Lumbosacral plexus & nerves of the lower limb

Click to add text

Dr Ashraf Sadek *PhD, MD, MRCPCH*

Assistant Professor of anatomy and embryology

objects

1-Make a list of contributing spinal nerves to the lumbar plexus.

2-Discuss the arrangement of the plexus.

3-Describe the location of this plexus and its relation to the psoas muscle.

4-List the terminal branches and follow up each branch to its final destination.

5-Make a list of contributing spinal nerves to the sacral plexus.

6-Discuss the arrangement of this plexus.

7-Describe the location of this plexus.

8-List its terminal branches and follow up each branch to its target organs.

9-Make a list of nerves of the lower limb including the Gluteal region.

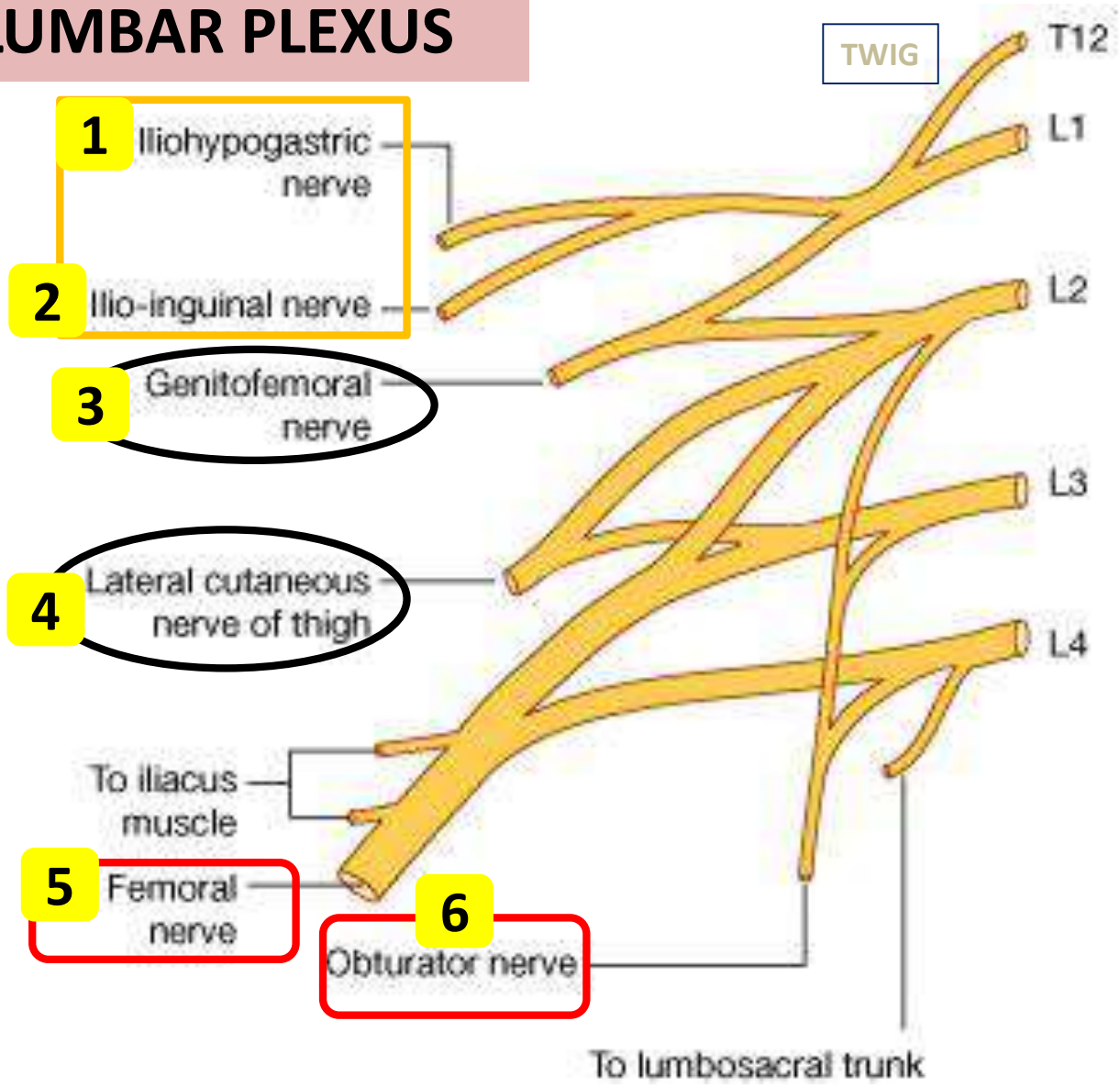
10-Follow up each nerve down to its target joints (cont) myotomes and dermatomes.d

LUMBAR PLEXUS

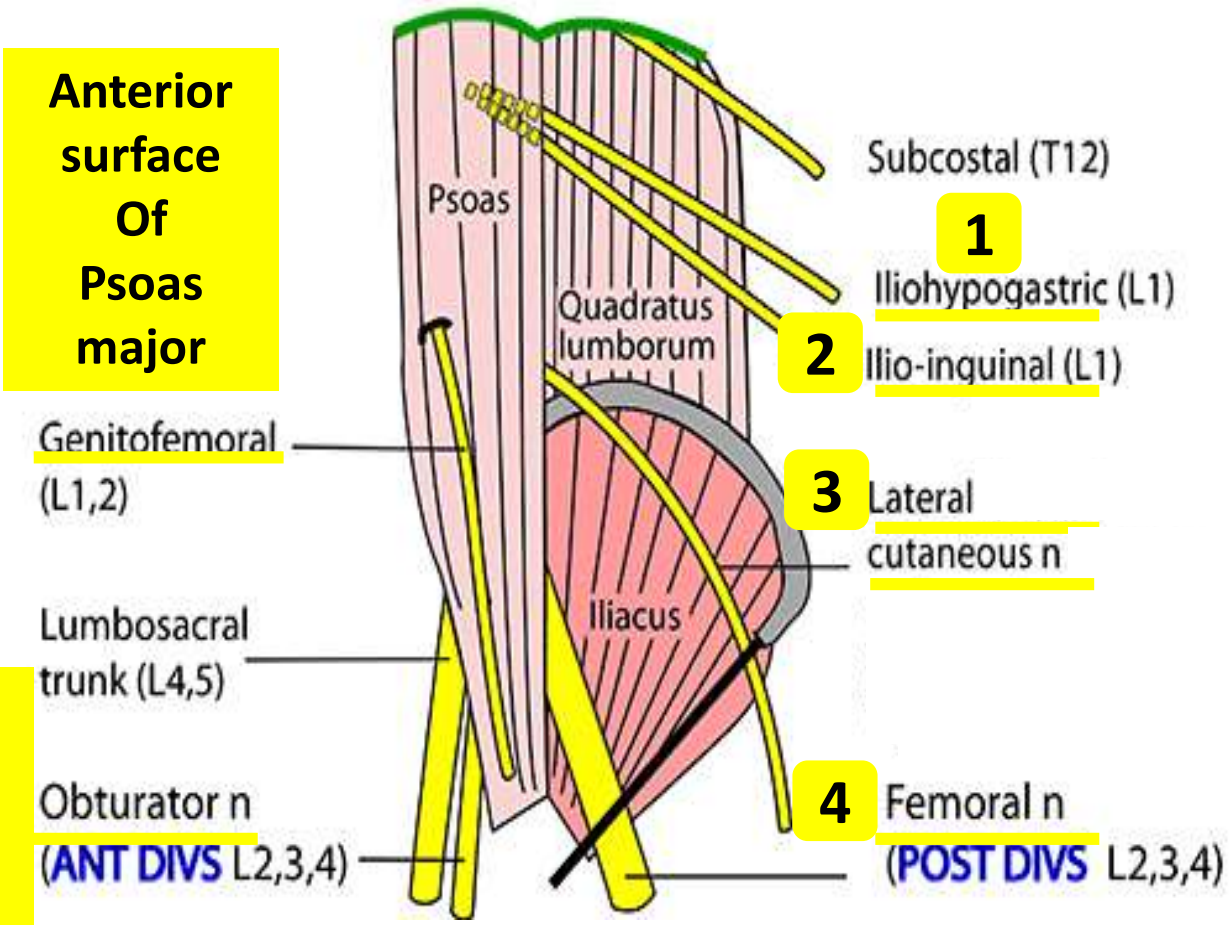
Formation:
WITHIN THE SUBSTANCE OF PSOAS MAJOR MUSCLE

