

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

The knee and foot Joints

RHS 221

Manual Muscle Testing

Theory – 1 hour


practical – 2 hours

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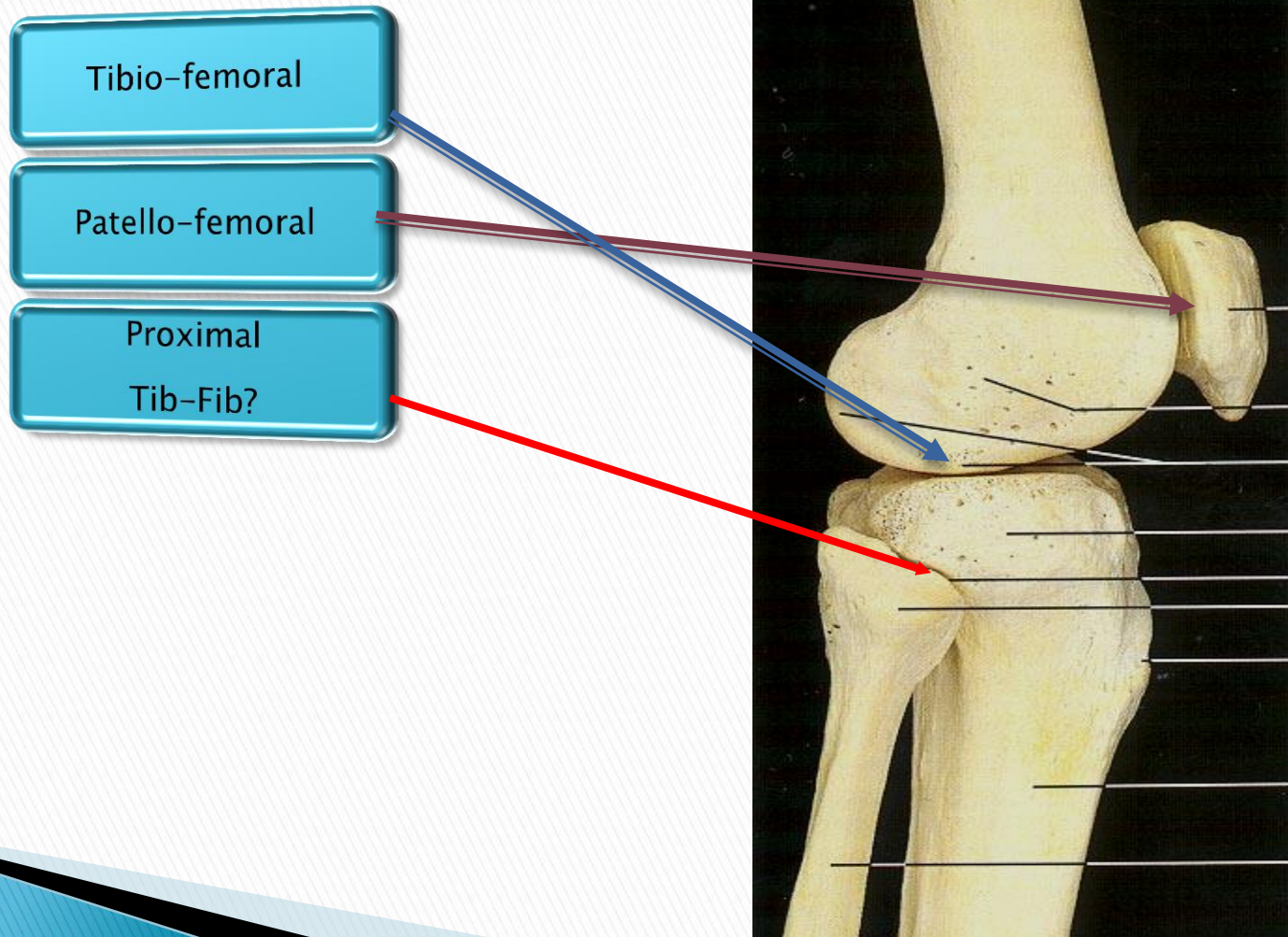
Content Outline

- ▶ Brief Review of Anatomy
- ▶ Evaluation of the knee and foot Joints
- ▶ Muscle Testing and rang of motion measurement of the knee and ankle Joints.

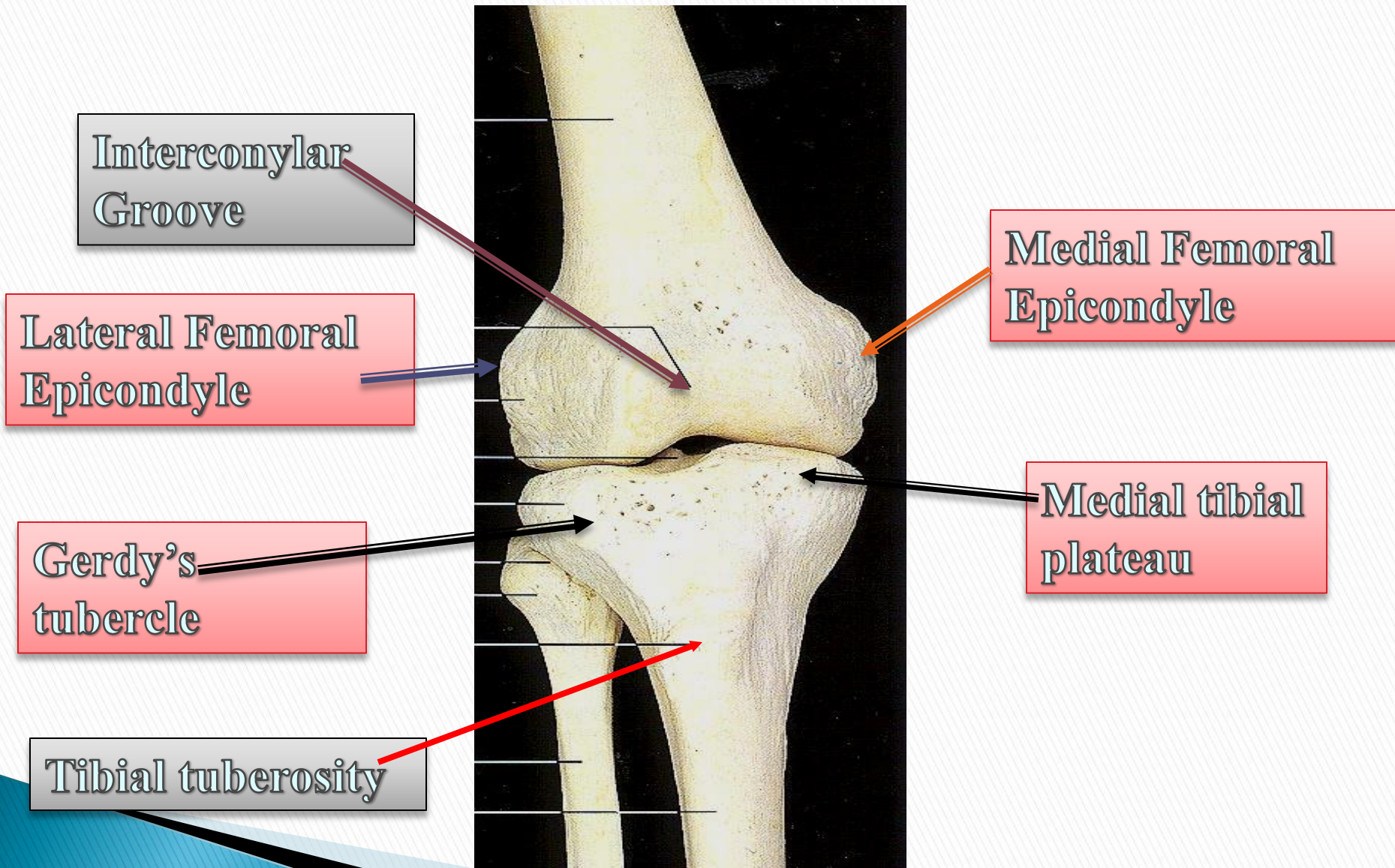
Knee joint

- ▶ The knee is a mechanism of three joints and four bones– the femur, tibia, patella and fibula.
- ▶ The function of these joints is to allow certain movements, restrict others, and to provide load transfer through the lower limb.

