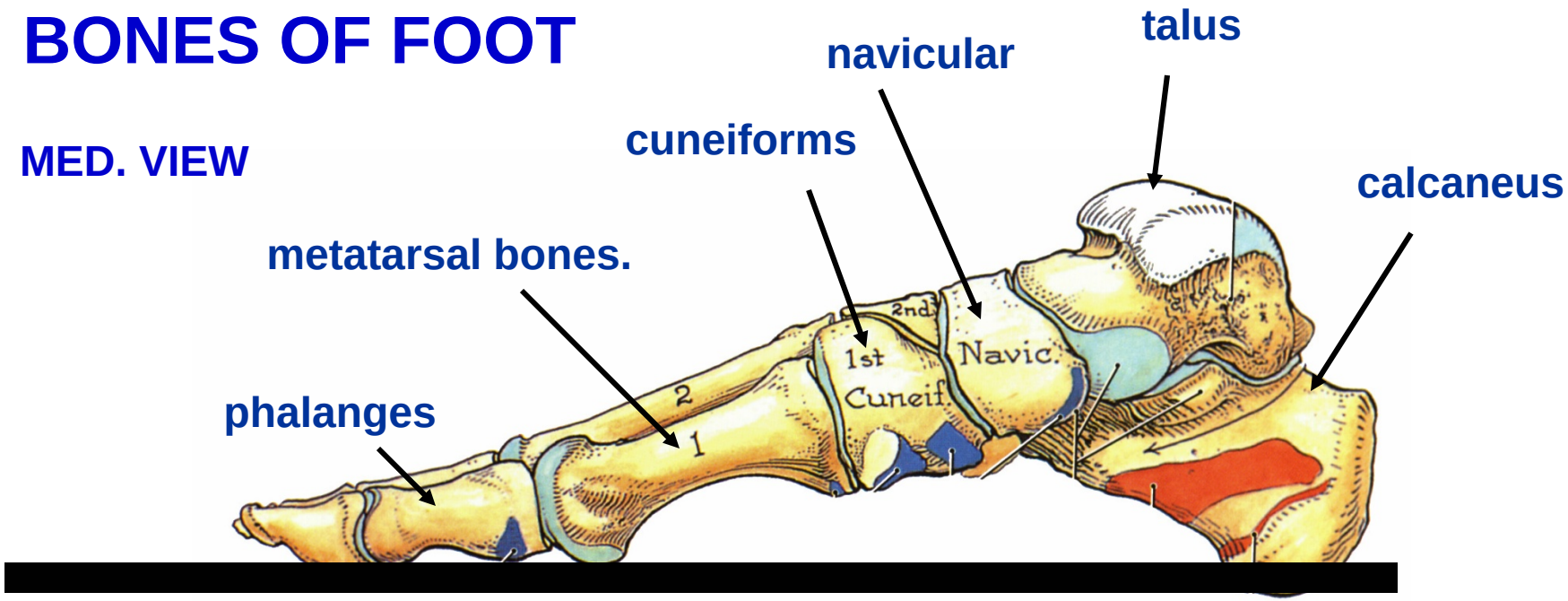
ARTERIES



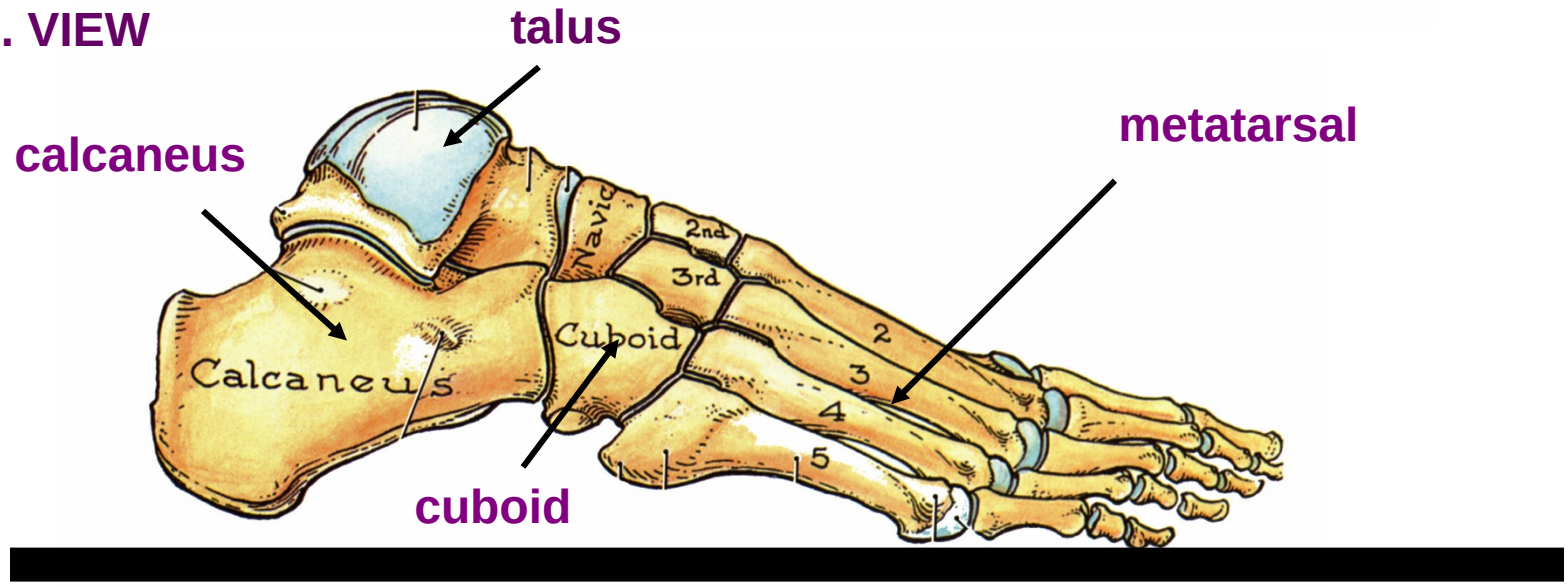
Note: **Pulse of Posterior Tibial Artery** - taken between medial malleolus and tendo calcaneus.