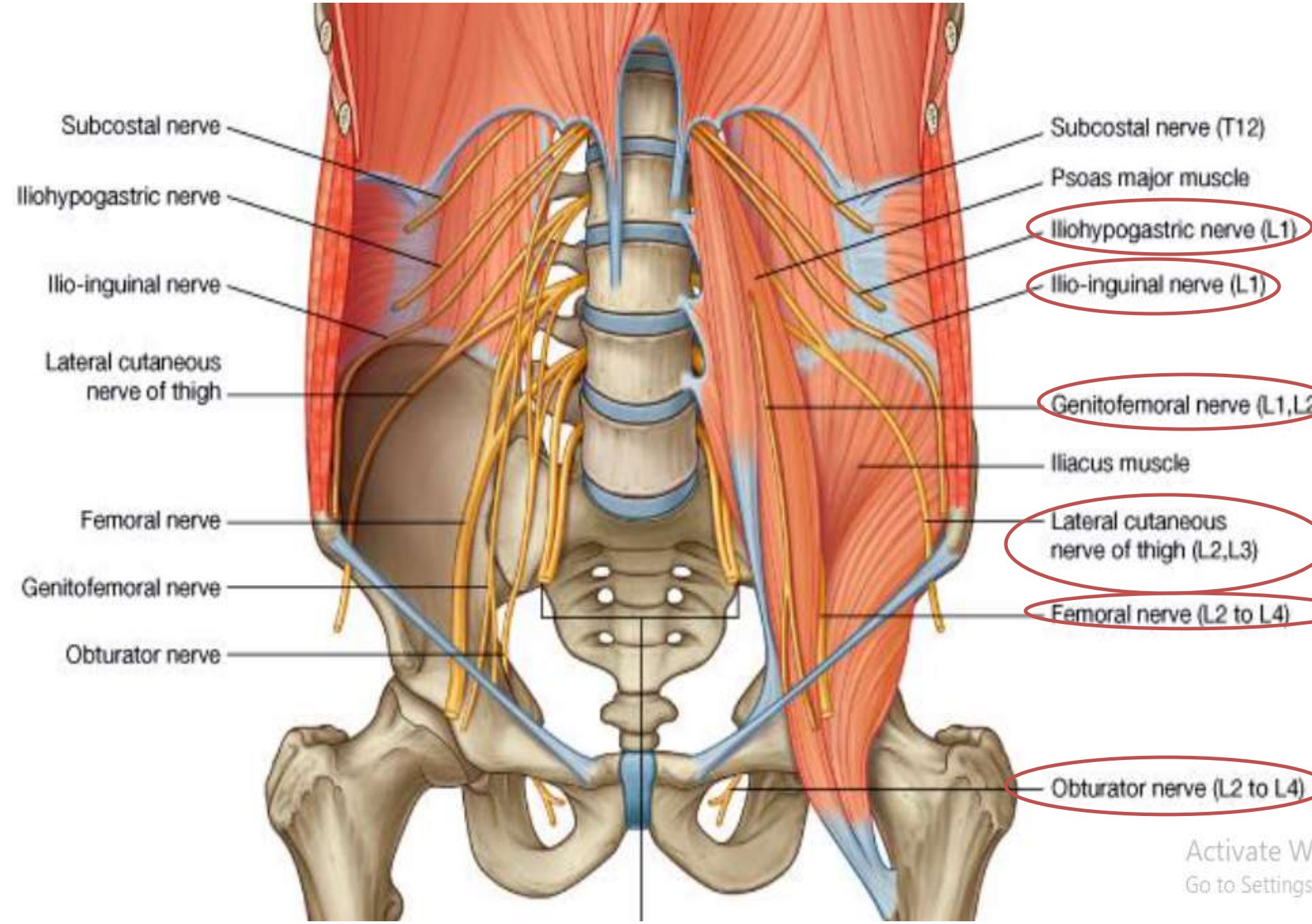
From ventral rami of upper 3 lumbar nerves & upper part of L4

Branches (6)



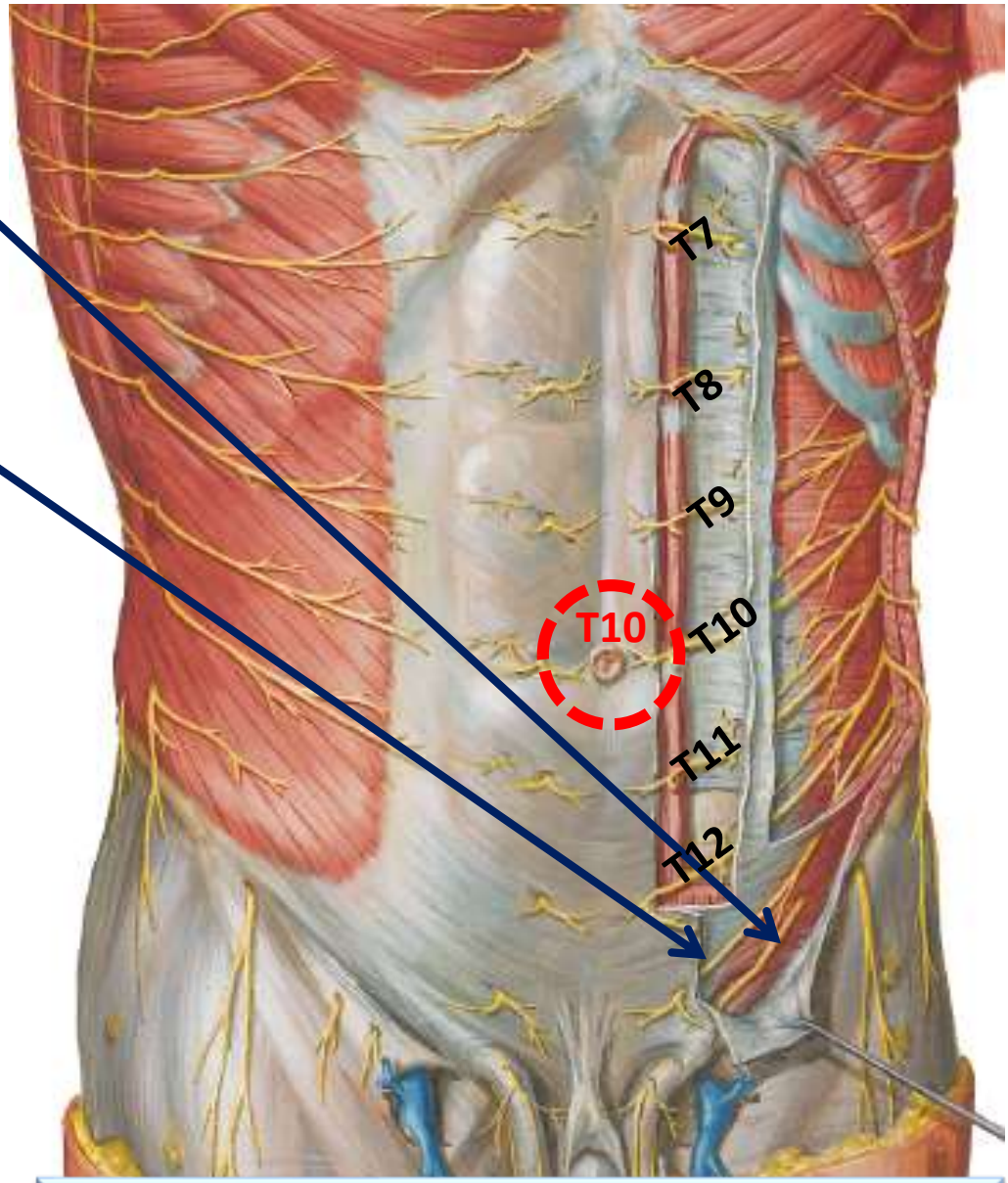
Arrangement of the lumbar plexus branches





:**iliohypogastric & ilioinguinal**.

- **supply the lower part of external & internal obliques and transverse abdominus**



Skin around umbilicus is supplied by T10

- **iliohypogastric & ilioinguinal.**
- **These 2 nerves have 2 special features:**

They leave the neurovascular plane & run between external & internal obliques

They don’t enter the rectus sheath.