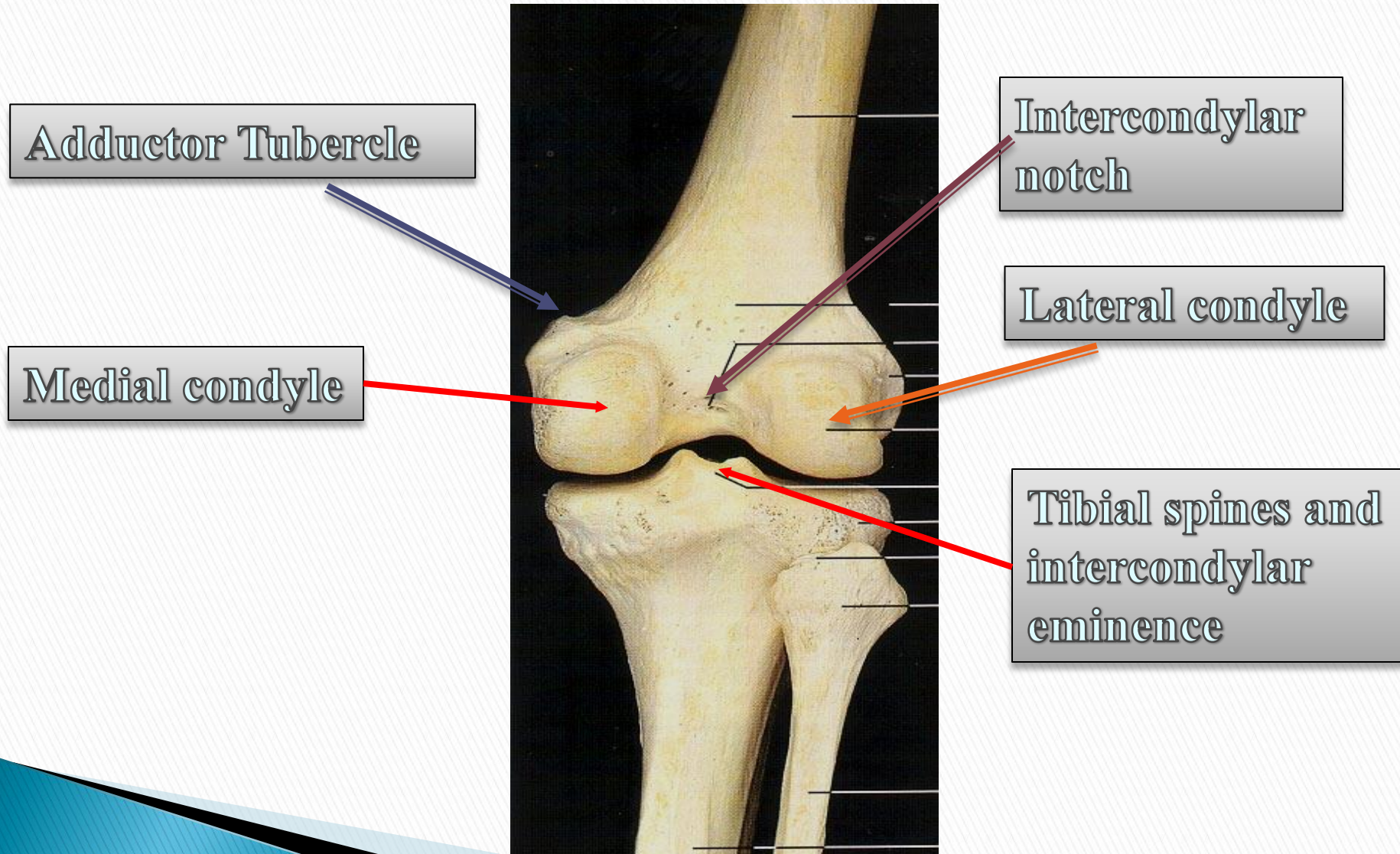
Knee Complex



Tibio-Femoral Joint Osteology



Tibio-Femoral Joint Osteology



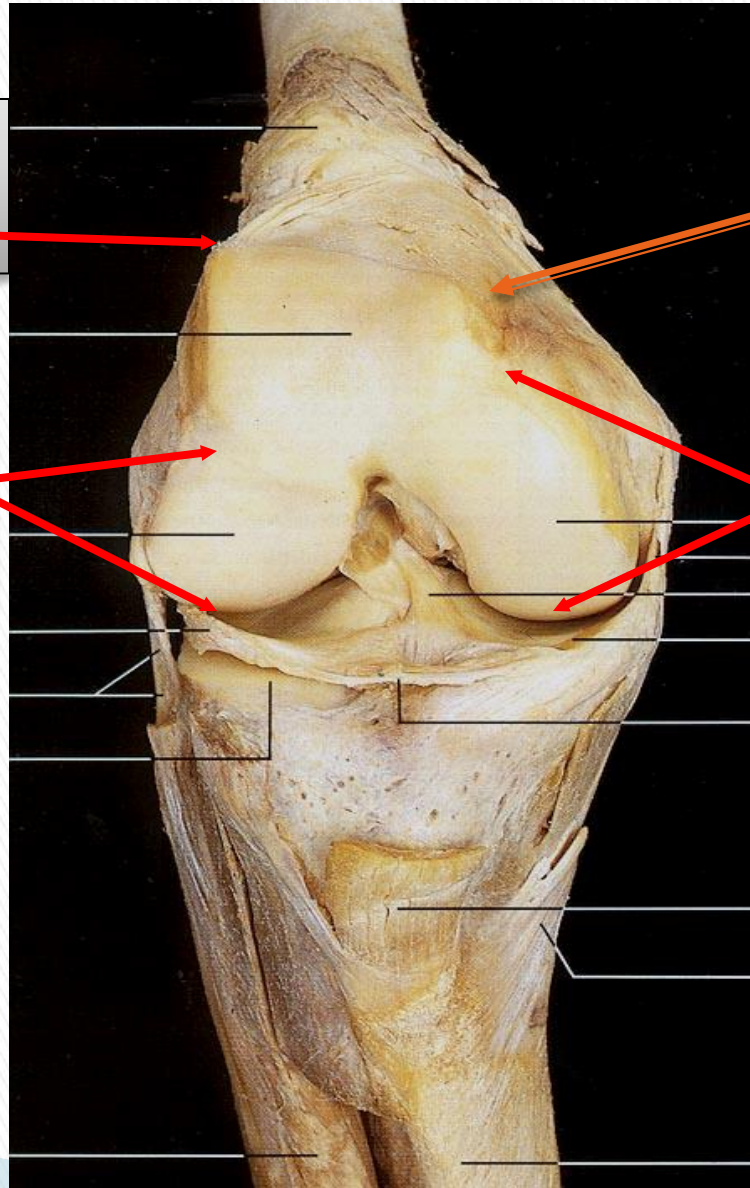
Femoral Articular Surface

Ant lateral femoral condyle

Ant Medial femoral condyle

Lateral Articular Surface

Medial Articular Surface

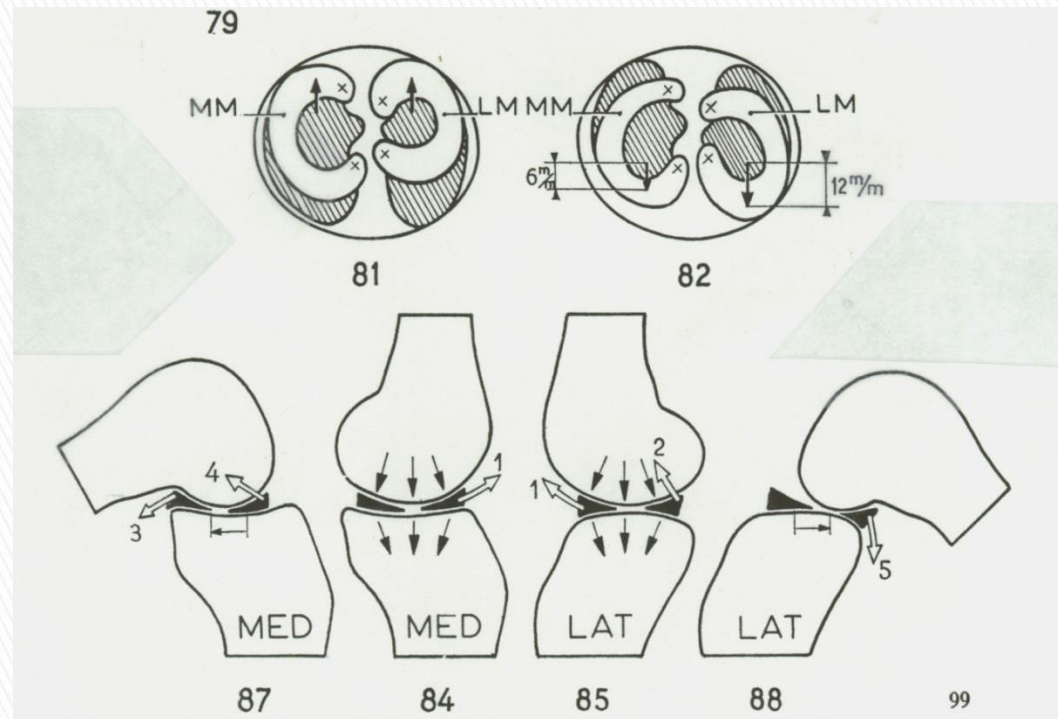


Meniscii

Motion

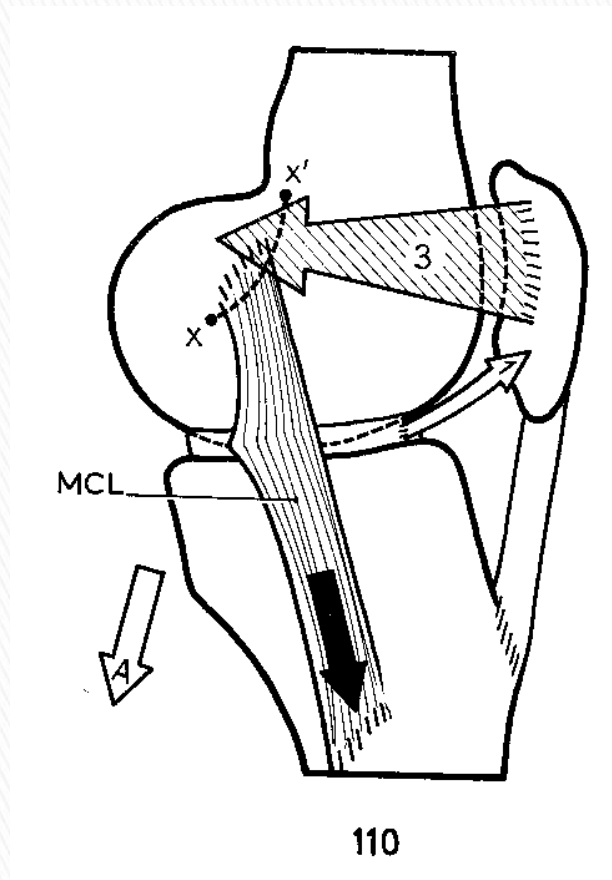
- Glide **anteriorly** with **extension**
- Glide **posteriorly** with **flexion**

- ▶ **Absorb** shock
- ▶ **Distribute** weight bearing(WB)
- ▶ Provide **stability**
- ▶ Aid in **lubrication**



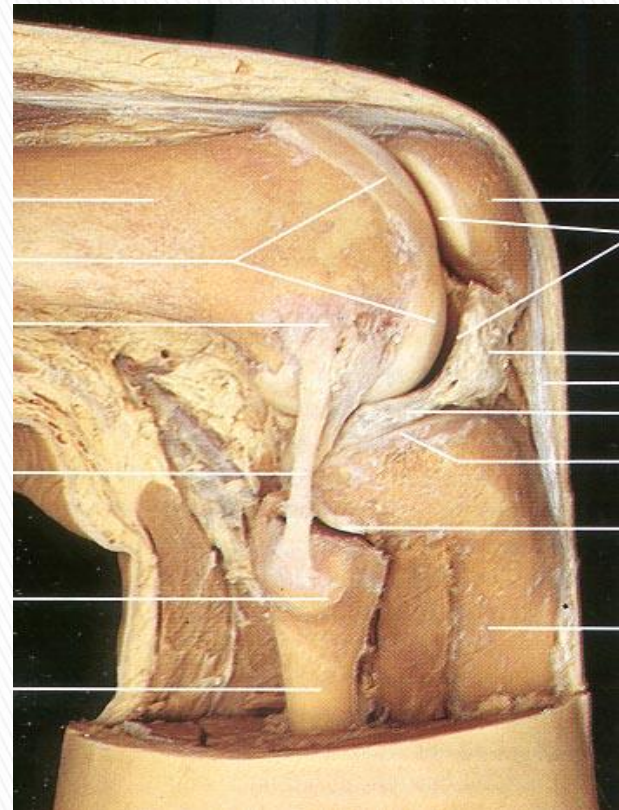
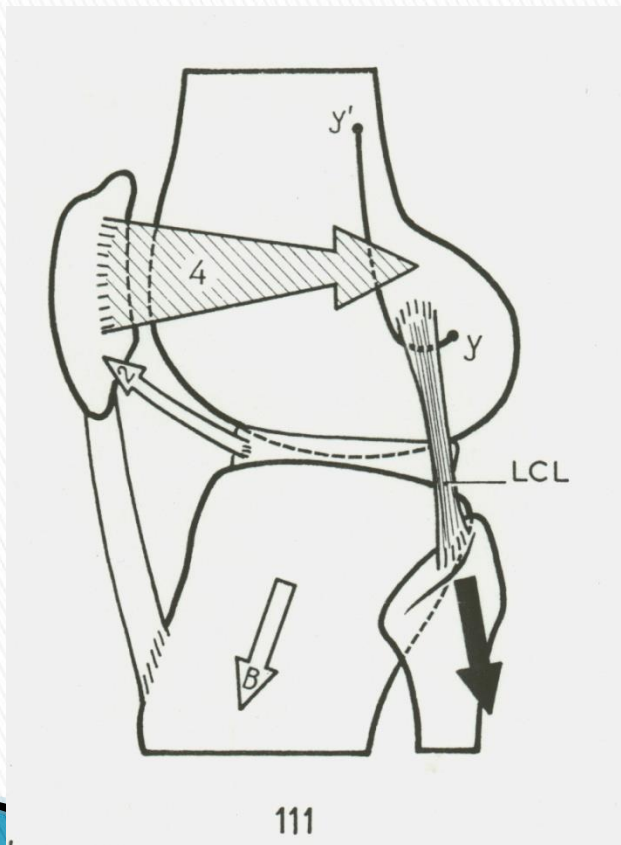
Ligaments

Medial Collateral Ligament

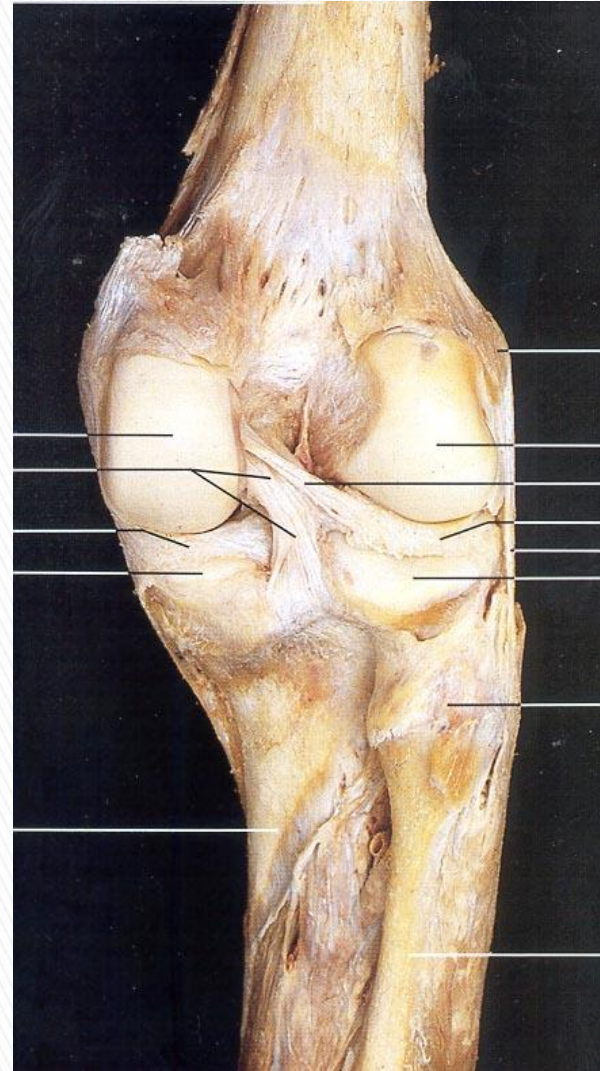
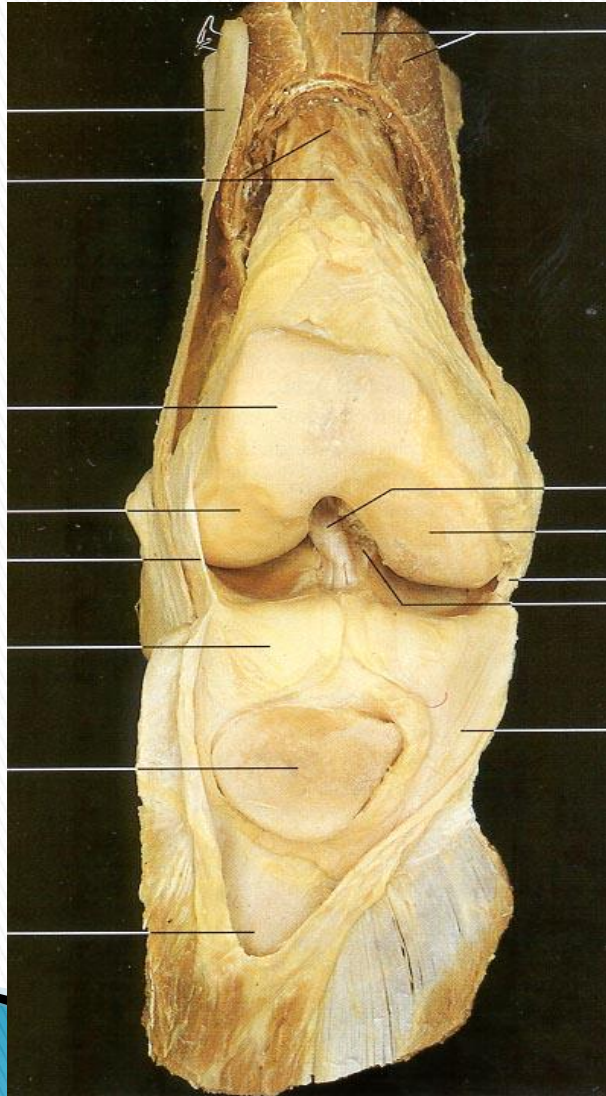