BONES OF FOOT

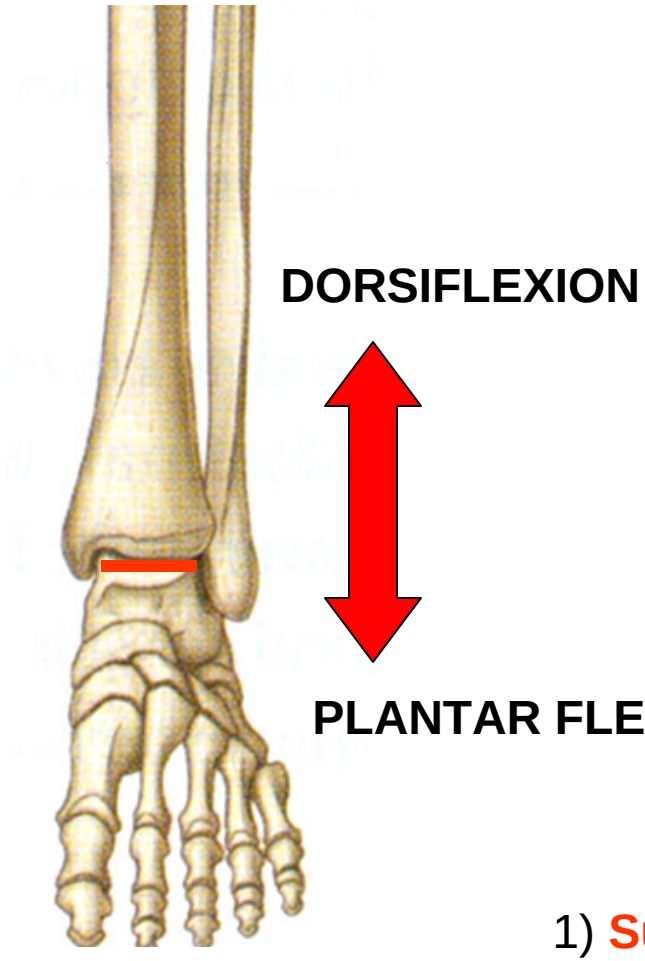
MED. VIEW



LAR. VIEW

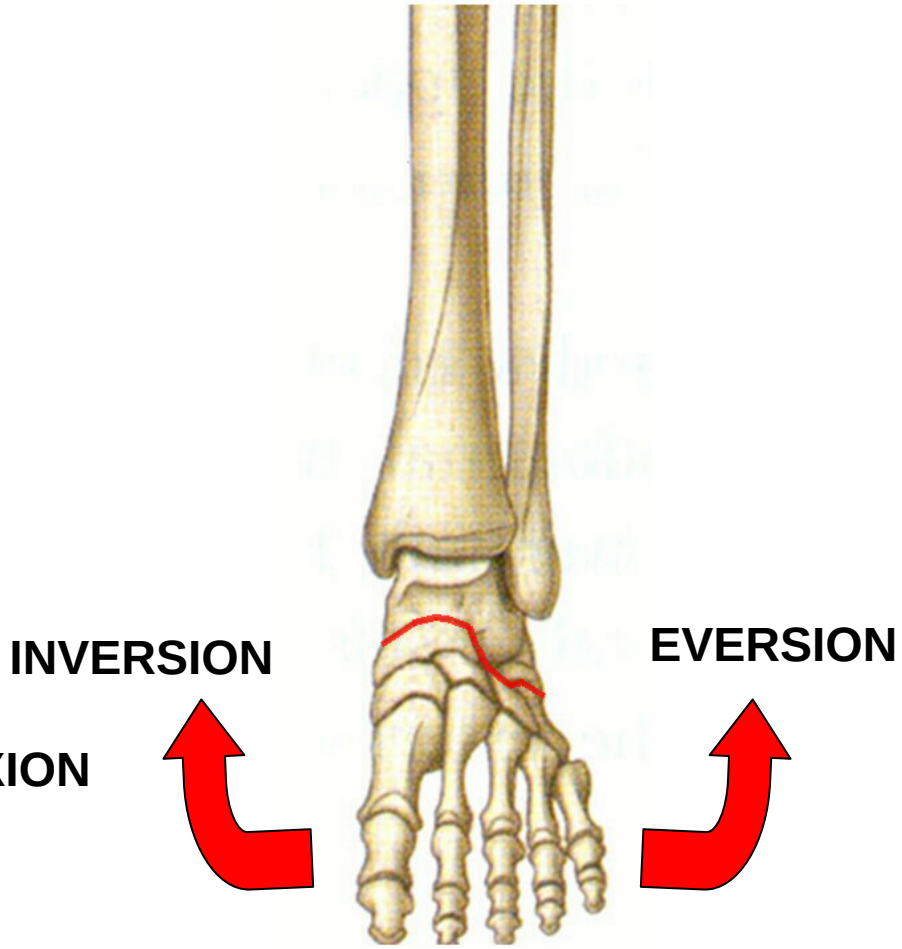


ANKLE JOINT: DORSIFLEXION/PLANTAR FLEXION



TIBIA AND FIBULA AND TALUS

JOINTS OF INVERSION AND EVERSION

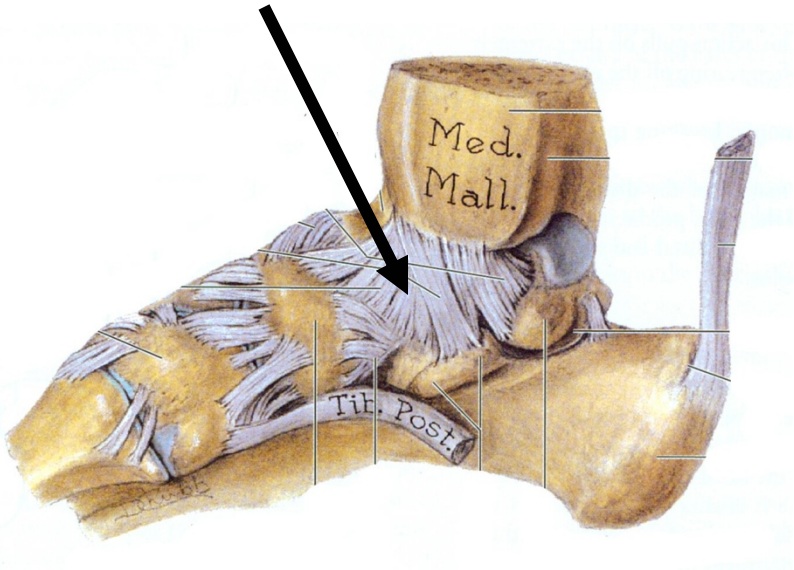


1) **Subtalar joint** (between **talus and calcaneus**)
2) **Transverse tarsal joint** (between **talus and navicular** bones medially, **calcaneus and cuboid bones** laterally.

ANKLE JOINT: LIGAMENTS

MEDIAL - LIGAMENT STRONG