2. *Genito-femoral nerve (L1,2):*

a) *The genital branch* enters the deep inguinal ring to supply the cremaster muscle and the skin of the scrotum in male or skin of the mons pubis and labium majus in female.

b) *The femoral branch* passes behind the inguinal ligament into the thigh to supply the skin over the upper part of the femoral triangle

3. *Lateral cutaneous nerve of the thigh (L2,3):*

- It emerges from the *lateral border* of the psoas major.
- It supplies skin of thigh.

4. *Obturator nerve (L2,3,4):*

- It emerges from the *medial* border of the psoas major at the pelvic brim.
- It passes into the obturator canal and divides into anterior and posterior branches which supply the adductor group of muscles in the thigh.

5. Femoral nerve (L2,3,4):

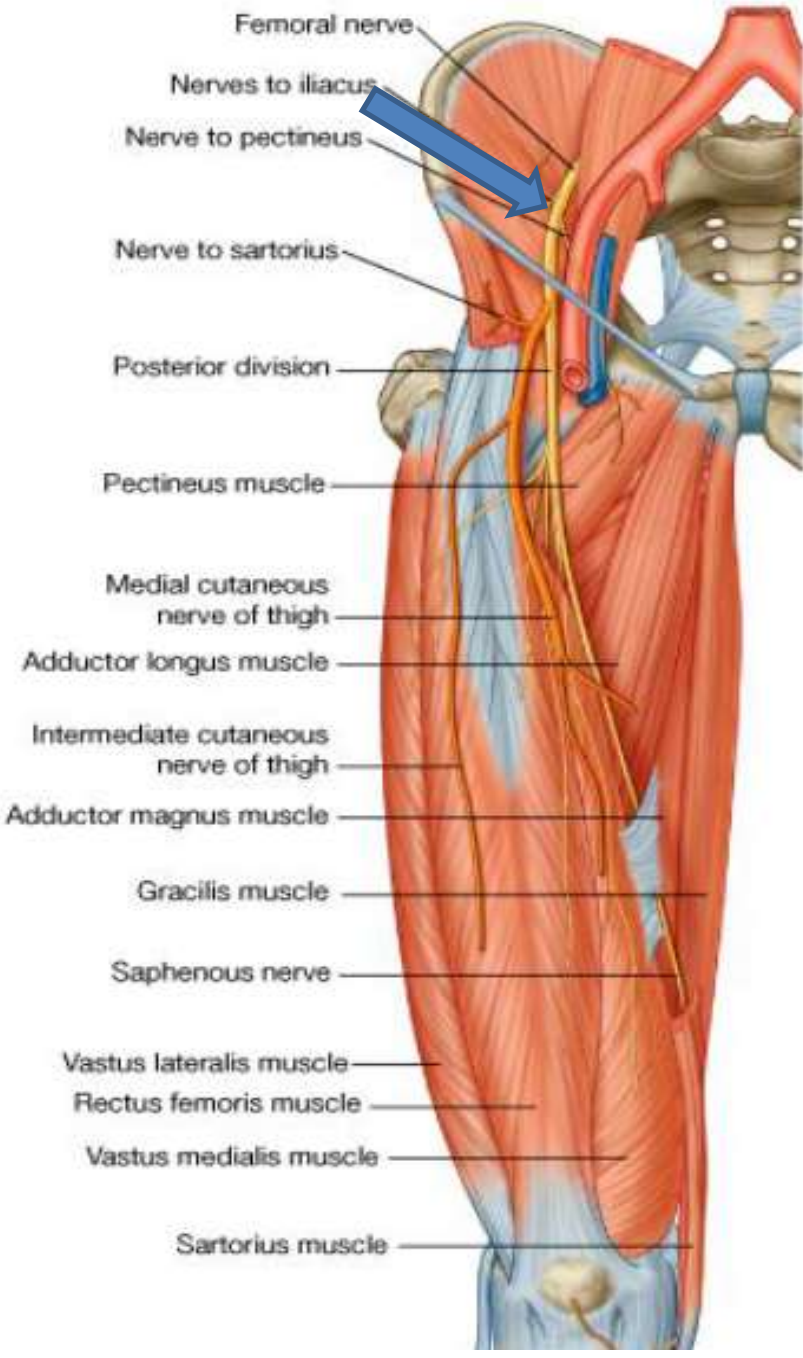
It emerges from the lower part of *lateral* border of psoas major.

It descends in the groove between the psoas major and iliacus under cover of the fascia iliaca.

It enters the thigh behind the midpoint of inguinal ligament It supplies small branches to iliacus in the abdomen.

lateral to the femoral artery outside the femoral sheath between iliacus muscle (*laterally*) & psoas major muscle (*medially*).

Ends 2 inches below the inguinal ligament by dividing into anterior and posterior divisions



Femoral nerve:

- **Branches:**

➢ **Trunk:**

iliacus

pectineus

Vascular branch (femoral artery)

➢ **Anterior division**

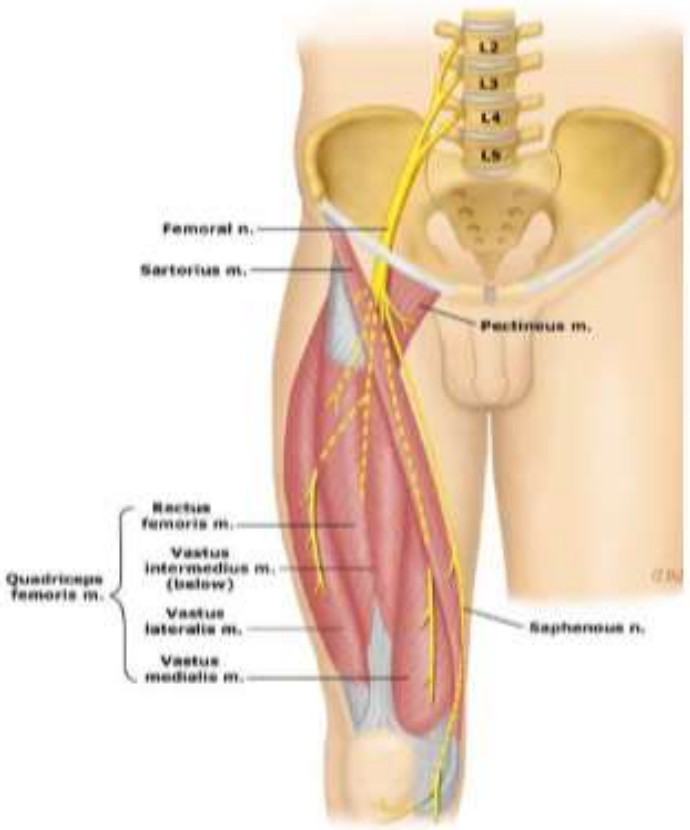
sartorius muscle.

medial and intermediate cut. ns.

➢ **Posterior division**

quadriceps femoris .

saphenous nerve



Saphenous nerve:

The largest branch of the femoral nerve.

- Is the longest cutaneous nerve in the body.

- Then descends on the **medial side of the leg** along the medial border of the tibia with the great saphenous vein.

- Finally passes **in front of the medial malleolus** and runs along the medial side of the dorsum of the foot to the **ball of the big toe**.

Saphenous nerve:

-Gives cutaneous branches to the medial side of the leg and medial side of dorsum of the foot down to the ball of the big toe.