Ligaments

Lateral Collateral Ligament



Ligaments: Cruciate Ligaments



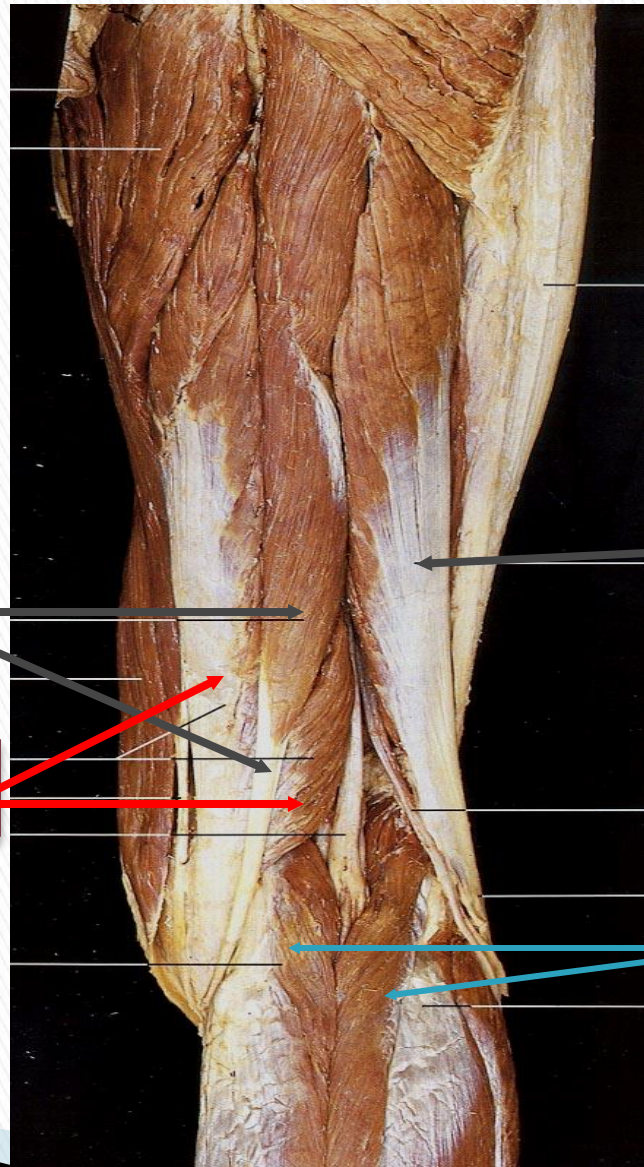
Considerations for Ligament Testing

- ▶ Direction of Force
 - Varus/LCL
 - Valgus/MCL
 - Anterior/ACL
 - Posterior/PCL