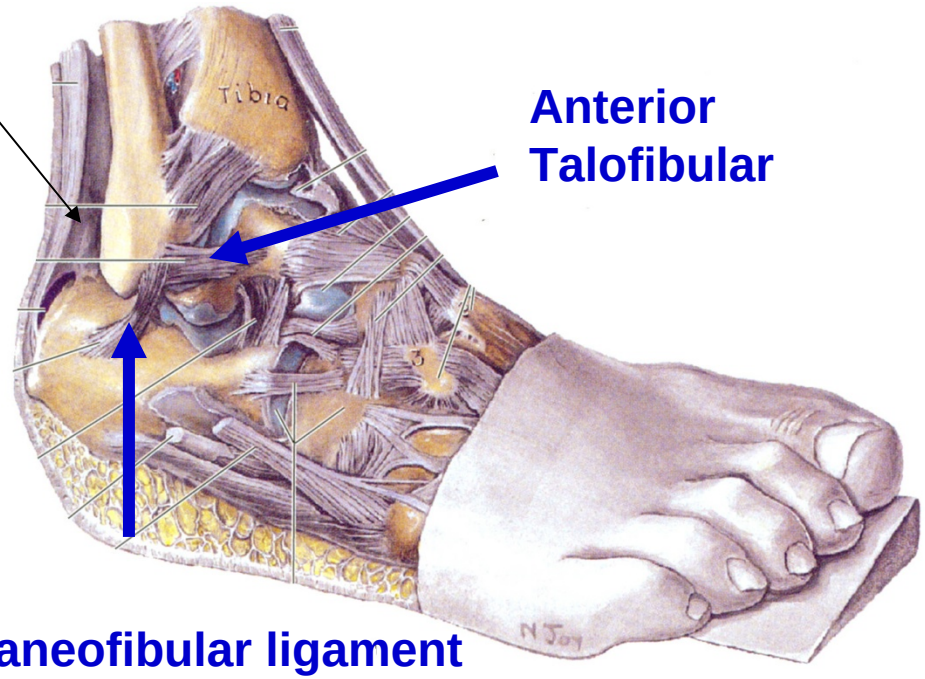
DELTOID LIGAMENT



LATERAL - LIGAMENTS WEAKER

Posterior Talofibular

Anterior Talofibular



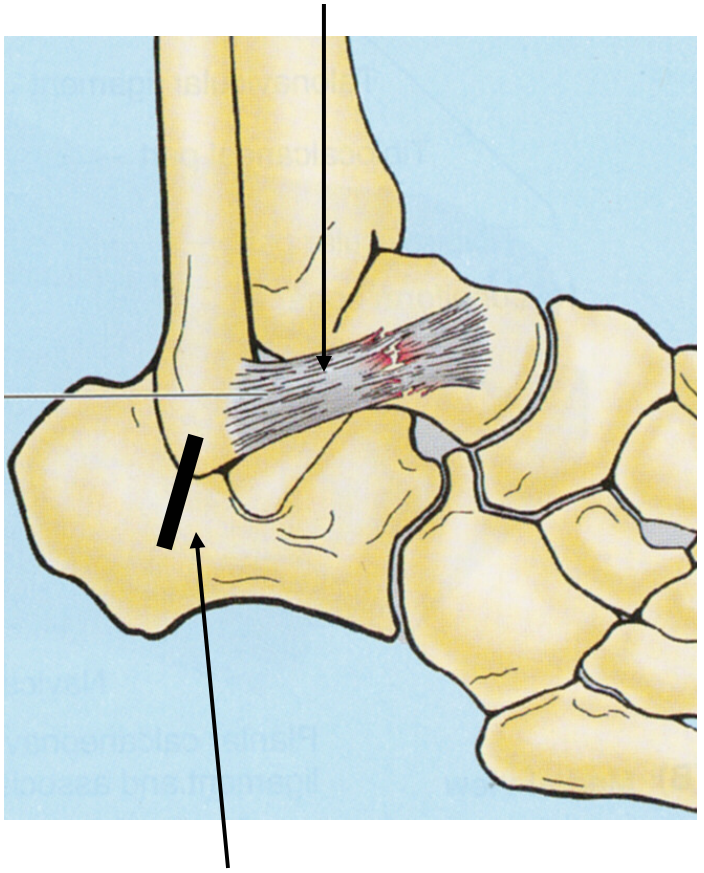
Calcaneofibular ligament

LIGAMENTS ALLOW FREE DORSIFLEXION AND PLANTAR FLEXION
PREVENT EXCESSIVE EVERSION AND INVERSION

SPRAINED ANKLE: EXCESSIVE INVERSION

Note: **Sprains** of ankle are usually caused by **excessive inversion**; **Anterior talofibular** and **Calcaneofibular ligaments** are commonly **stretched or partially torn**.