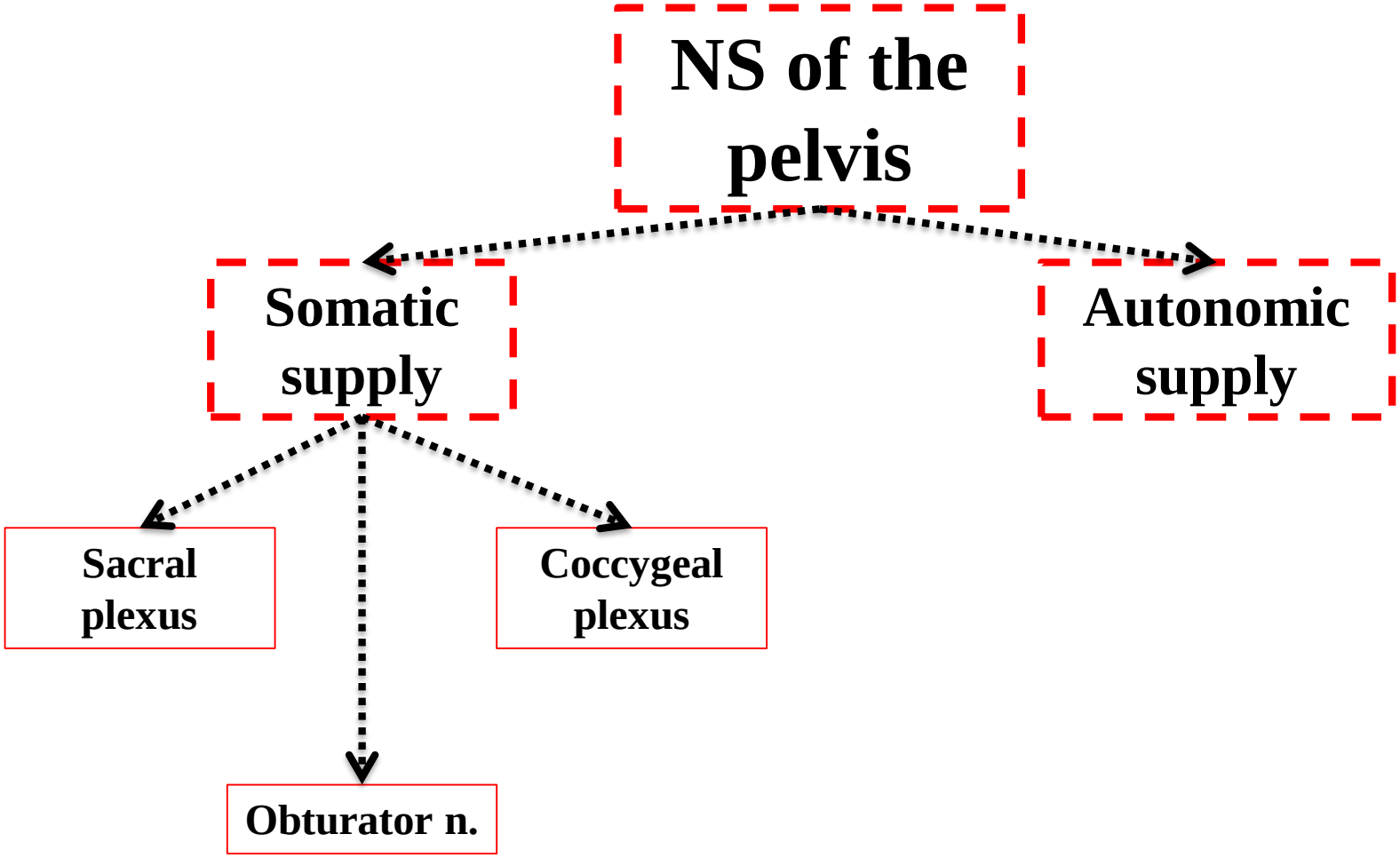
Applied anatomy:

1-The femoral nerve gives articular branches to both hip & knee joints, so a lesion in one joint leads to referred pain in the other joint.

2-Injury of the femoral nerve leads to:

a) Motor effect: paralysis of the quadriceps femoris muscle (knee cannot be extended).

b) Sensory effect: loss of sensation of the anteromedial side of the thigh and the medial side of the leg & the foot.


NS of the pelvis
Somatic supply
Autonomic supply
Sacral plexus
Coccygeal plexus
Obturator n.

Sacral plexus :

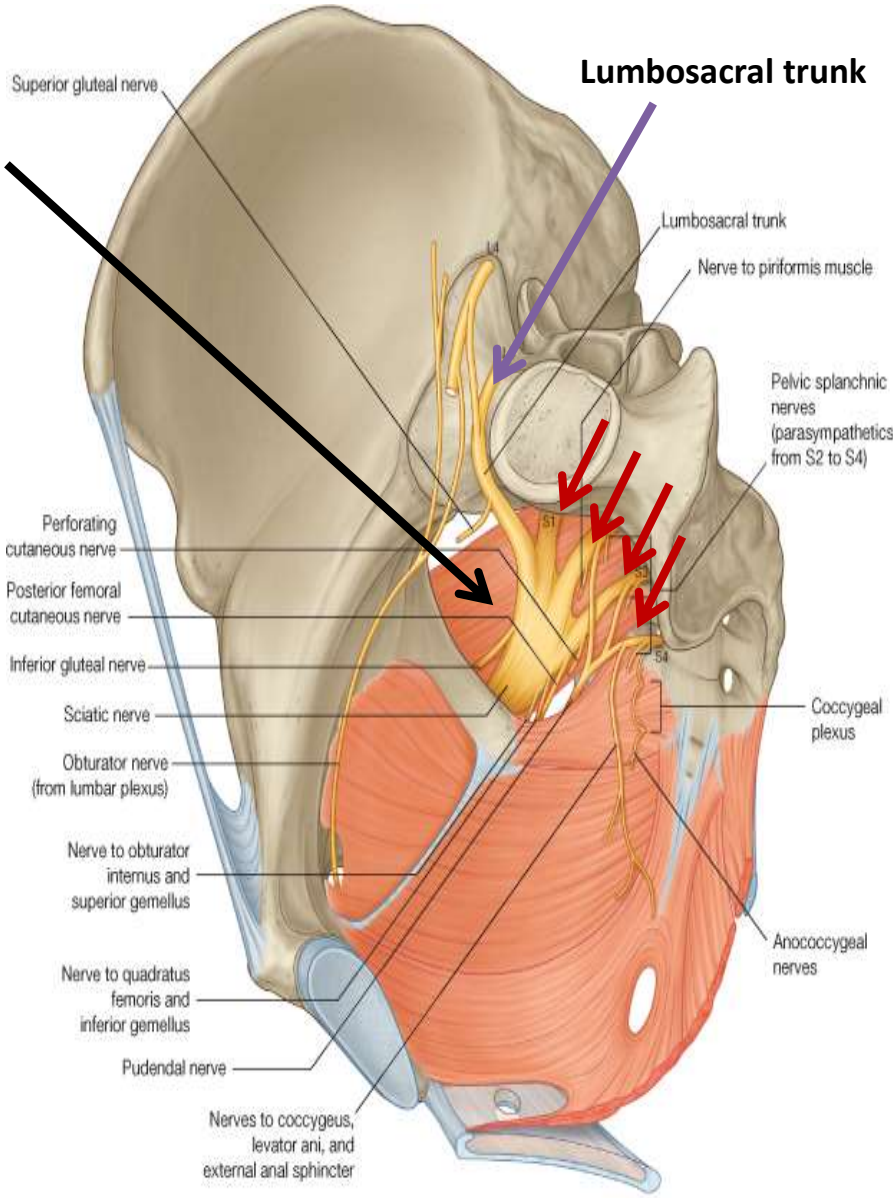
Is formed infront of piriformis by:

Lumbosacral trunk (L4,5) and upper 4 sacral ventral rami (S1,2,3 & upper part of S4)

Coccygeal plexus :

Is formed by:

Ventral rami of S4, S5 & coccygeal nerves.



https://www.google.com.eg/search?hl=en-EG&tbs=simg:CAQSoAIJSf8KiV6vN58alAILELCMpwgaYgpgCAMSKNsCzwnOCYUIhAjQCb0T5QPaAtEJ_1T-bPvw_16De3NPs8kTrgM8w23iwaMOvBxd6uA_1egTb4Clz4h92M1r0r9-qwJf8qDNEmlauqloY3TlIAsLfubSpq8TXIJByAEDAsQjq7-CBoKCggIARIEnLRMcgwLEJ3twQkajAEKHwoLM2QgbW9kZWxpbmfapYj2AwwKCi9tLzAycDMwdnYKGgoHZGlhZ3JhbdqIiPYDCwoJL20vMDJ2MG0yChoKCHNrZWxldG9u2qWI9gMKCggvbS8wNnc2aAoYCgVza3VsbNqIiPYDCwoJL20vMDE2bTJkChcKBWhlYXJ02qWI9gMKCggvbS8wOTVfbgw&q=obturator+internu