Muscle Function: Knee Extensor Mechanism



Muscle Function: Flexors



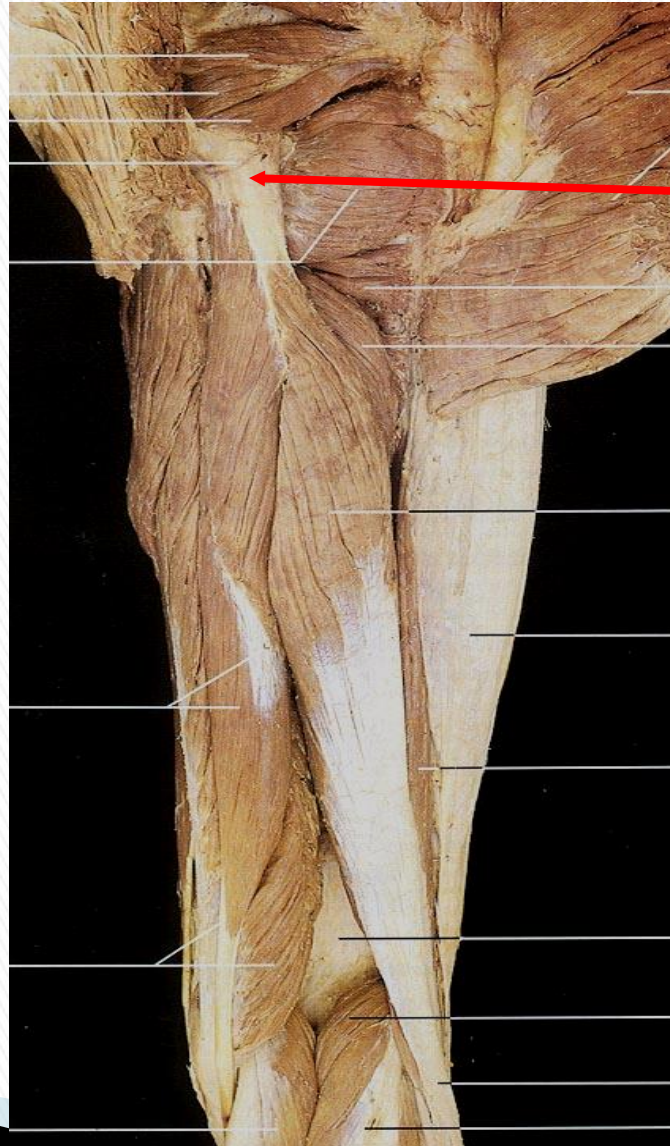
Semitendinosus

Semimembranosus

Biceps Femoris

Gastrocnemius

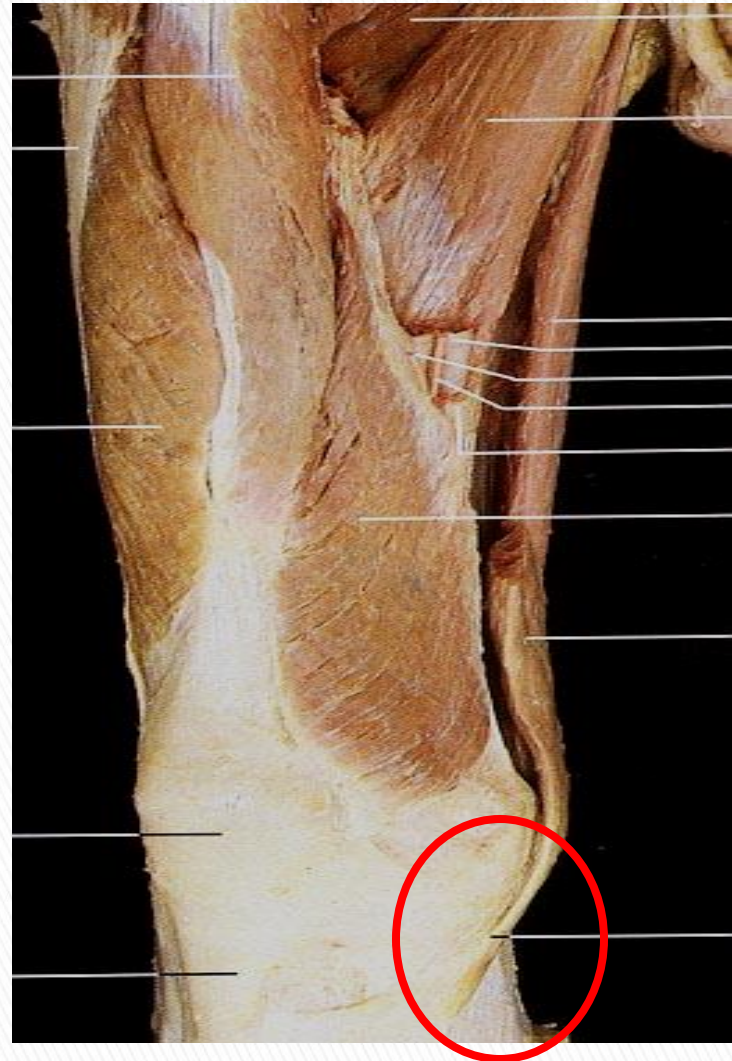
Muscle Function: Flexors



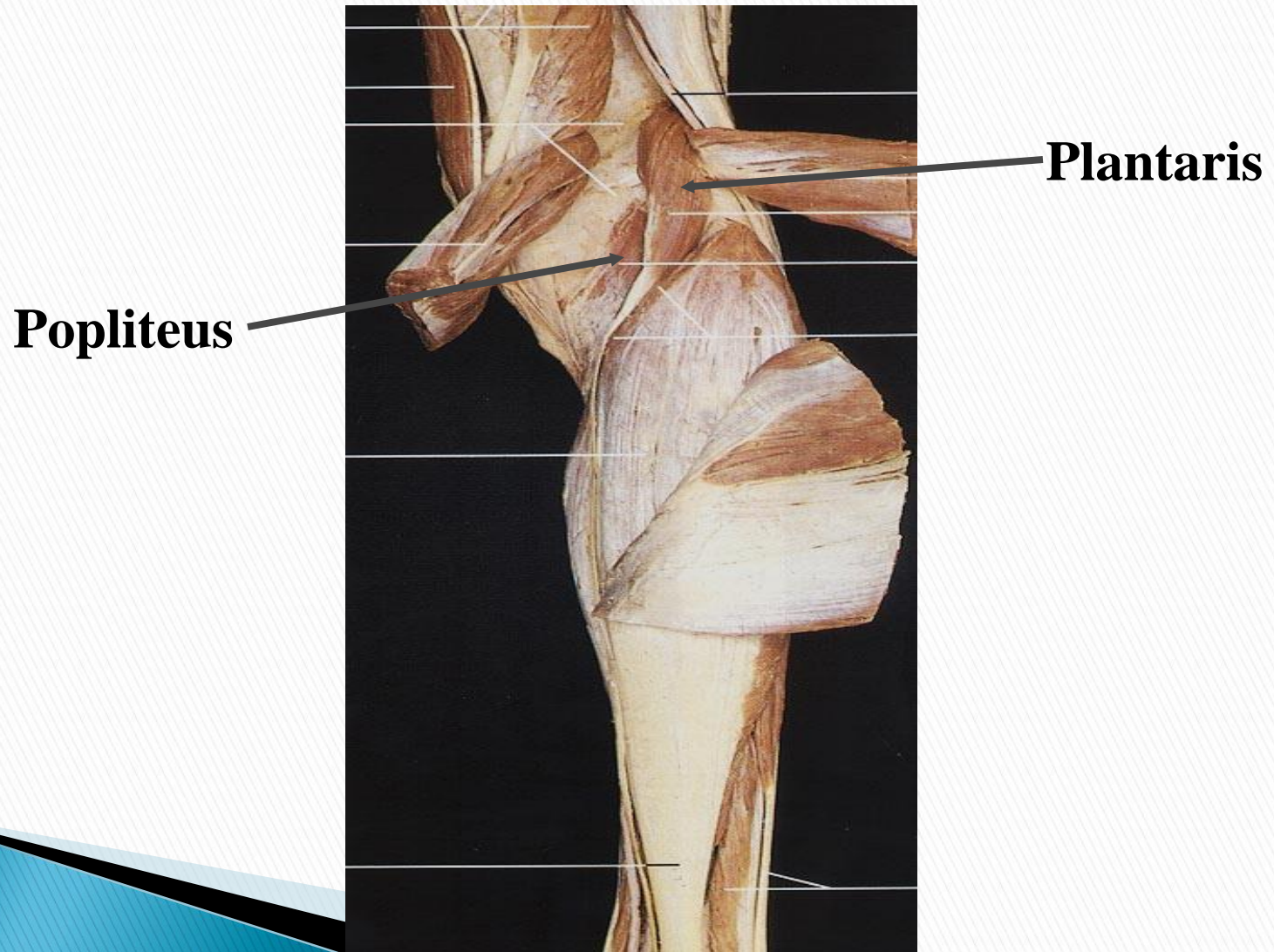
Ischial Insertion
of Hamstrings

Pes Anserine

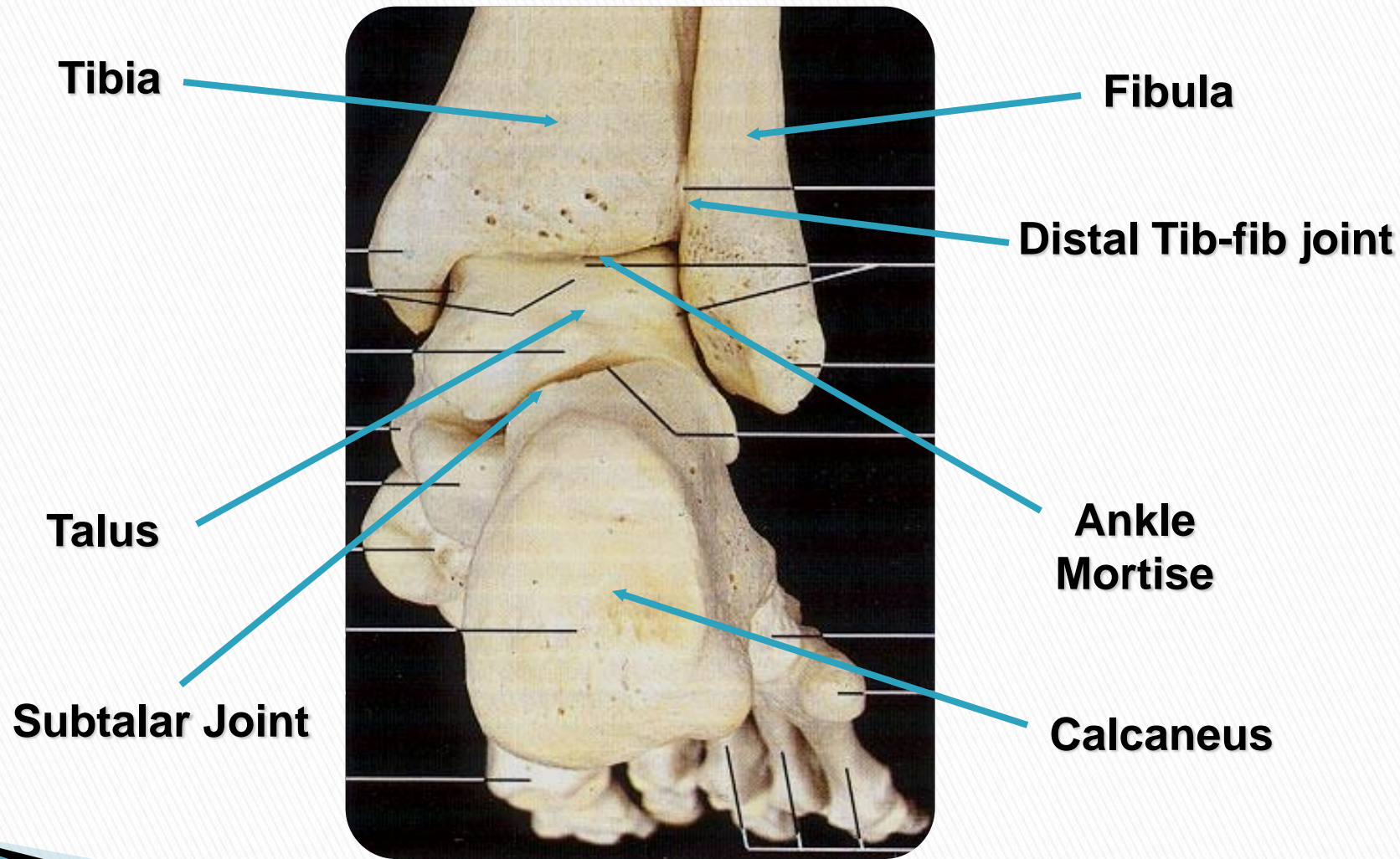
- ▶ Semitendinosus
- ▶ Gracilis
- ▶ Sartorius