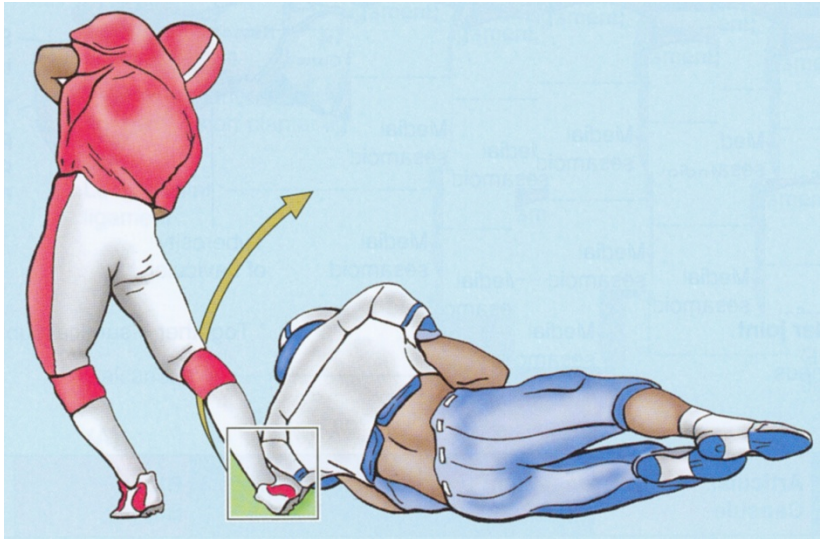
Symptom - pain on LATERAL side of ANKLE

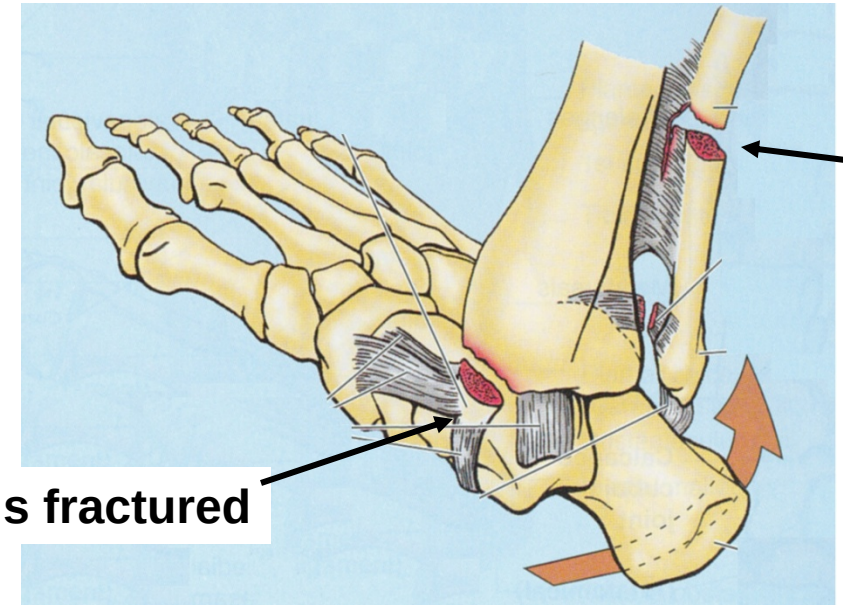


POTT'S FRACTURE: EXCESSIVE EVERSION

Note: **Pott's fractures** are caused by **excessive eversion**; strong **Deltoid ligament does not rupture** but **medial malleolus is fractured**; also **break shaft of fibula.**

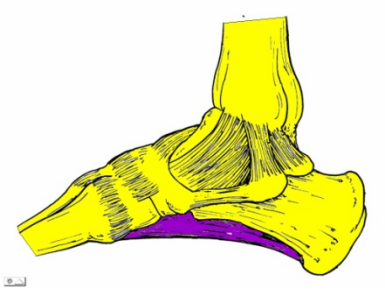
SYMPTOM - pain in ankle





Fibula is fractured

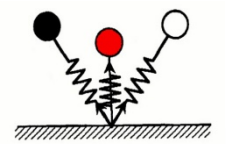
Medial malleolus is fractured



MEDIAL ARCH

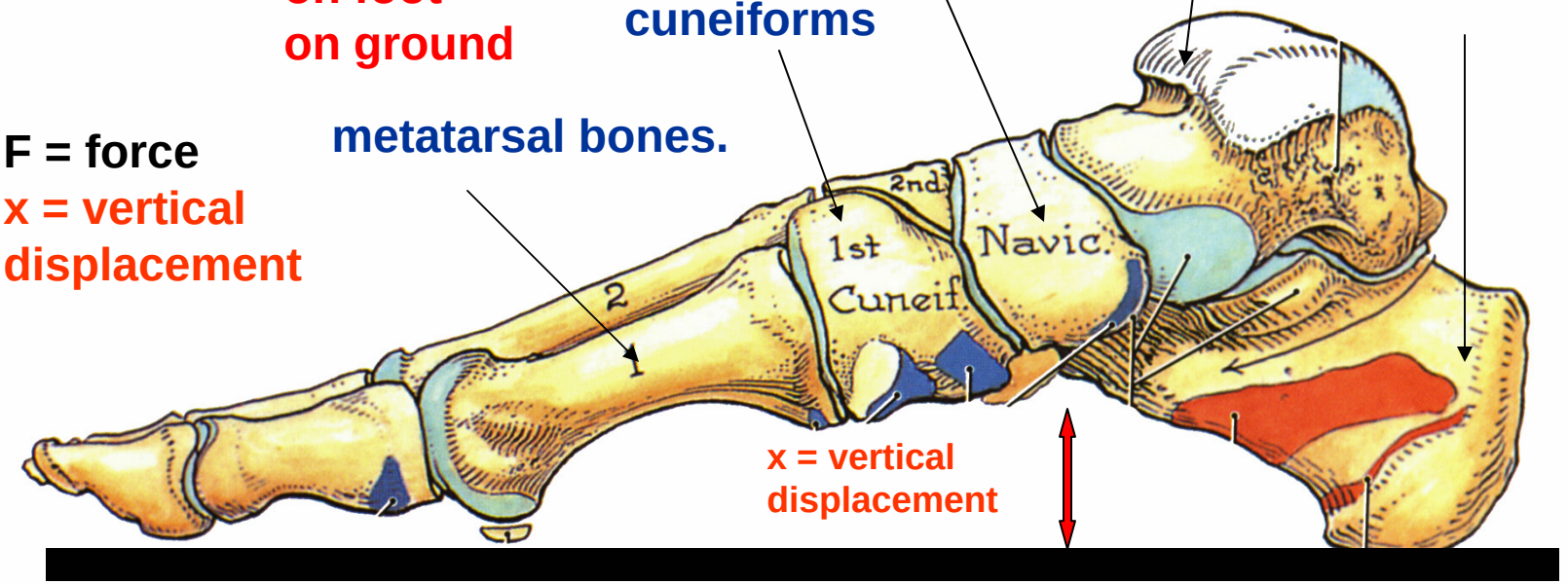
Medial Longitudinal arch - highest arch, responsible for 'fallen arches'
-formed by - **calcaneus, talus, navicular, cuneiforms and medial three metatarsal bones.**