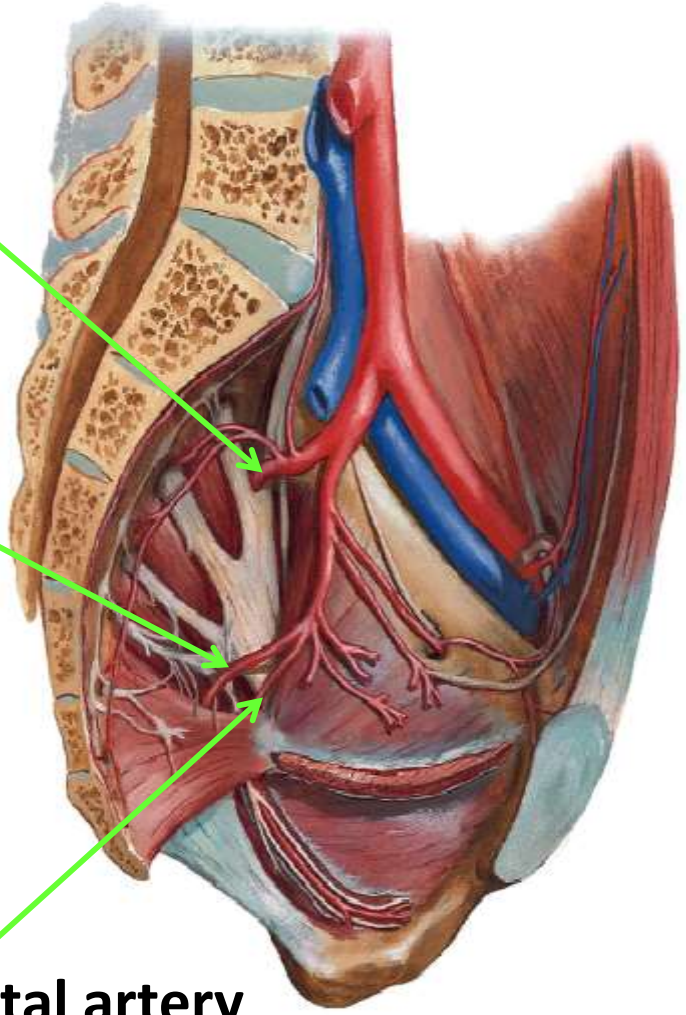
Vessels related to the sacral plexus

Superior gluteal artery

passes backwards between lumbosacral trunk and S1 or between S1 & S2.

Inferior gluteal artery

passes backwards between S1&S2 or S2&S3.



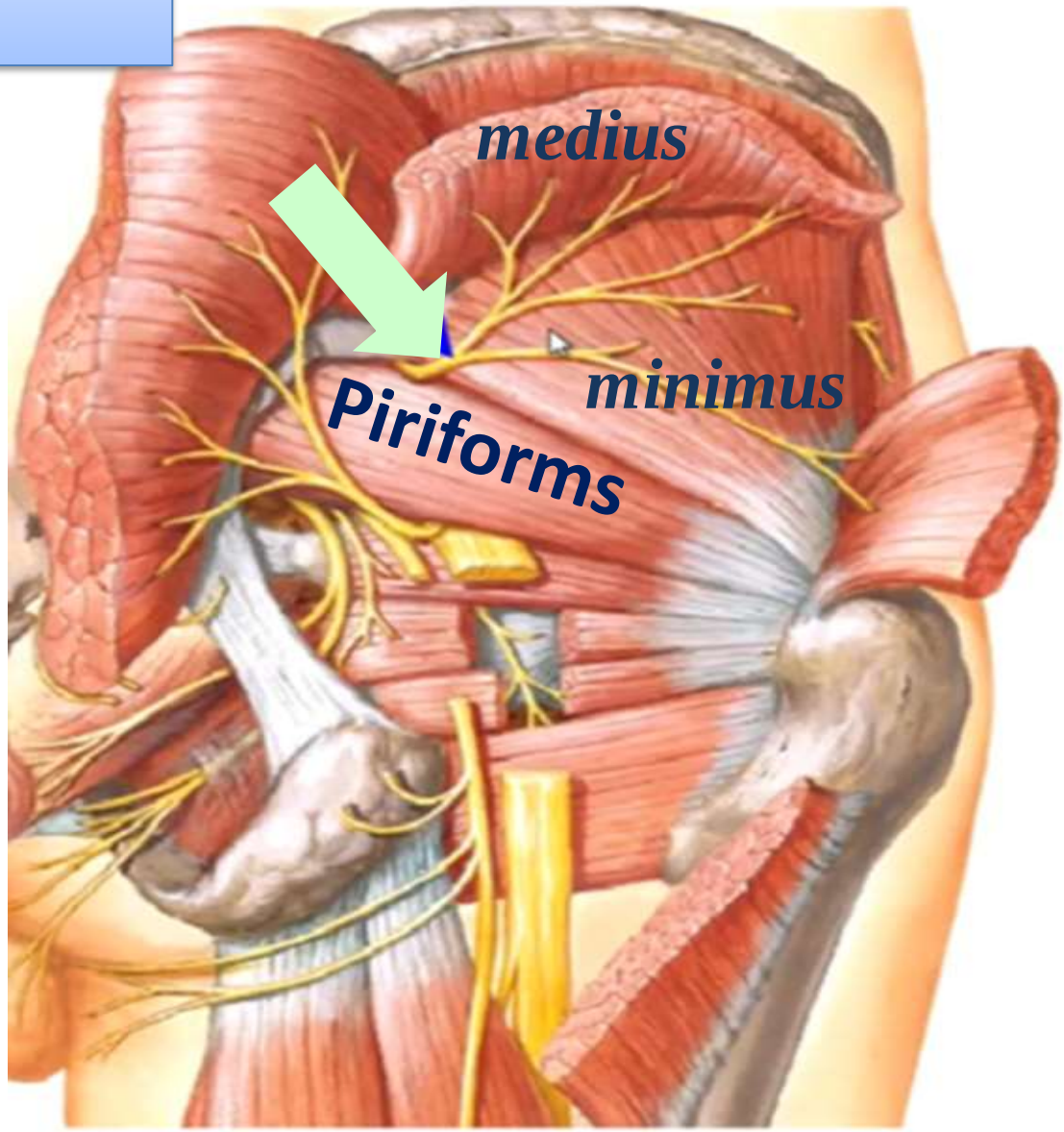
Internal pudental artery

descend in front of the plexus.

https://www.google.com.eg/search?hl=en-EG&tbs=simg:CAQSoQIJgFRB6BYpo38alQILELCMpwgaYgpgCAMSKNIGzgmqAt0G0AnVBtMGoBHDCd4GgS3iJN4stzT3N5Ik_1D_10N5Q6zjYaMM8XY8Oz9mwfFDoXfY9hmei-tYcSgGq7q0Mx7JuQH4Xwpo5PQKQW8P0nXFZlu-nbEyAEDAsQjq7-CBoKCggIARIEV5hUbAwLEJ3twQkajQEKHQoLdmlzdWFsIGFydHPapYj2AwoKCC9tLzBwOXh4Ch8KDGlsbHVzdHJhdGlvbtqliPYDCwoJL20vMDFrcjhmChcKBWhlYXJ02qWI9gMKCggvbS8wOTVfbgoWCgR2ZWlu2qWI9gMKCggvbS8wZHpiMgoaCgdjYXJtaW5l2qWI9gMLCgkvbS8wNXRfeXQM&q=inferior+vesical+artery+in+men&tbm=isch&sa=X&ved=2ahUKEwjW0oj32ZroAhVUkMMKHRG3BhMQwg4oAHoECAcQJg

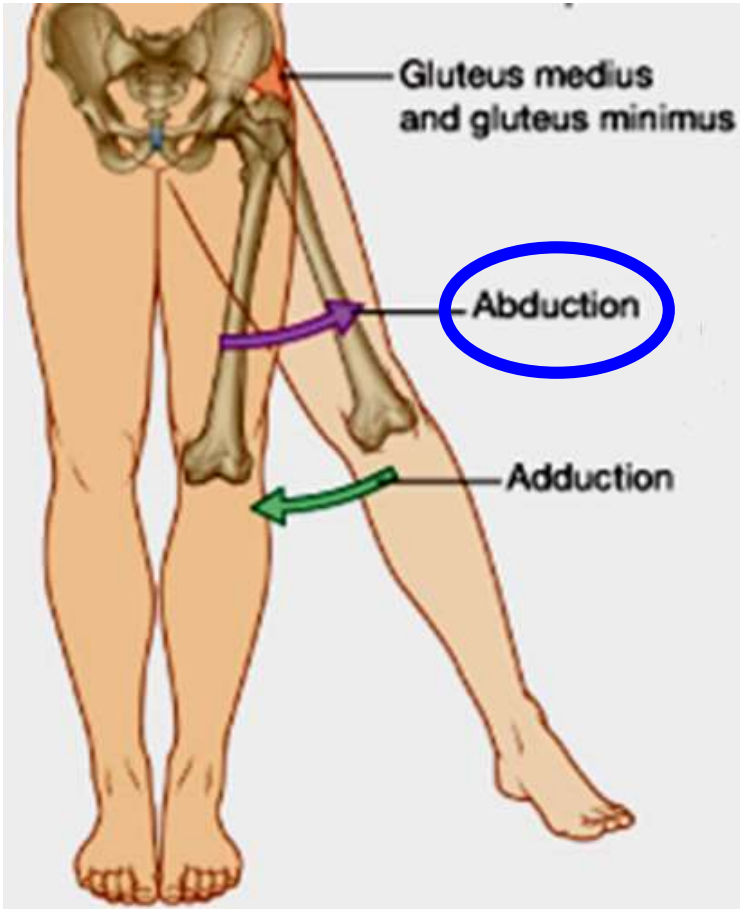
Superior gluteal nerve (L4,5, S1)