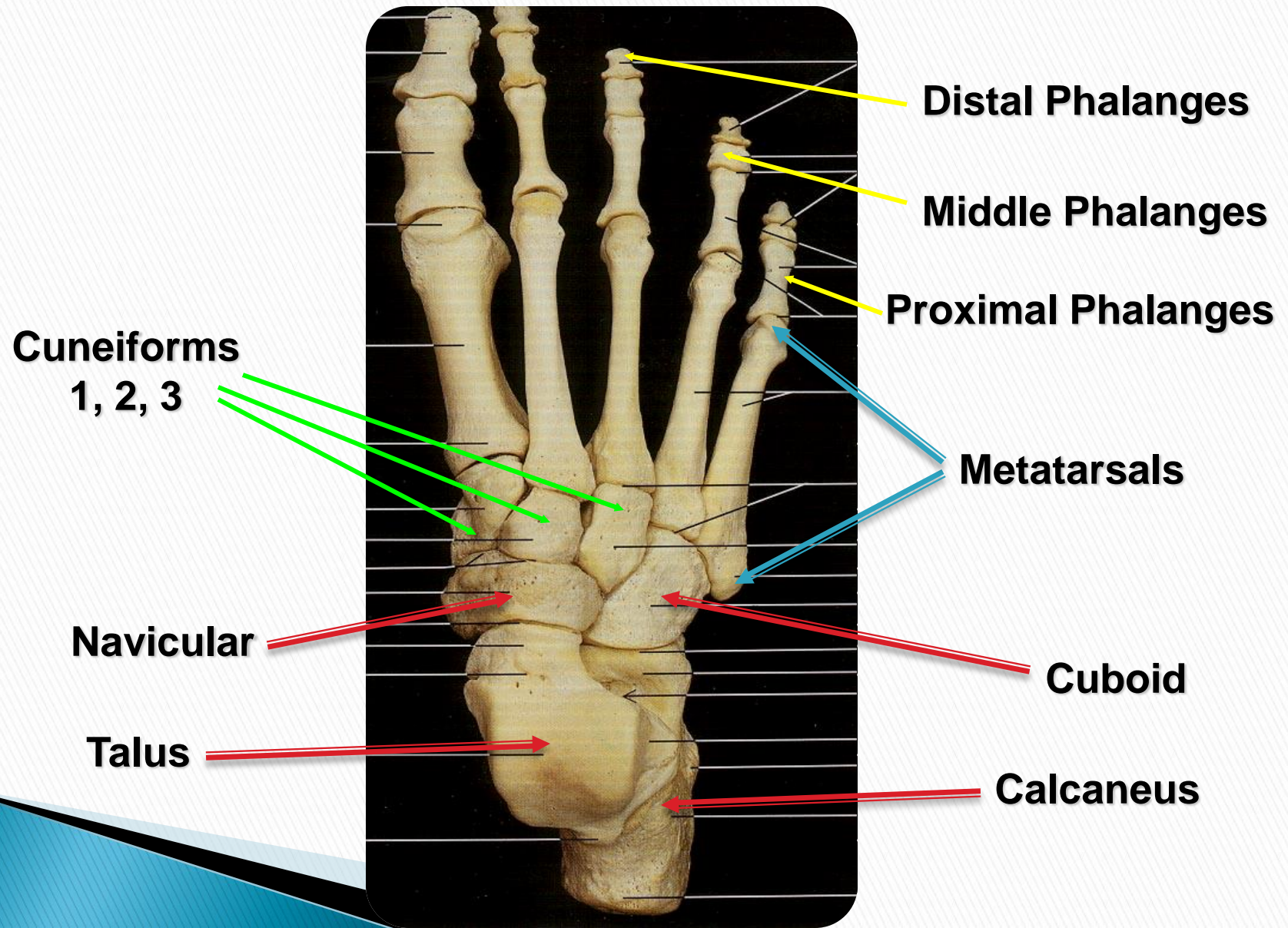
Knee Flexors: Plantaris and Popliteus



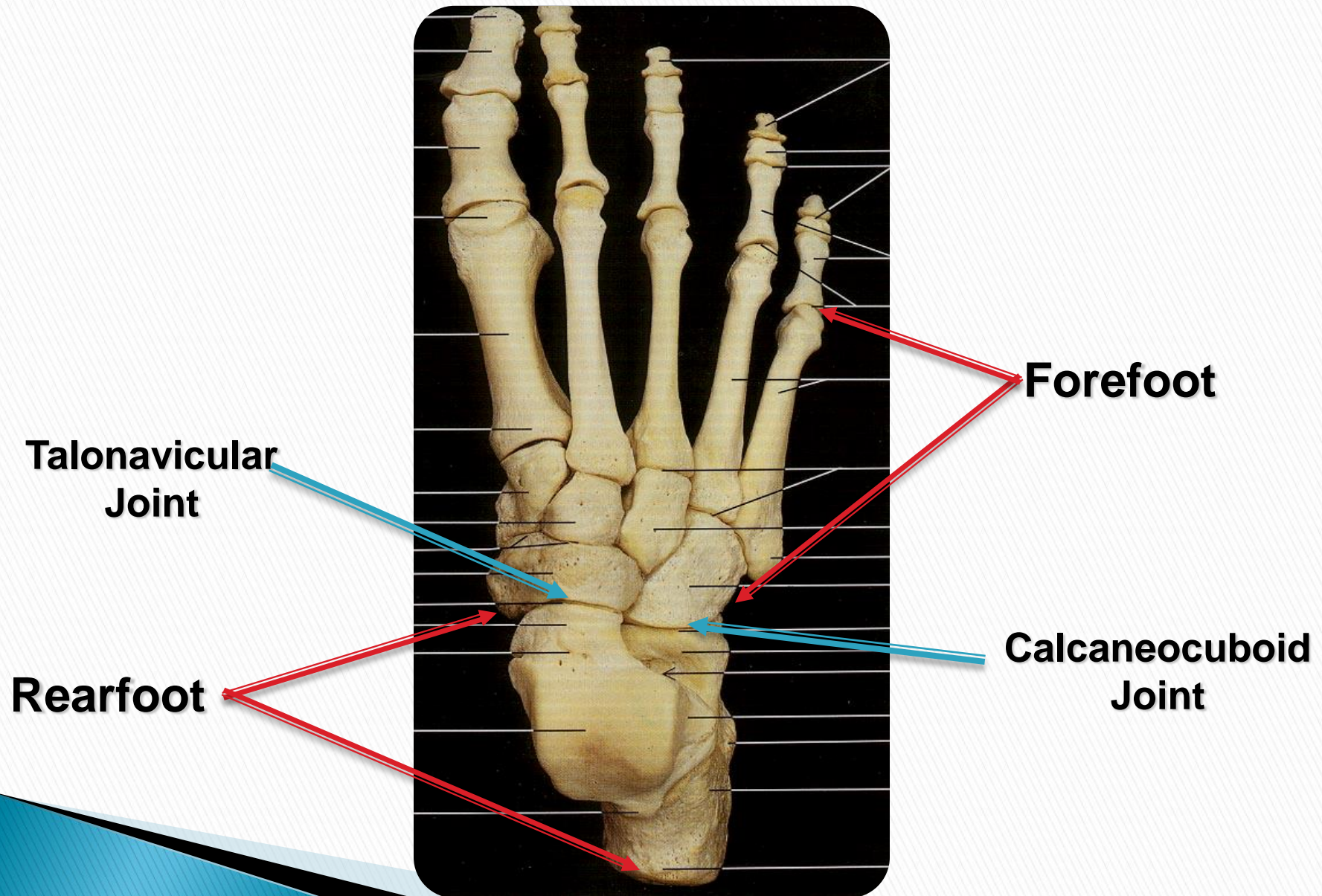
Talocrural and Subtalar Joint Osteology



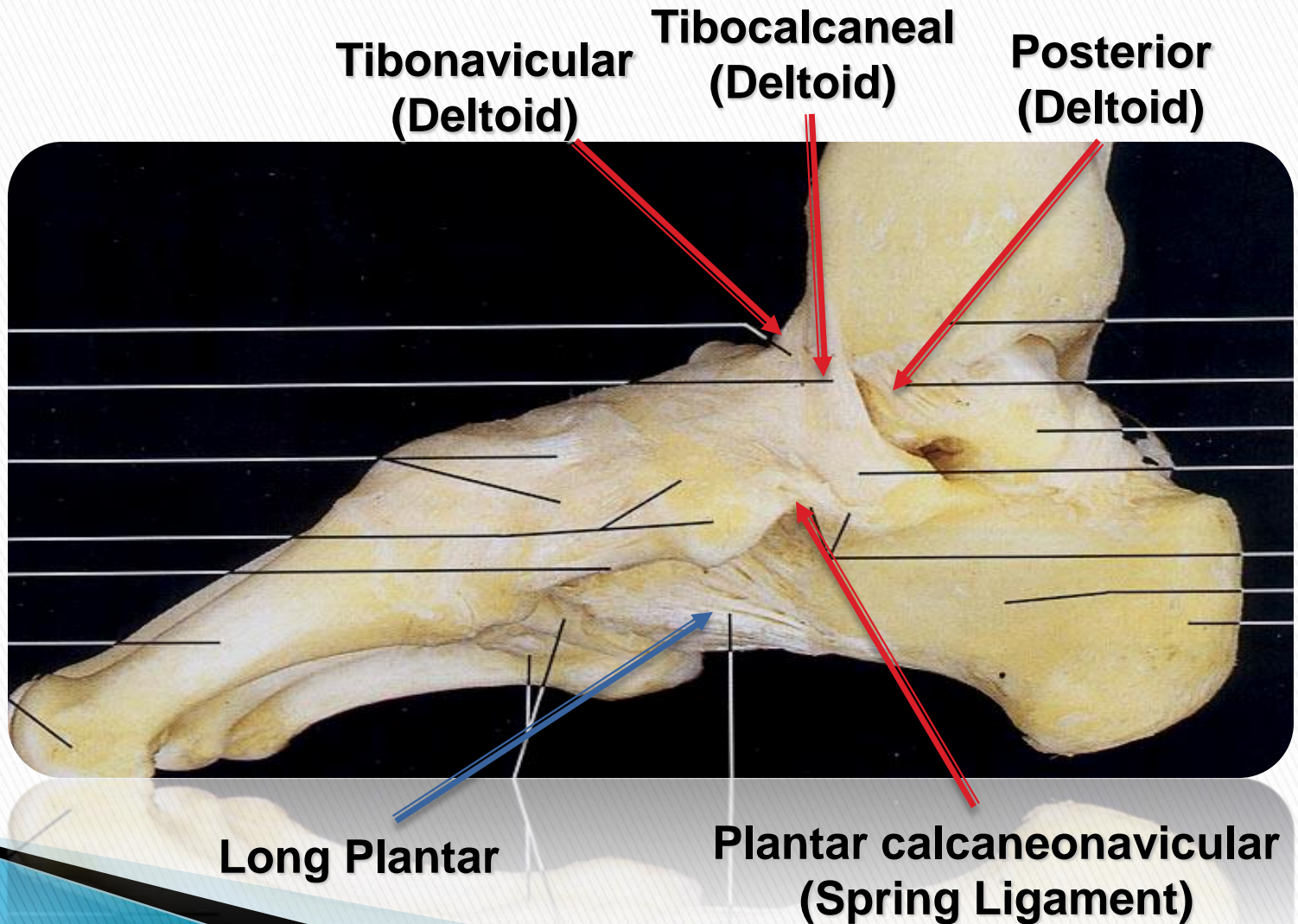
Dorsal View of Foot Bones



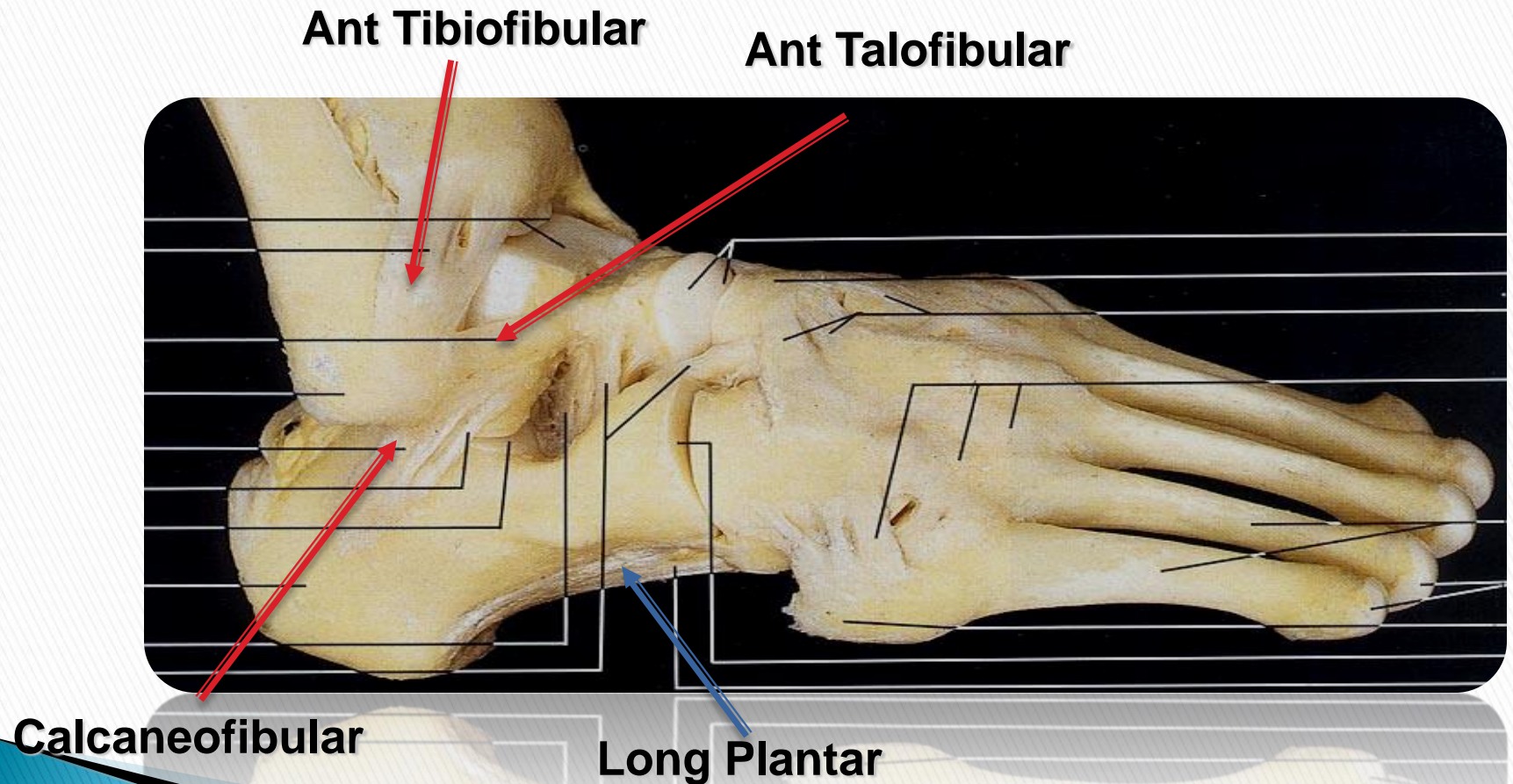
Rearfoot and Forefoot



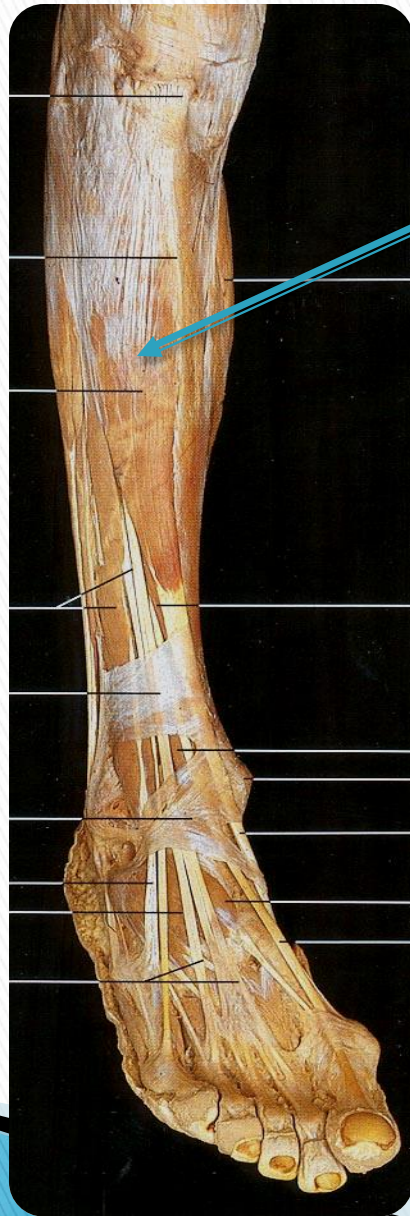
Medial Ligaments



Lateral Ligaments



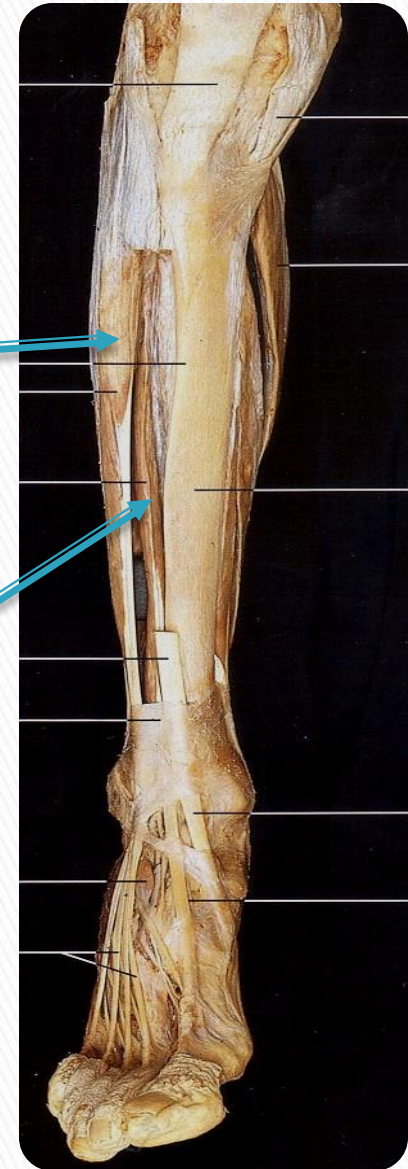
Anterior Compartment Muscles



Tibialis Anterior

**Extensor
Digitorum**

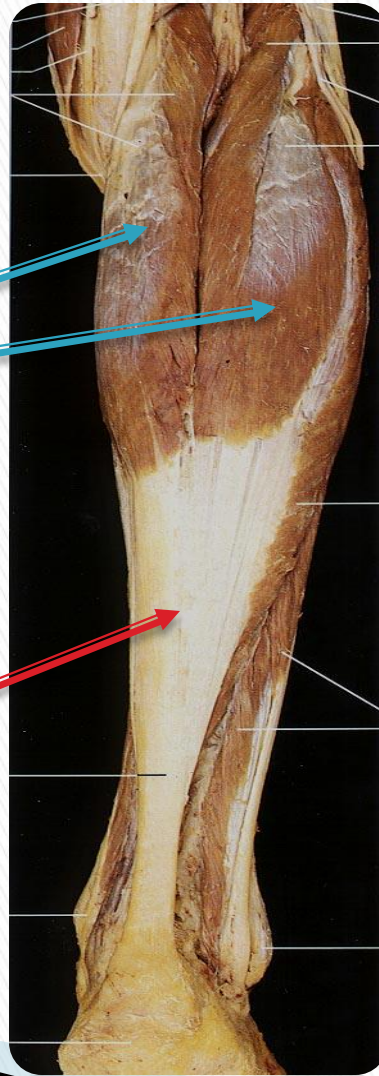
**Extensor
Hallicus
Longus**



Superficial Posterior Compartment Muscles

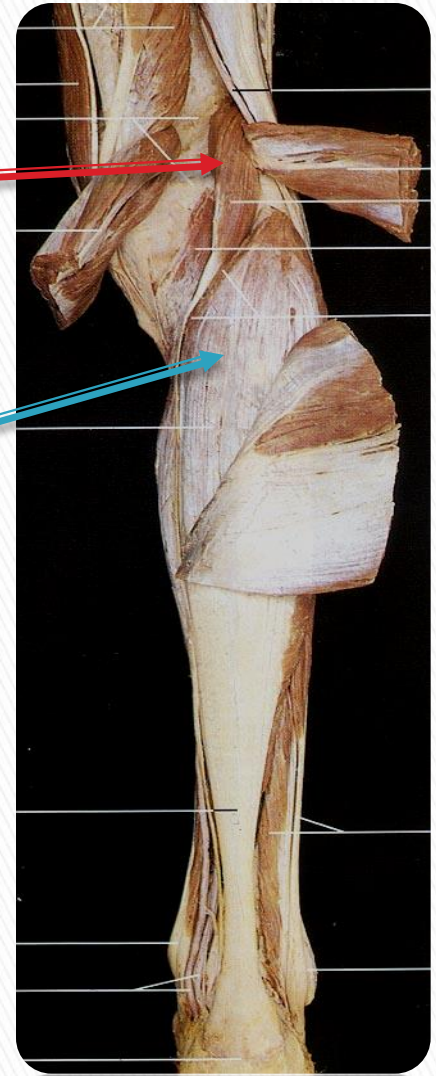
Gastrocnemius
: Medial and
Lateral heads