F = k*x



Load springs when put weight on foot on ground

F = force
x = vertical displacement

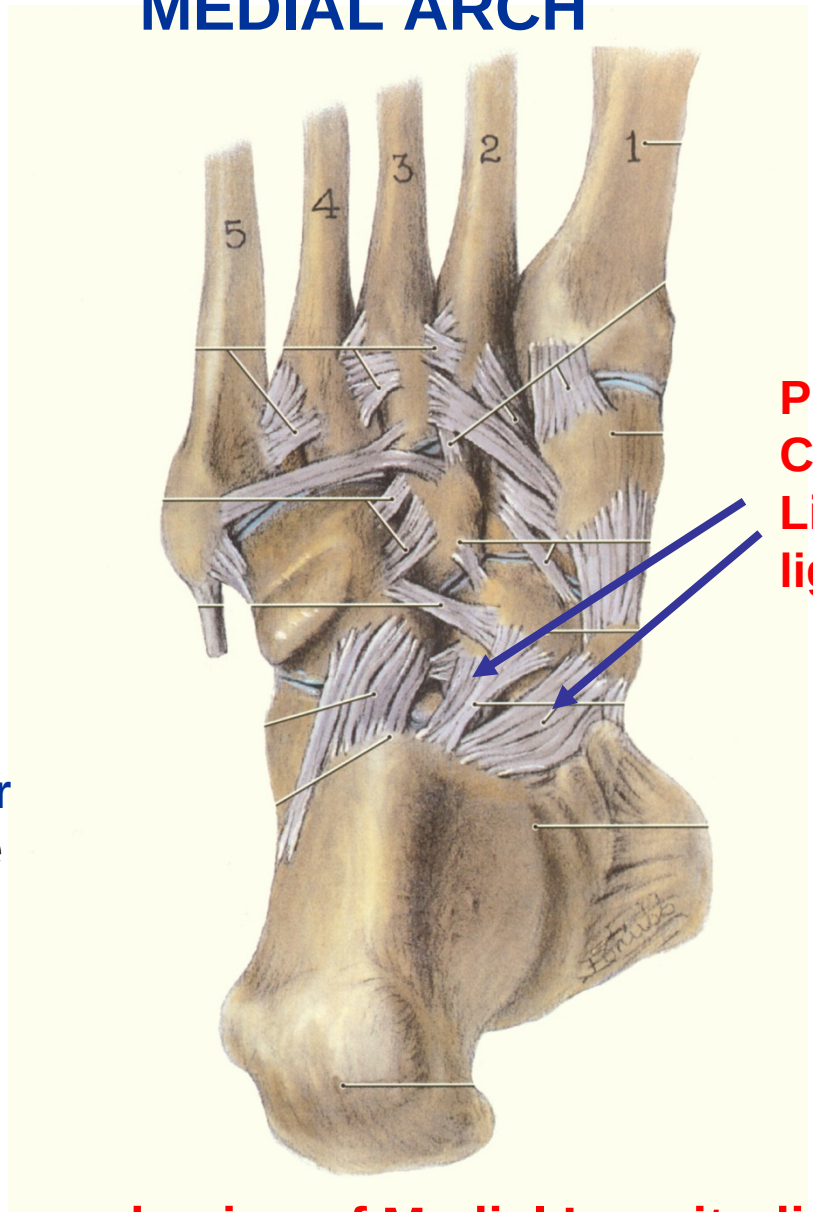


MEDIAL ARCH

- supported by ligaments and muscles

i. **Plantar Calcaneonavicular Ligament - 'Spring' ligament,** most important ligament, keeps head of talus high off ground.

ii. **Tibialis Posterior and Tibialis Anterior** - insert to medial side of foot and support arch.