 Enters gluteal region through greater sciatic foramen above piriformis. supllies **gluteus medius & minimus and *tensor fasciae latae*.**

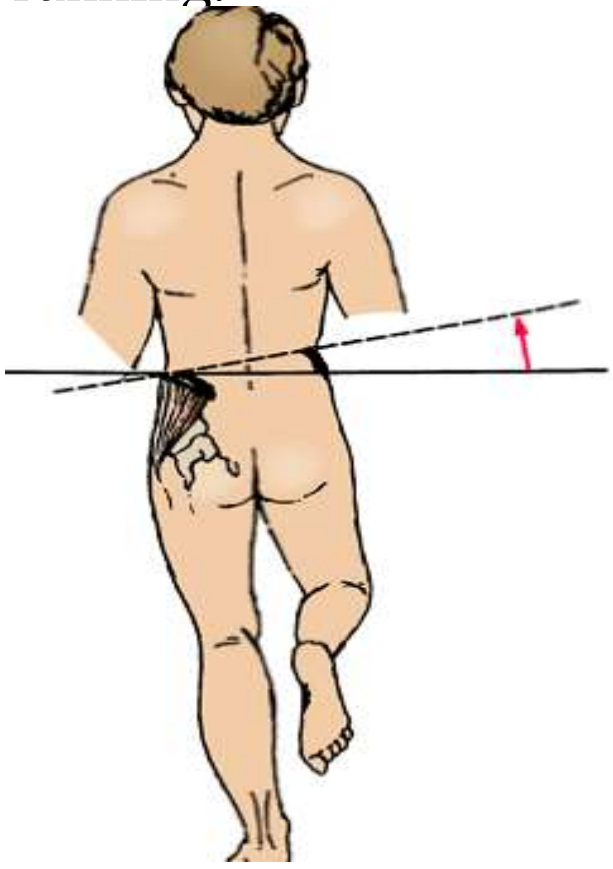


Action of gluteus medius and minimus

Main abductors of the thigh



2) They **prevent tilting of the pelvis to the unsupported raised limb** by contraction of muscles of supported side, so they are important during walking and running.



paralysis of the glutei (due to injury of superior gluteal nerve) or hip dislocation or fracture neck femur lead to

positive Trendelenburg's sign

ABductors of thigh

Active | Paralyzed

in case of unilateral

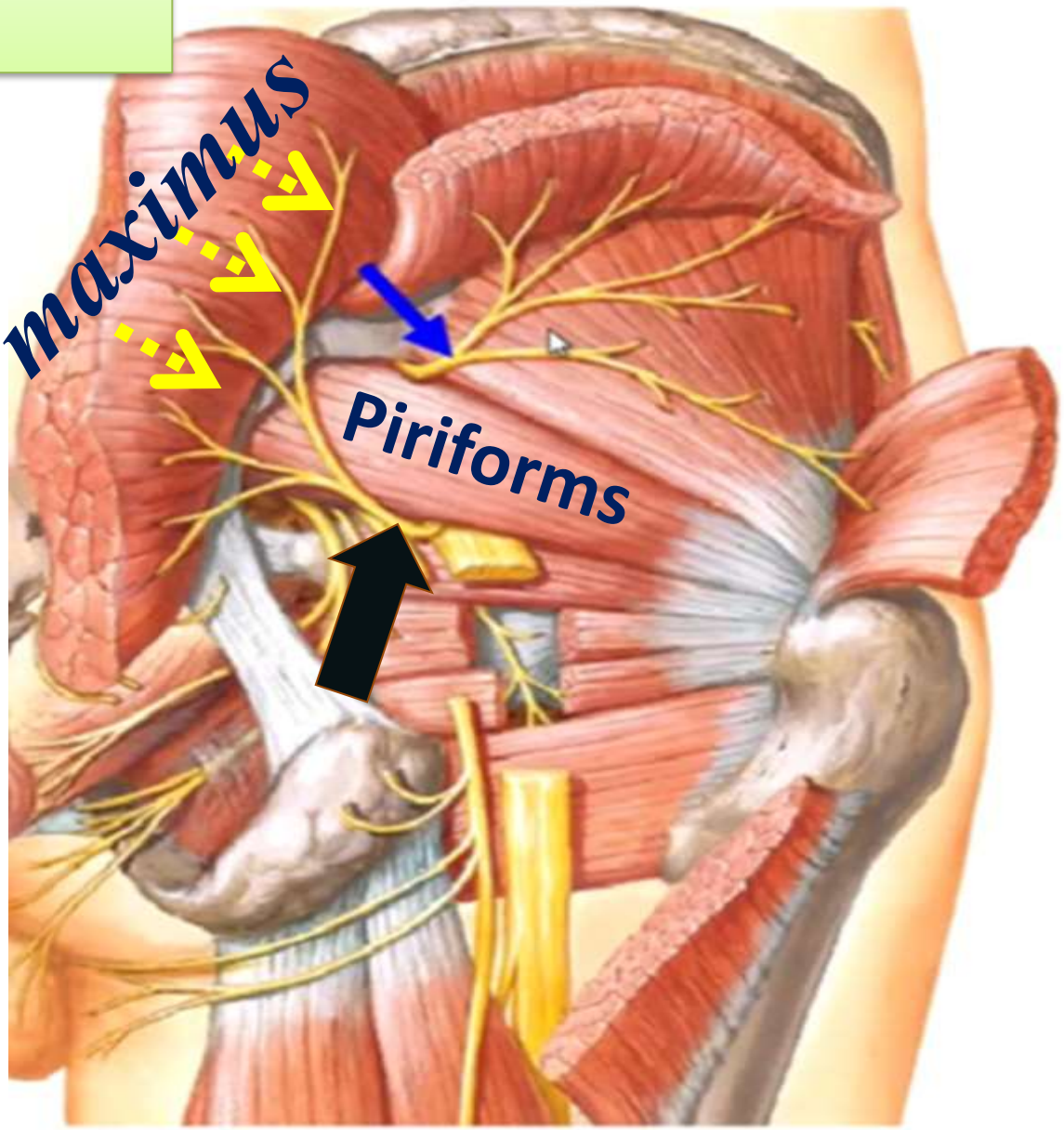
Lurching gait

in case of Bilateral

Waddling gait

Inferior gluteal nerve (L5, S1,2):

- Enters gluteal region through <u>greater sciatic foramen below piriformis.</u>
- Supplies the ***gluteus maximus***



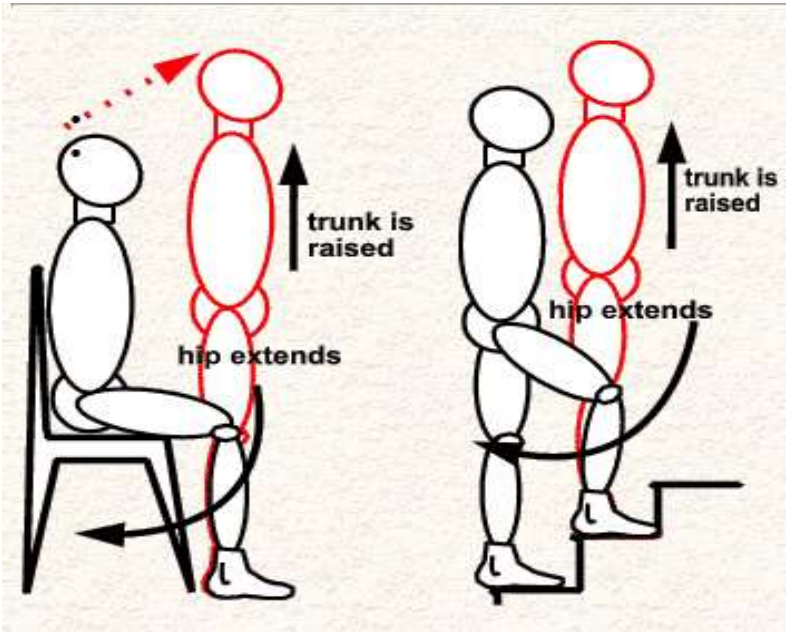
Inferior gluteal nerve

L5 S1 2

supplies the Gluteus maximus muscle from its deep surface

1) **The chief extensor of thigh at hip joint**

(this action is very essential in raising from sitting position or lifting heavy weights from the ground).