**Achilles
Tendon**



Plantaris

Soleus



Deep Posterior Compartment Muscles

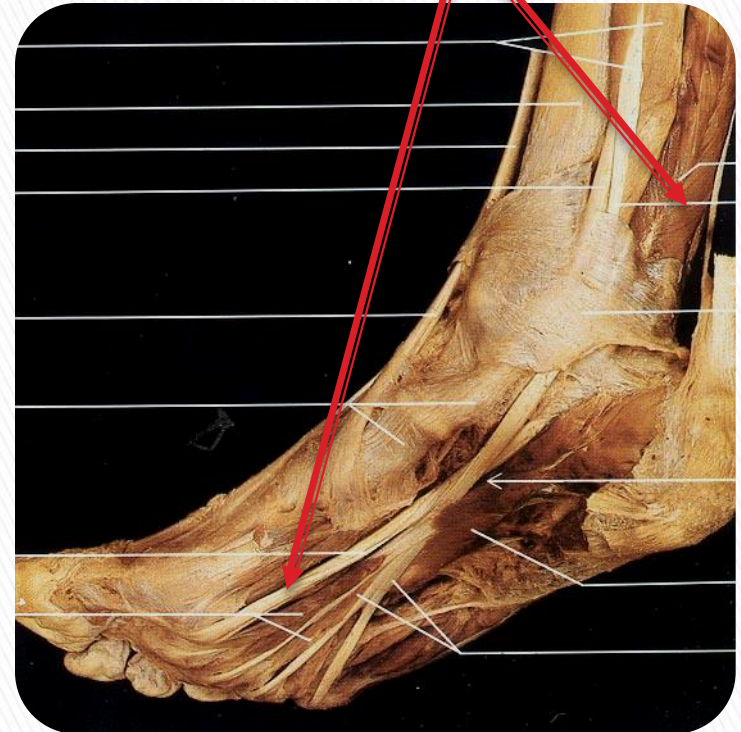
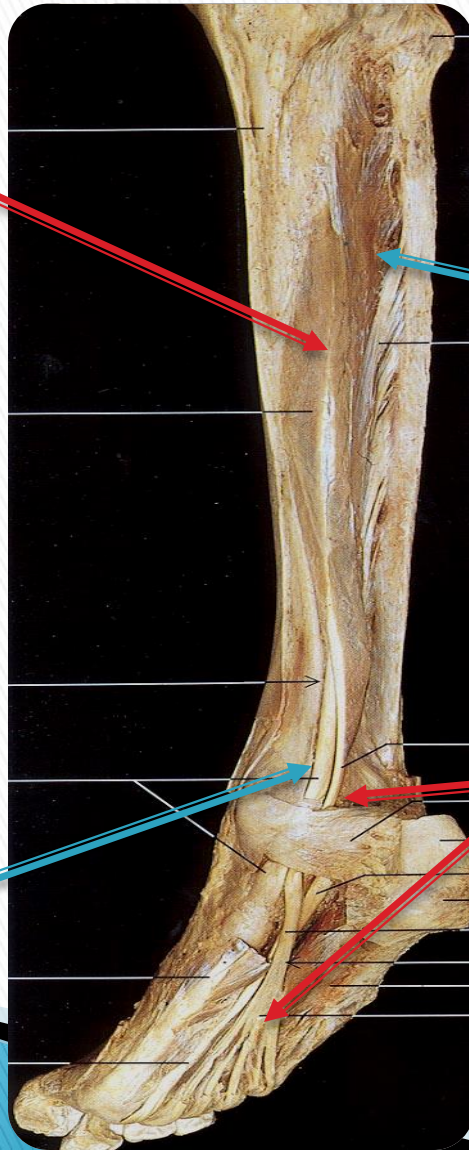
**Flexor
Digitorum**

**Tibialis
Posterior**

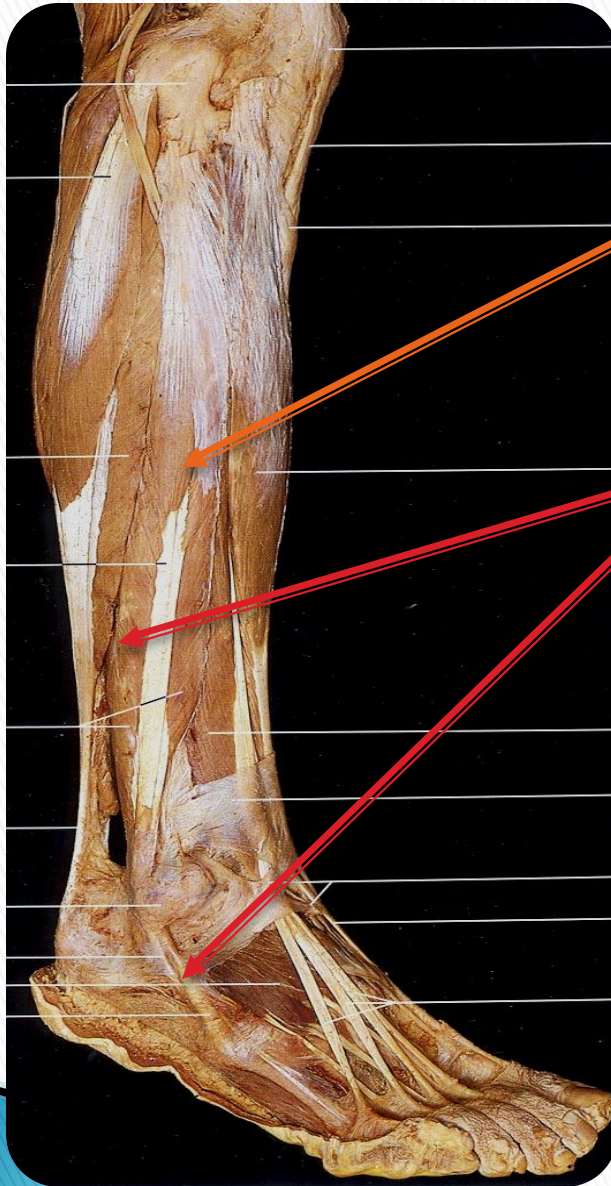
**Tibialis
Posterior
Tendon**

**Flexor
Digitorum
Tendon**

**Flexor
Hallucis
Longus**



Lateral Compartment Muscles



Peroneus L

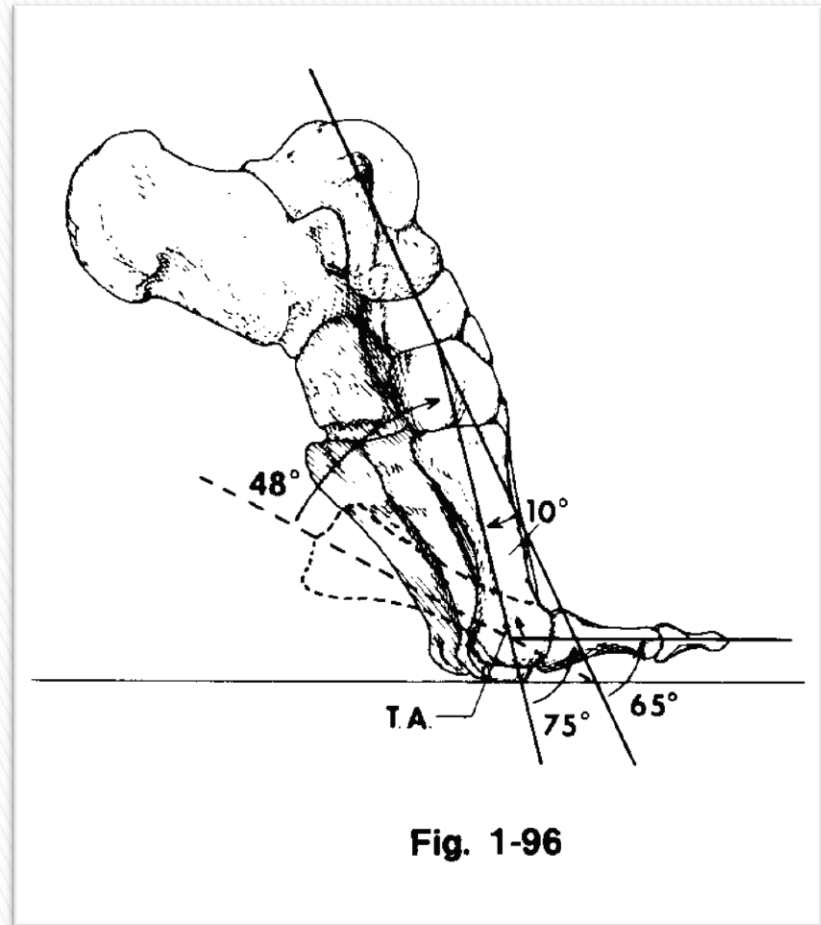
Peroneus B



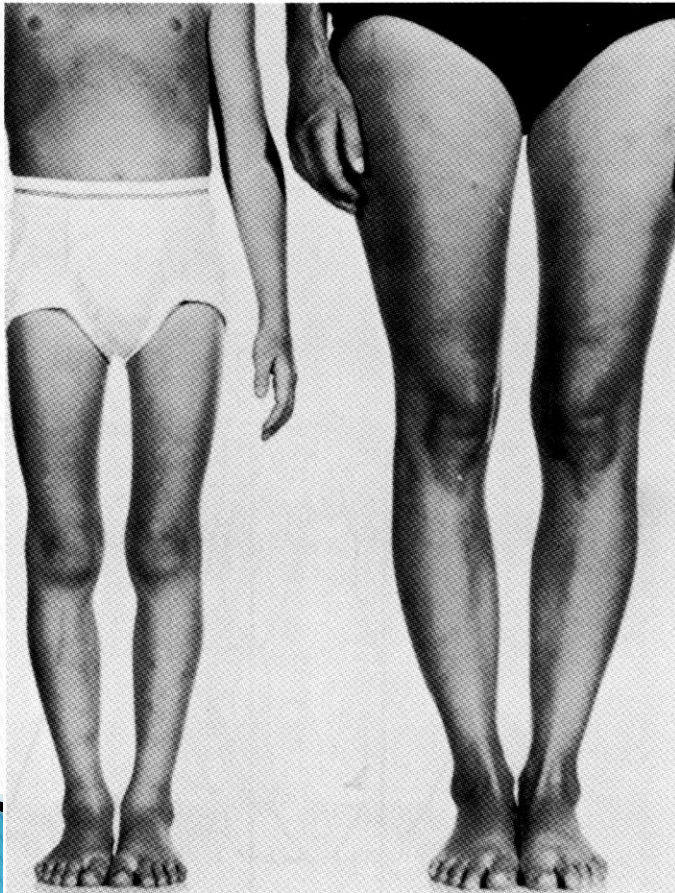
First MTP Motion

Normal gait:

- ▶ Requires **75°** of **1st MTP extension** – occurs as result of:
 - heel lift
 - STJ supination
 - 1st MT shorter than 2nd
 - normal sesamoid function



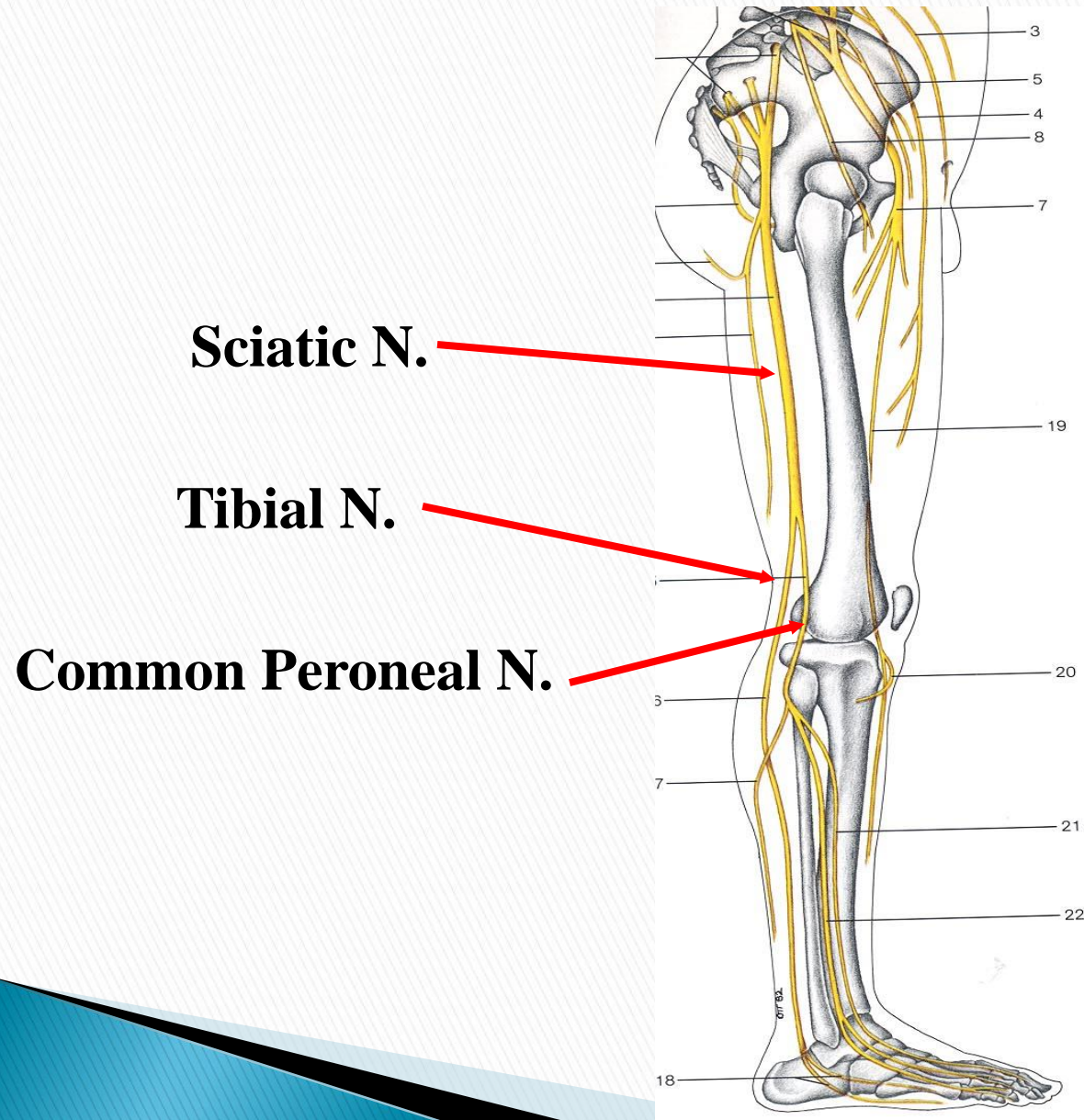
Effect of Foot and Ankle on Other Joints



Consideration of Two – Joint Muscles

- ▶ Rectus Femoris, Hamstrings.
- ▶ Gastrocnemius: Knee and Ankle.