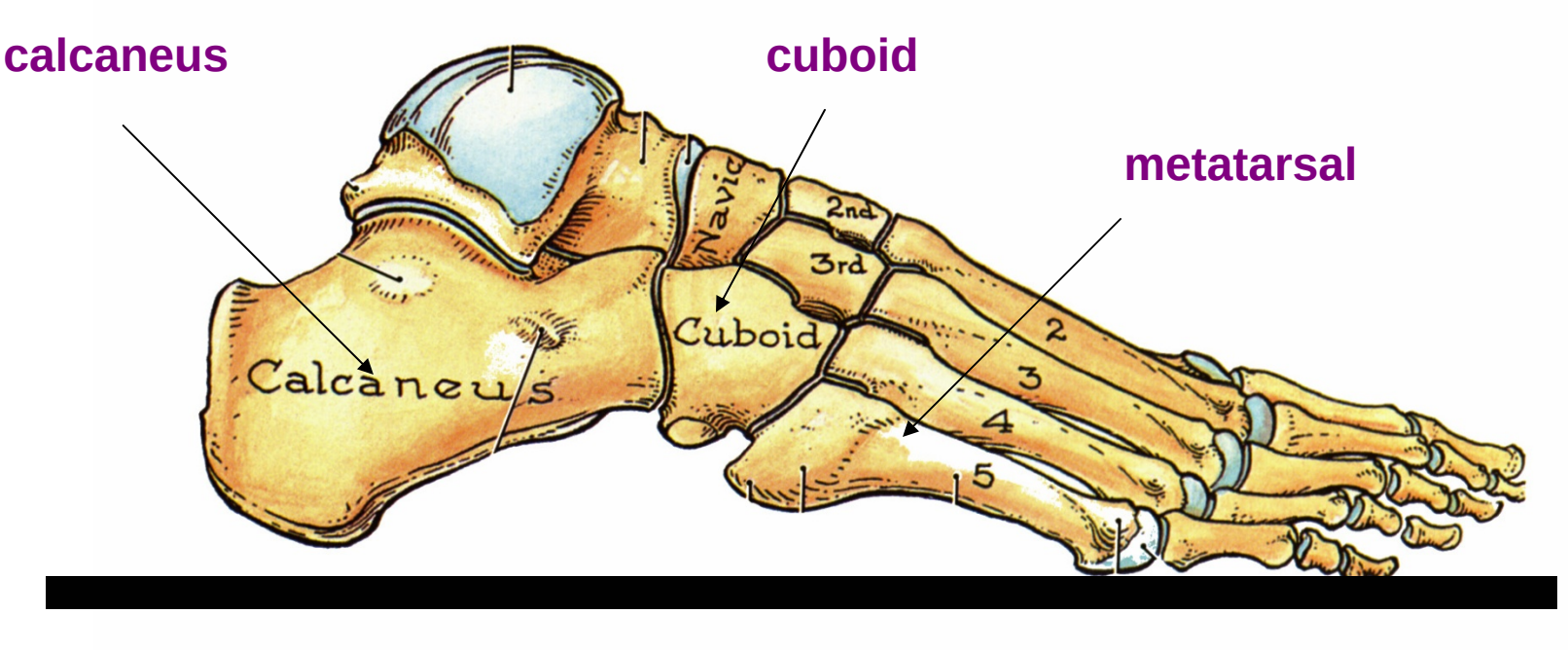


Note: **'Flat' Feet - weakening of Medial Longitudinal arch** - associated with **stretching of Plantar Calcaneonavicular ligament**.

GOOD LUCK!

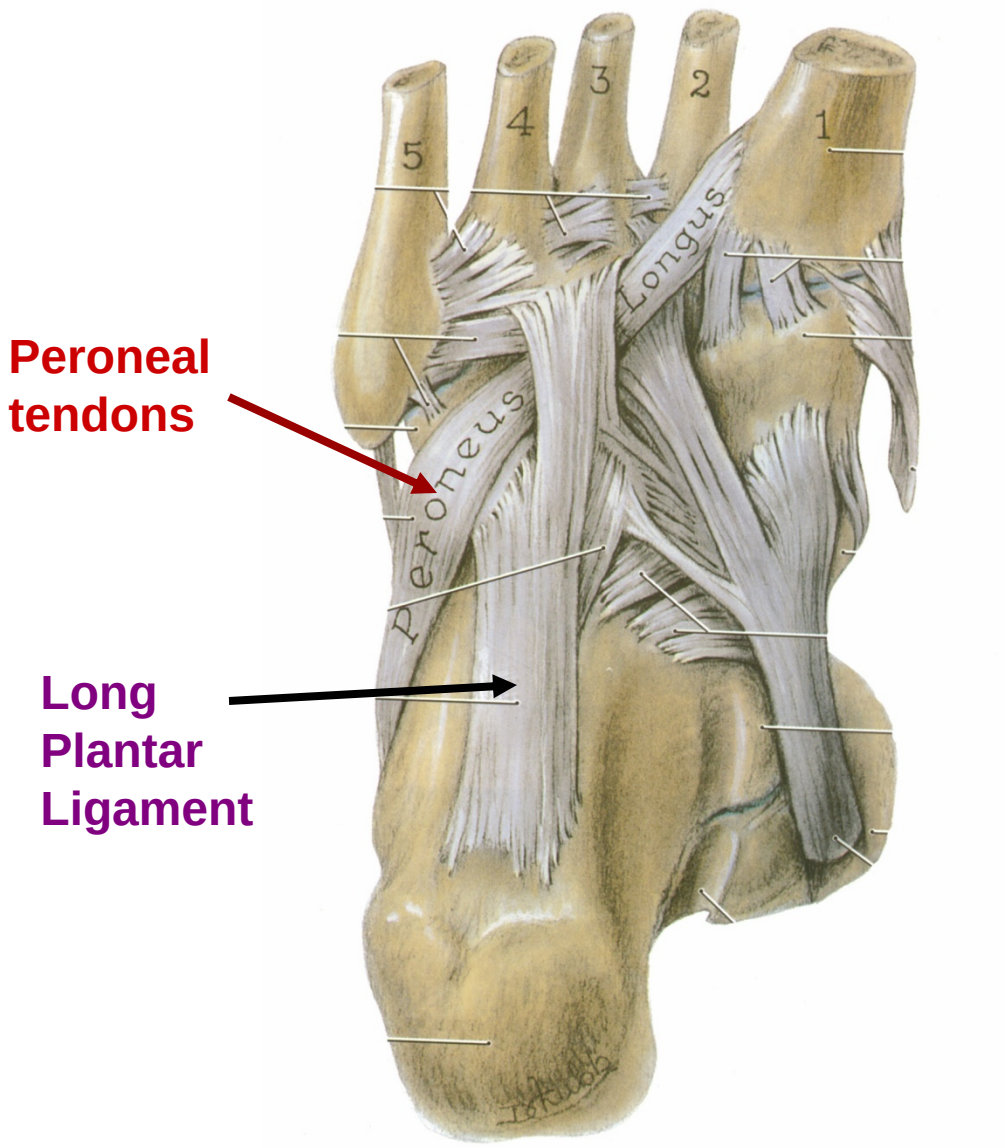
LATERAL ARCH

2. **Lateral Longitudinal arch** - smaller
a. formed by - **calcaneus, cuboid and lateral two metatarsals**
b. supported by
i. Long Plantar Ligament and Plantar Aponeurosis
ii. Peroneal tendons