INJURY TO INFERIOR GLUTEAL NERVE

Muscle paralyzed

Gluteus maximus muscle

Inferior Gluteal Nerve Palsy

Difficulty stepping into bus

Difficulty in arising from chair is often an early complaint

Difficulty in climbing stairs is often an early symptom due to weakness of pelvic girdle muscles

Motor loss

- Impairment of hip extension and lateral rotation
- Difficulty in raising the body from sitting or stooping position

SUMMARY (Gluteal nerves injuries)

Superior Gluteal Nerve Injury causes

- loss of abduction of the limb
- impairment of gait; patient cannot keep pelvis level when standing on one leg
- Sign is Trendelenburg's sign
- Gait if only one side affected→ "Lurching gait"
- Gait if both sides affected→ "Waddling gait

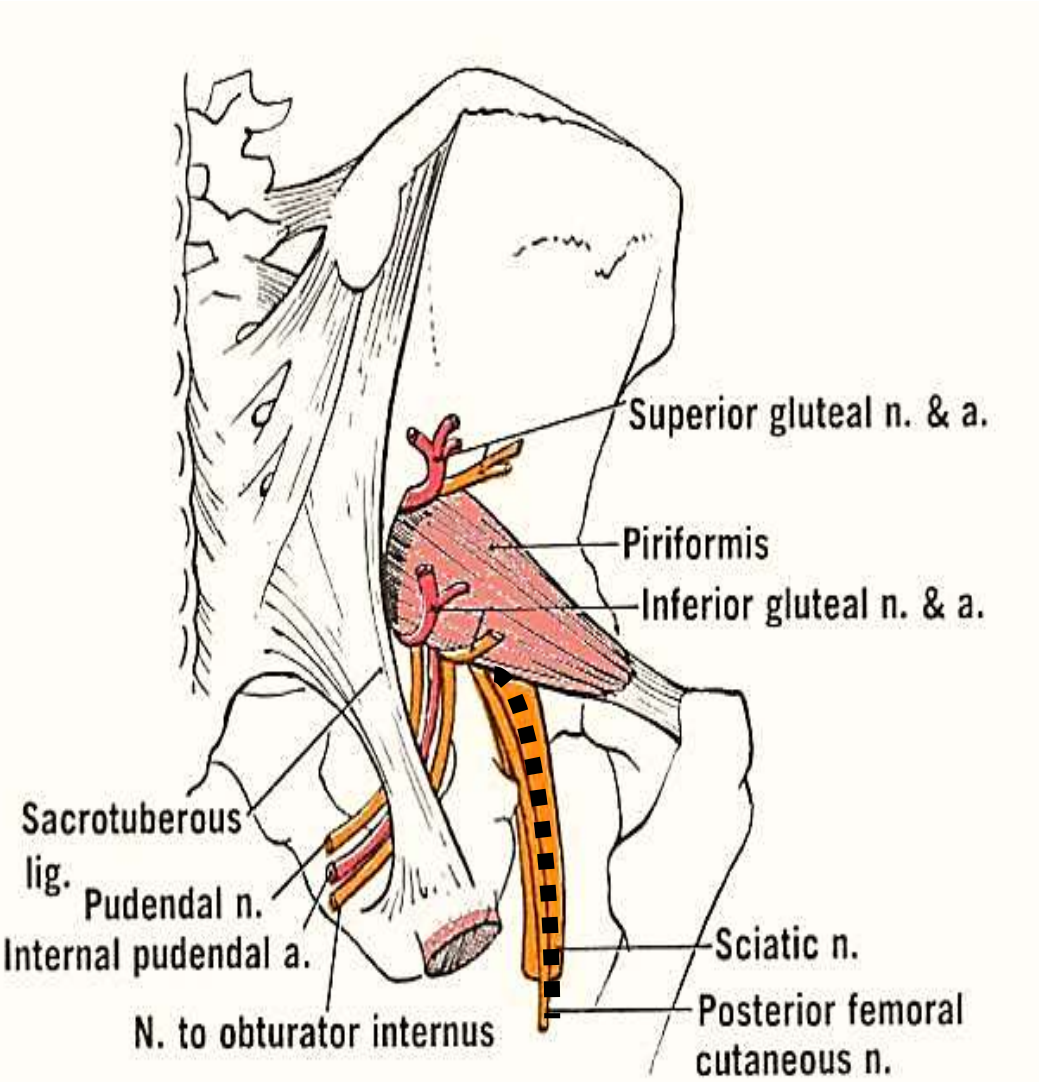
Inferior Gluteal Nerve injury causes

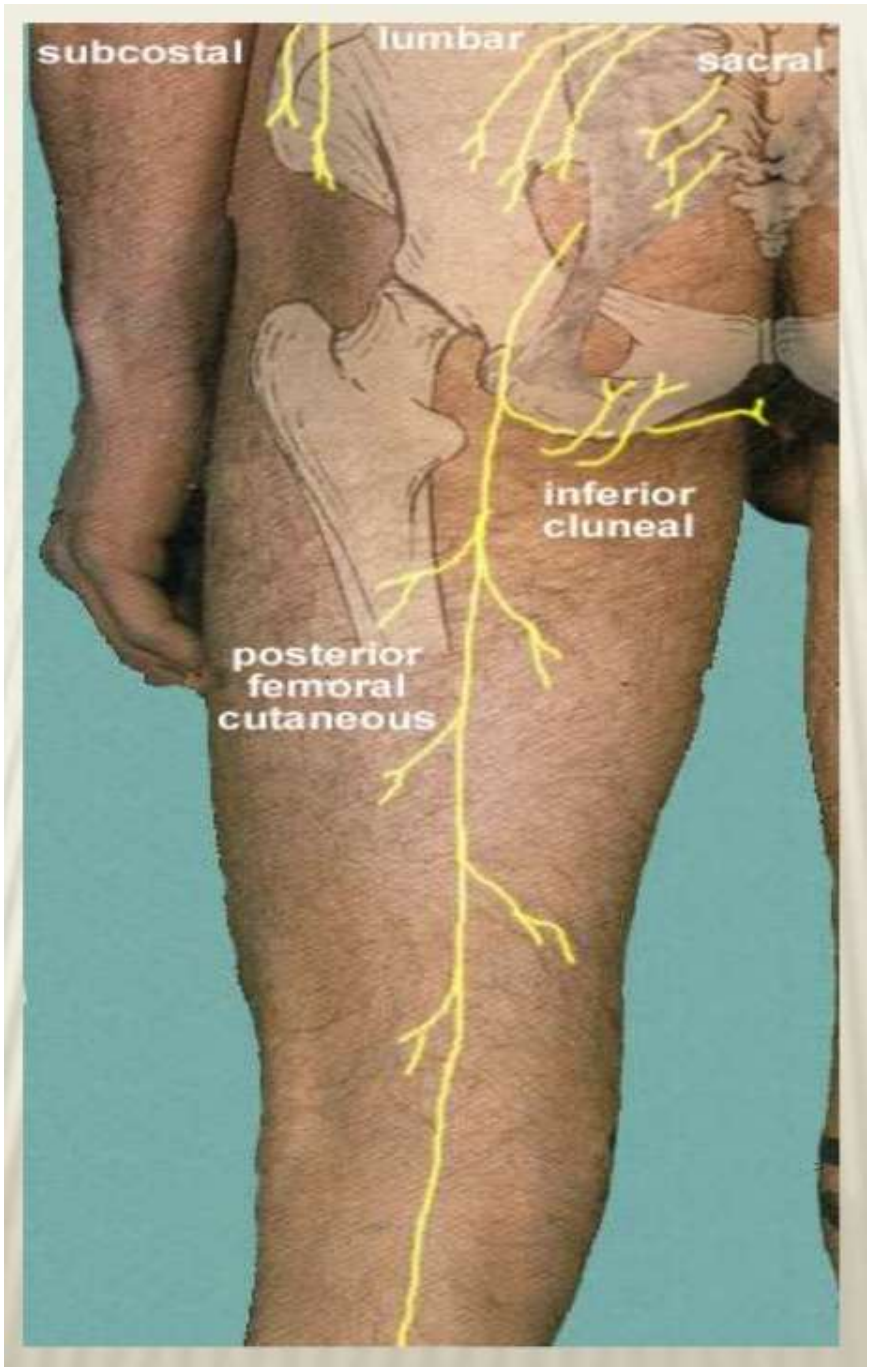
- weak hip extension
- patient has difficulty rising from a sitting position or climbing stairs.

posterior cutaneous nerve of the thigh

Enters gluteal region through greater sciatic foramen below piriformis.