Nerve Supply to the Knee



Testing the Muscles of the Lower Extremity

1. **Knee Flexion and Extension**
2. **Ankle Planter Flexion**

Knee Flexion

1. Prim mover/agonist: Hamstring muscles

	<i>origin</i>	<i>insertion</i>
<i>Biceps femoris</i>	<i>Ischium (tuberosity)</i>	<i>Fibula (head, lateral aspect)</i>
<i>Semitendinosus</i>	<i>Ischial tuberosity</i>	<i>Tibia (proximal shaft), (inferior medial aspect)</i>
<i>Semimembranosus</i>	<i>Ischial tuberosity</i>	<i>Tibia (medial condyle)</i>

2. Synergist / Accessory Muscles:

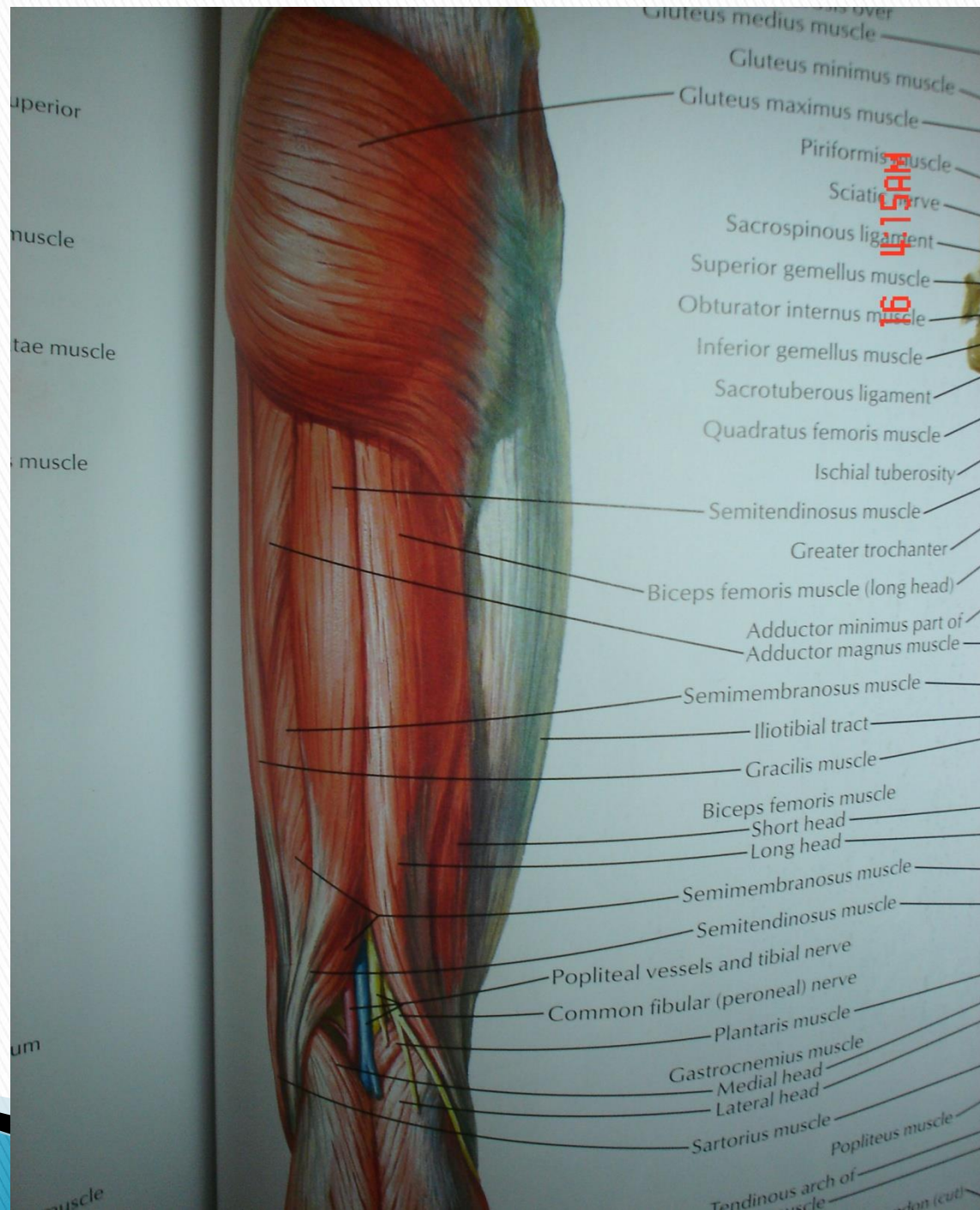
Gracilis, TFL, Sartorius, Popliteus, Gastrocnemius, & Plantaris.

3. Nerve supply:

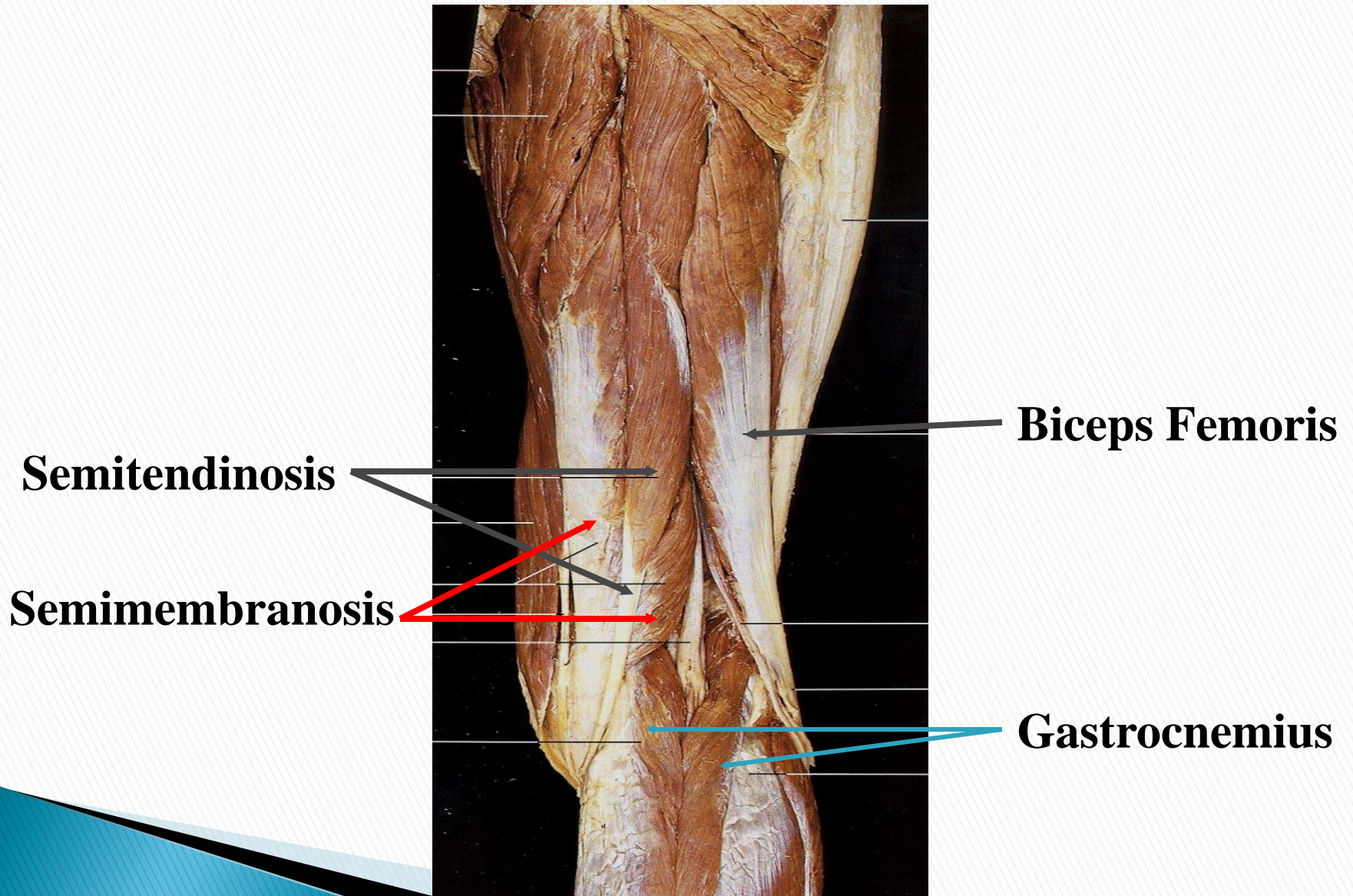
<i>Biceps femoris:</i>	<i>Semitendinosus & Semimembranosus</i>
<i>Sciatica (common peroneal n. – L5–S2)</i>	<i>Sciatica (tibial n. – L5–S2)</i>

4. Range of motion:

from 0 to 135°



Muscle Function: Flexors



Knee Flexion

5. Fixation:

- a. Contraction of iliocostalis lumborum and quadratus lumborum muscles.
- b. Weight of thigh and pelvis.

6. Effect of weakness and contracture:

Effect of **weakness** and contracture:–Video?

weakness of **both** med & lat hamstring causes knee **hyperextension**.

- ❖ weakness of lat. Hamstring causes loss of lateral knee stability.
- ❖ weakness of med. Hamstring decrease medial knee stability.

effect of contracture: knee flexion deformity accompanied by posterior tilting of the pelvis and flattening of the lumbar curve?

Why?

- restriction of knee extension when the hip is flexed or restriction of the hip flexion when the knee is extended. **Why?**

7. Factor Limiting of motion:

- a. Contact or approximation between calf muscles with posterior thigh muscles.
- b. Tension of quadriceps muscles.

8. Substitution:

- 1) hip flexion. 2) sartorius 3) gracilis

Knee Flexion

9. Procedures:

a- patient position (pt):

b- Therapist Position:

inner hand:

Outer hand:

Instruction to patient:

Direction of Resistance :

c- grading system:

Normal(5), Good(4), Fair(3), Poor(2), Trace(1), Zero(0)

make sure patient tolerates maximal resistance pluse
hold 3 sec.

e. Palpation site:

Knee Extension

1. Prim mover /agonist: Quadriceps Femoris Ms.

Origin

Insertion

Rectus femoris

Ilium (AIIIS)

Patella (base by quad. Tendon)

Vastus intermedius

Femur (upper 2/3 lat & ant aspect)

Patella (base by
quad.tendon)

Vastus lateralis

Femur linea aspera (lat lip)

Patella (base by quad. Tendon)

Vastus medialis

Femur linea aspera (med lip)

Patella (medial border)

2. Synergist / Accessory Muscles:

TFL.