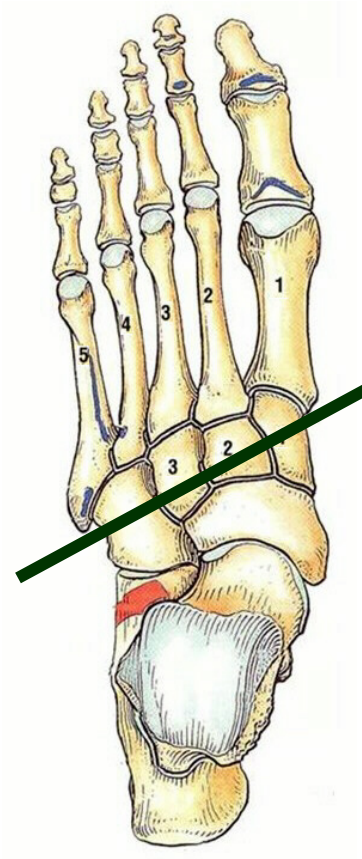
LATERAL ARCH

b. supported by
i. **Long Plantar Ligament** and Plantar Aponeurosis
ii. **Peroneal tendons**

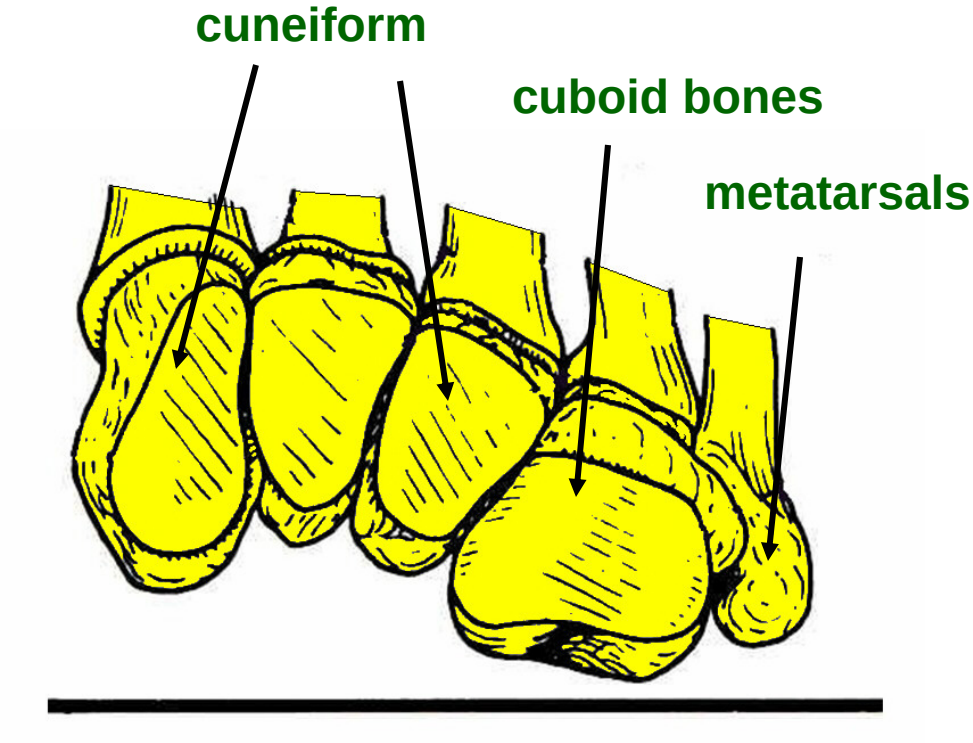


TRANSVERSE ARCH

3. **Transverse arch**
a. formed by **cuneiform** and **cuboid bones** and **metatarsals**



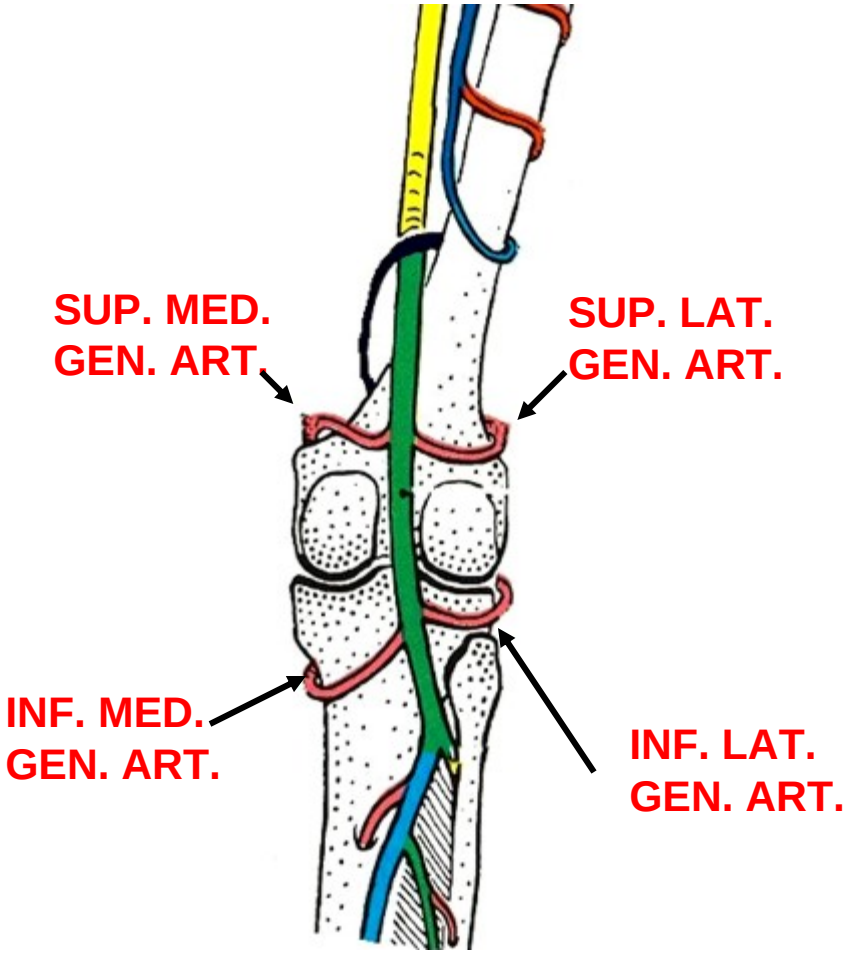
Plane of Transverse arch



supported by Interosseus muscles and Peroneus longus tendon

GENICULAR ANASTOMOSIS

1. **Superior Medial Genicular artery** - anastomoses with Descending Genicular artery (from Femoral Artery)
2. **Superior Lateral Genicular artery** - anastomoses with Descending branch of Lateral femoral circumflex artery
3. **Inferior Medial Genicular artery** - anastomoses with Recurrent branch of Anterior Tibial artery
4. **Inferior Lateral Genicular artery** - anastomoses with Recurrent branch of Anterior Tibial artery



posterior view

GENICULAR ANASTOMOSIS

1. Superior Medial Genicular artery - anastomoses with Descending Genicular artery (from Femoral Artery)
2. Superior Lateral Genicular artery - anastomoses with Descending branch of Lateral femoral circumflex artery
3. Inferior Medial Genicular artery AND
4. Inferior Lateral Genicular artery - BOTH anastomose with Recurrent branch of Anterior Tibial artery

DESC. GEN. FROM FEMORAL

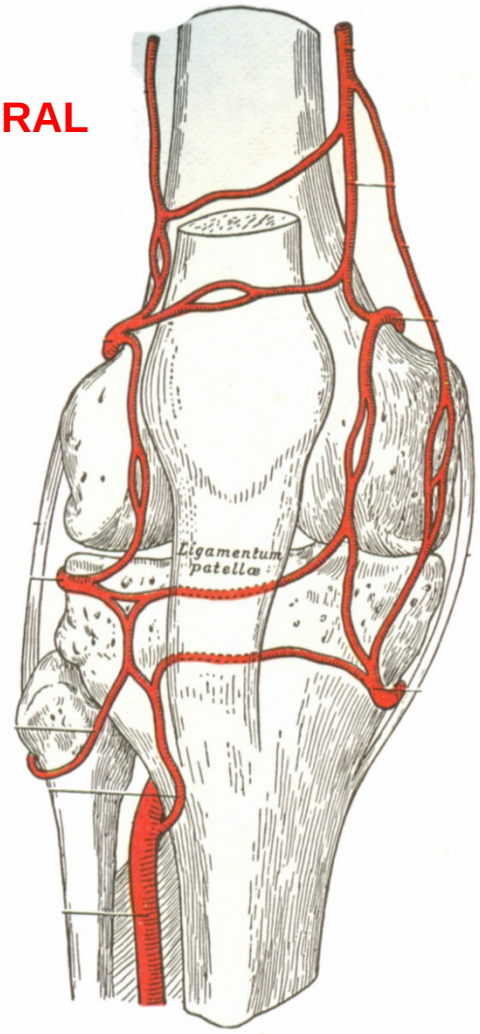
↓

SUP. MED. GEN. ART.

DESC. BR. LAT. FEM. CIRC.

↓

SUP. LAT. GEN. ART.



INF. LAT. GEN. ART.

↑

RECURR. BR. ANT. TIB. A.

INF. MED. GEN. ART.

↑

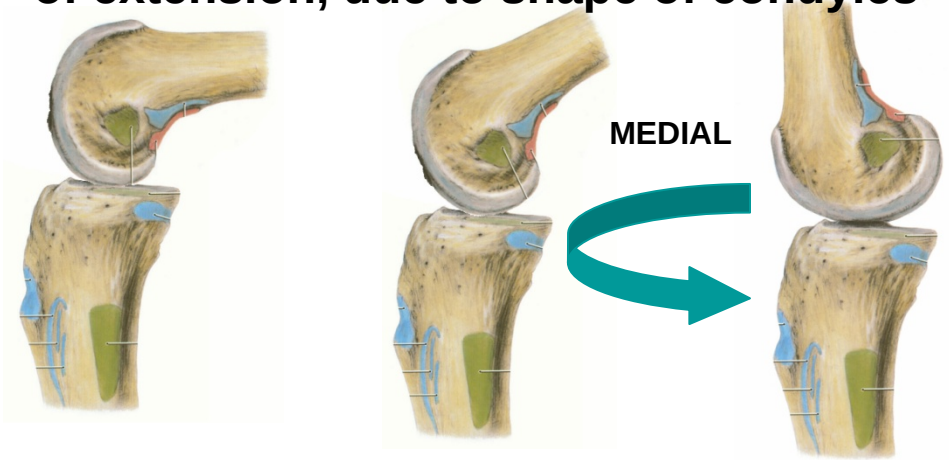
RECURR. BR. ANT. TIB. A.

anterior view

LOCKING AND UNLOCKING KNEE JOINT

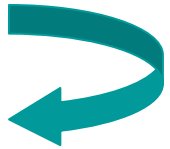
- When moving to full extension of knee joint, femur rotates medially during last 30 degrees of movement.
- this pulls all major ligaments of the knee joint taut, 'locking' the knee and making it very stable;
- to flex knee from full extension, joint must first be unlocked by contracting the **popliteus muscle** which rotates the femur laterally (foot is firmly on ground)

Femur rotates medially during last 30 degrees of extension, due to shape of condyles



FLEXED

EXTENDED



POPLITEUS UNLOCKS KNEE WHEN FLEX KNEE BY ROTATING FEMUR LATERALLY (FOOT ON GROUND)