3. Nerve supply:

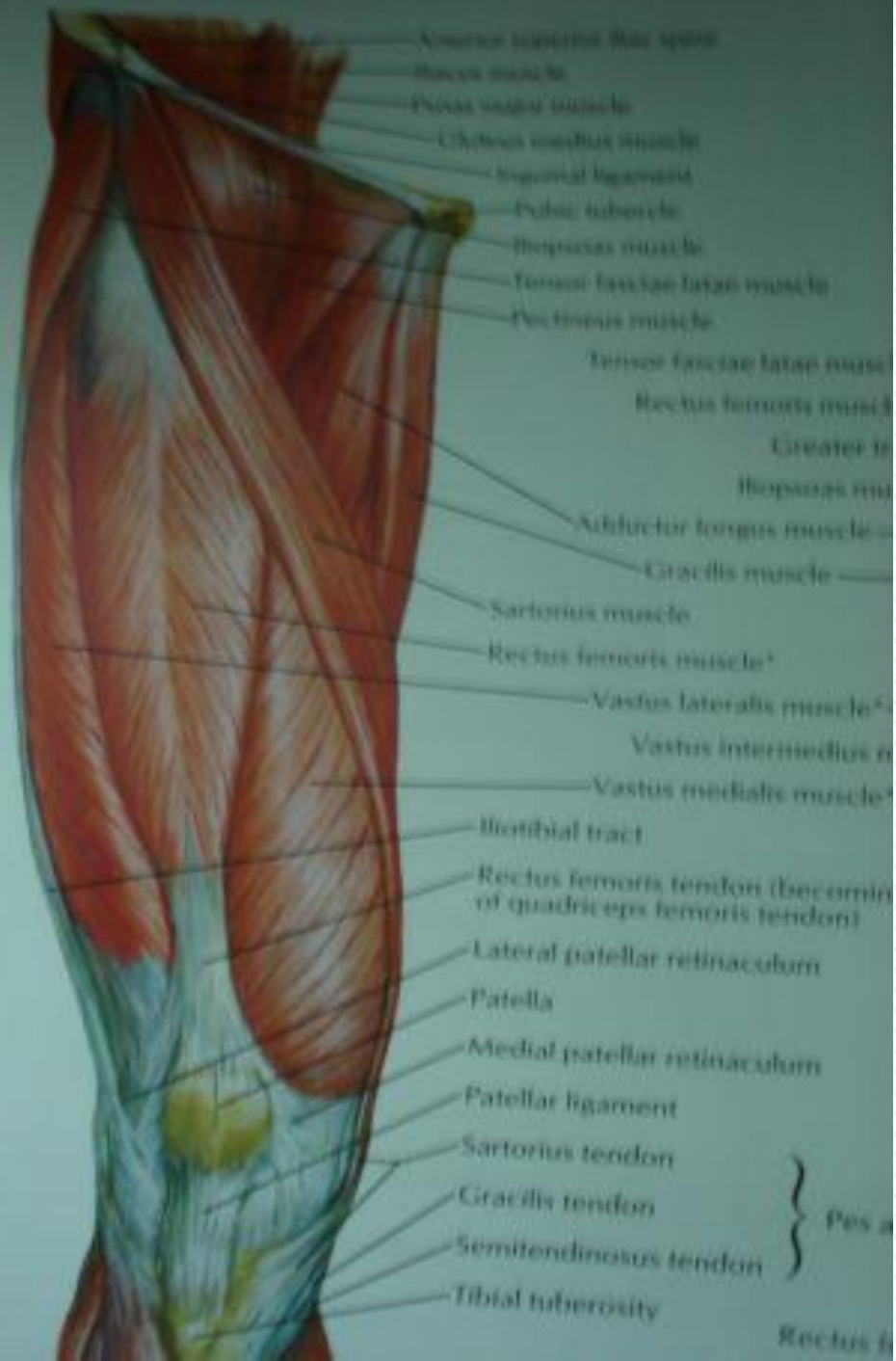
Quadriceps

Femoral n.(L2–L4)

4. Range of motion:

from 135° to 0°

2 6:23PM



Muscle Function: Knee Extensor Mechanism



Knee Extension

5. *Fixation:*

- a. Contraction of antero-lateral abdominal muscles to fix origin of rectus femoris.
- b. Weight of thigh and pelvis.

6. *Effect of weakness and contracture:*

Effect of **weakness** and contracture:–Video?

Difficulty in **getting up & down** from **sitting** position as well as on going up & down stairs.

– knee hyperextension.

effect of shortness: shortness of the Rectus femoris will result in a restriction of the knee flexion when the hip is extended or a restriction of the hip extension when the knee is flexed.

effect of contracture: restriction of knee flexion.

7. *Factor Limiting of motion:*

- a. Tension of oblique popliteal, cruciate and collateral ligaments of knee joint.
- b. Tension of knee flexor muscles.

8. *Substitution:*

when pt in side-lying (grade 2) pt may use hip internal rotators.

Knee Extension

9. *Procedures:*

a- patient position (pt):

b- Therapist Position:

inner hand:

Outer hand:

Instruction to patient:

Direction of Resistance :

c- **grading system:**

Normal(5), Good(4), Fair(3), Poor(2), Trace(1), Zero(0)

make sure patient tolerates maximal resistance plus
hold 3 sec.

e. **Palpation site:**

Ankle Planter Flexion

1. *Prim mover /agonist:*

Origin

Insertion

Gastrocnemius

Medial head	Femur (medial condyle)	Tendo Calcaneus–calcaneu (posterior)
Lateral head	Femur (lateral condyle)	Tendo Calcaneus
Soleus	Fibula (posterior)	Tendo Calcaneus–calcaneus (posterior)

2. *Synergist / Accessory Muscles:*

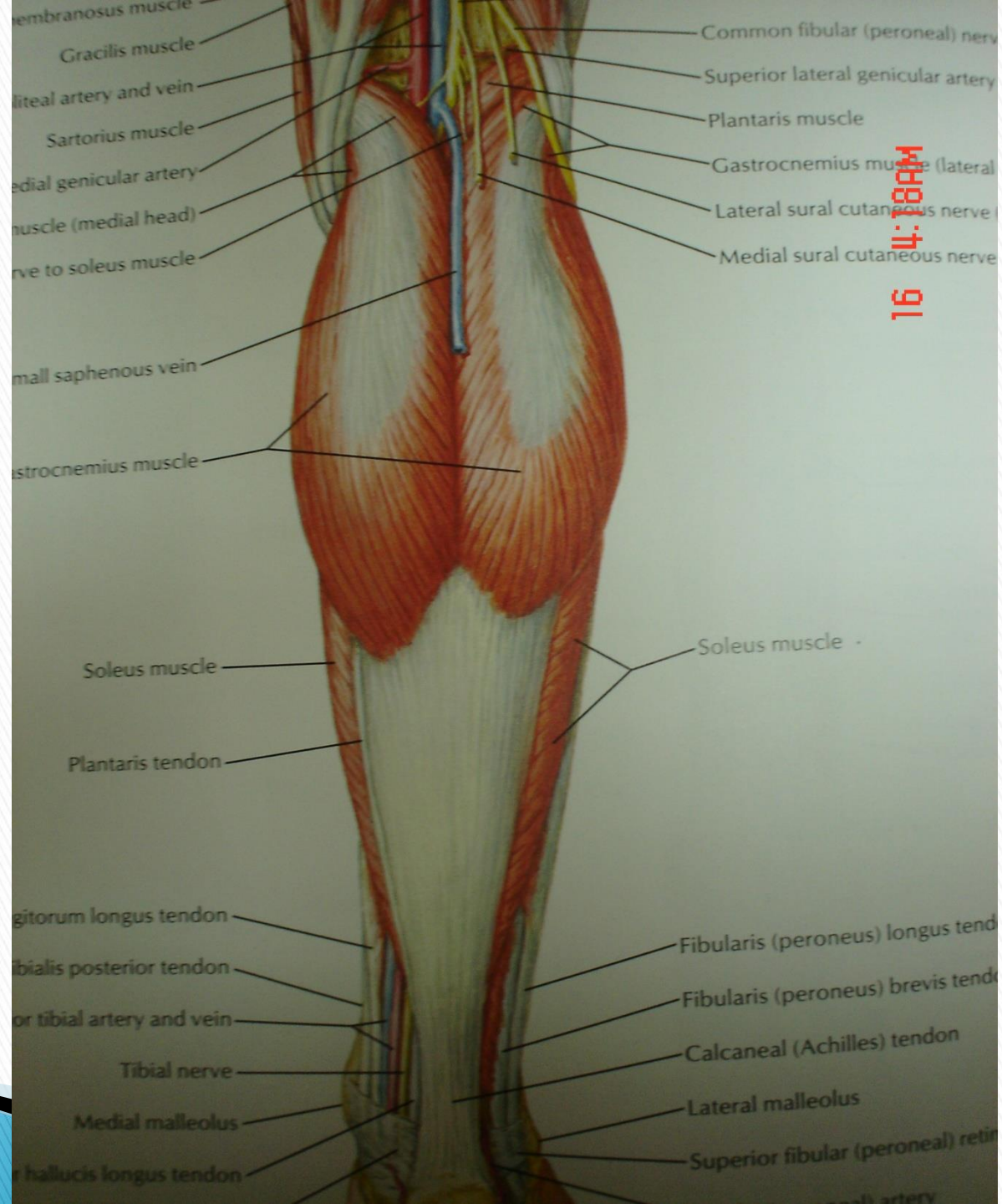
Tibialis posterior, plantaris, peroneus longus & brevis, Flexor digitorum & hallucis longus.

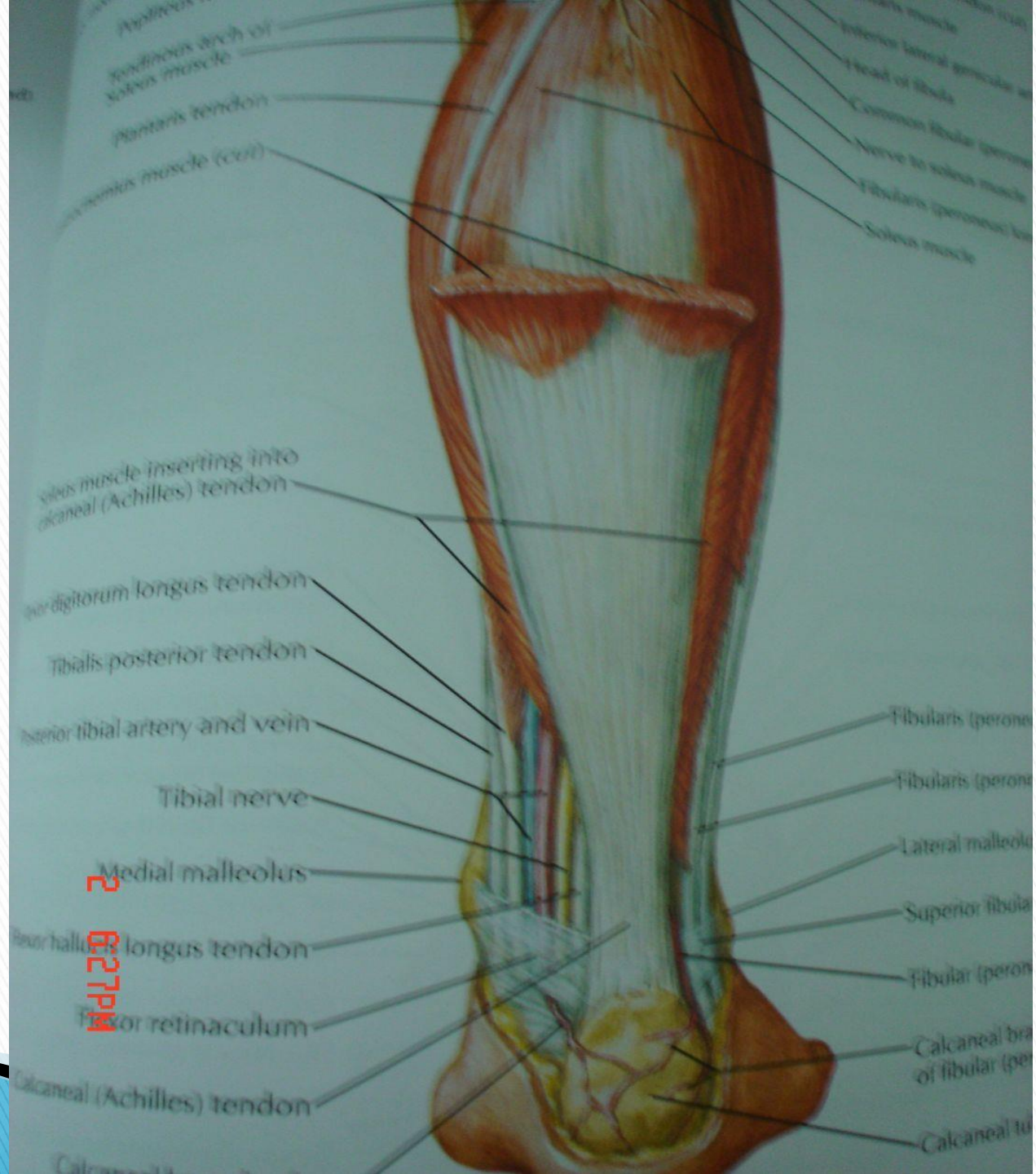
3. *Nerve supply:*

Gastrocnemius & Soleus: Tibia n.

4. *Range of motion:*

from 0° to 45°





Ankle Planter Flexion

5. *Fixation:*

By Weight of thigh.

6. *Effect of weakness and contracture:*

Effect of weakness and contracture:–Video?

Result in an hyperextension of the knee(why?) as well as in a non-weight bearing position as in standing. During walking the inability to rise on toes.

effect of contracture: result in an equinus position of the foot and flexion of the knee.

– also a restriction of the ankle dorsiflexion when the knee is extended and a restriction of the knee extension when the ankle is dorsiflexed.

7. *Factor Limiting of motion:*

- a. Tension of anterior talofibular ligament and anterior fibers of deltoid ligaments.
- b. Tension of dorsiflexor muscles.
- c. Contact of posterior portion of talus with tibia.

8. *Substitution:*

by

- 1) Flexor hallucis longus and flexor digitorum longus
- 2) Peroneus longus and brevis.
- 2) Tibialis posterior.

Ankle Planter Flexion

9. *Procedures:*

WB test and Non WB test

a- patient position (pt):

b- Therapist Position:

inner hand:

Outer hand:

Direction of Resistance :

Instruction to patient:

c- **grading system:**

Normal(5), Good(4), Fair(3), Poor(2), Trace(1), Zero(0)

make sure patient tolerates maximal resistance plus hold
3 sec.

e. Palpation site:

Thank You