- Descends under cover of gluteus maximus, lying directly superficial to sciatic nerve.
- In the popliteal fossa, it pierces the deep fascia, to become subcutaneous.




subcostal
lumbar
sacral
inferior
cluneal
posterior
femoral
cutaneous

Sciatic nerve

The thickest nerve in the body.

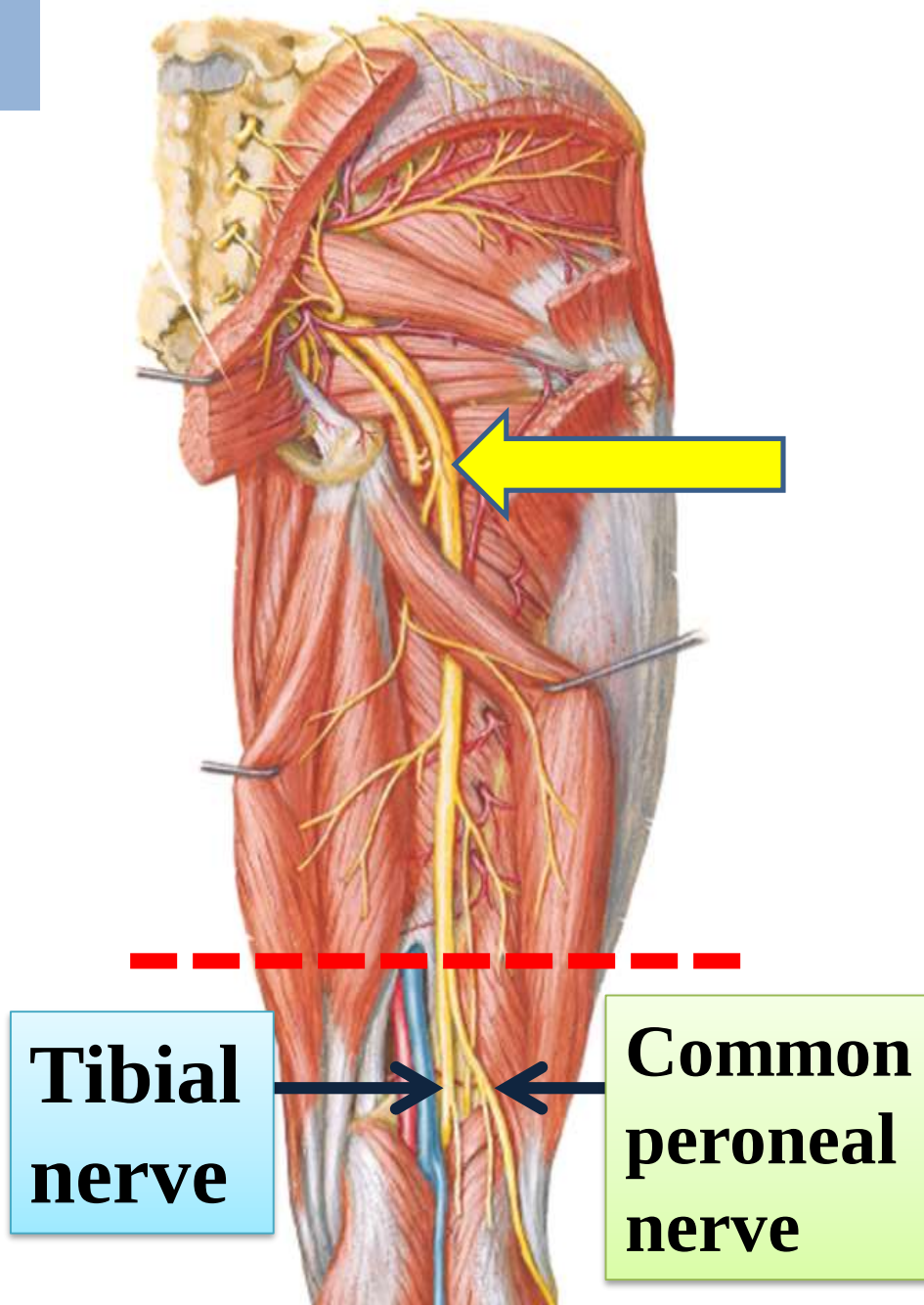
- Begins in the pelvis and terminates at the superior angle of popliteal fossa.

Termination:

It divides into

a) Tibial *nerve*

b) Common peroneal *nerve*

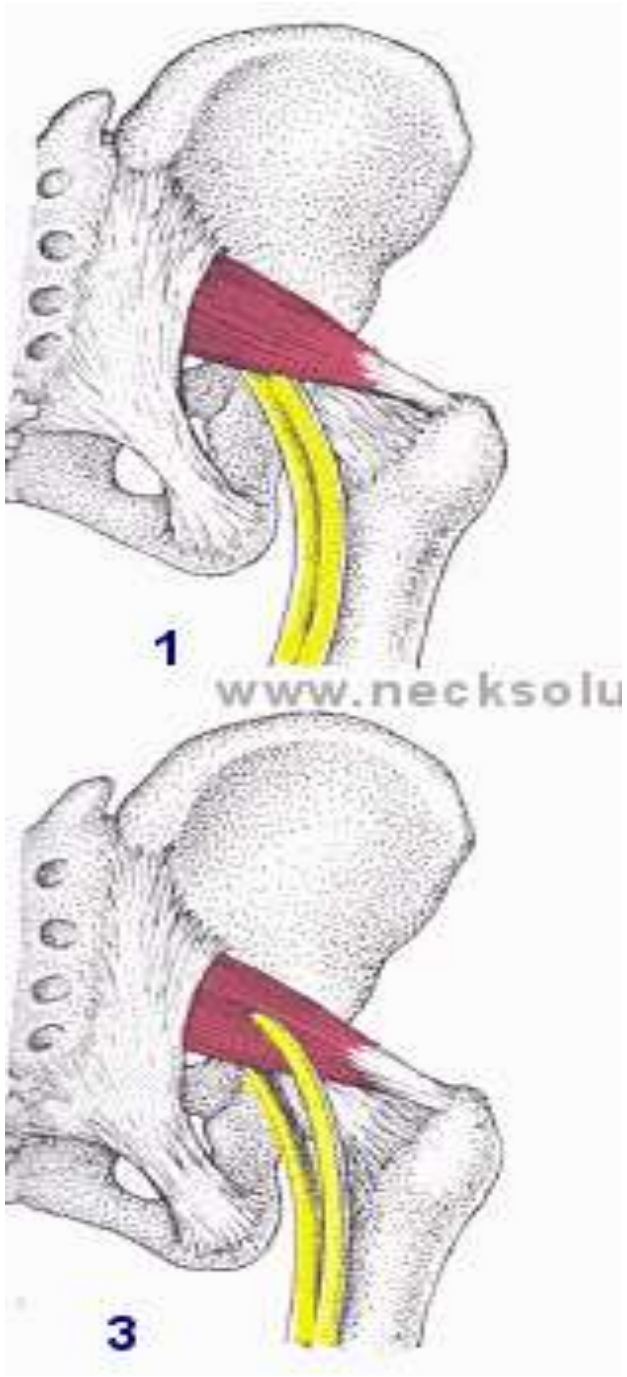


Sciatic nerve

Sometimes the sciatic nerve may be absent,

→ in this case:
the **tibial nerve** leaves the pelvis below piriformis

while the **common peroneal** nerve pierces the piriformis.



Sciatic nerve

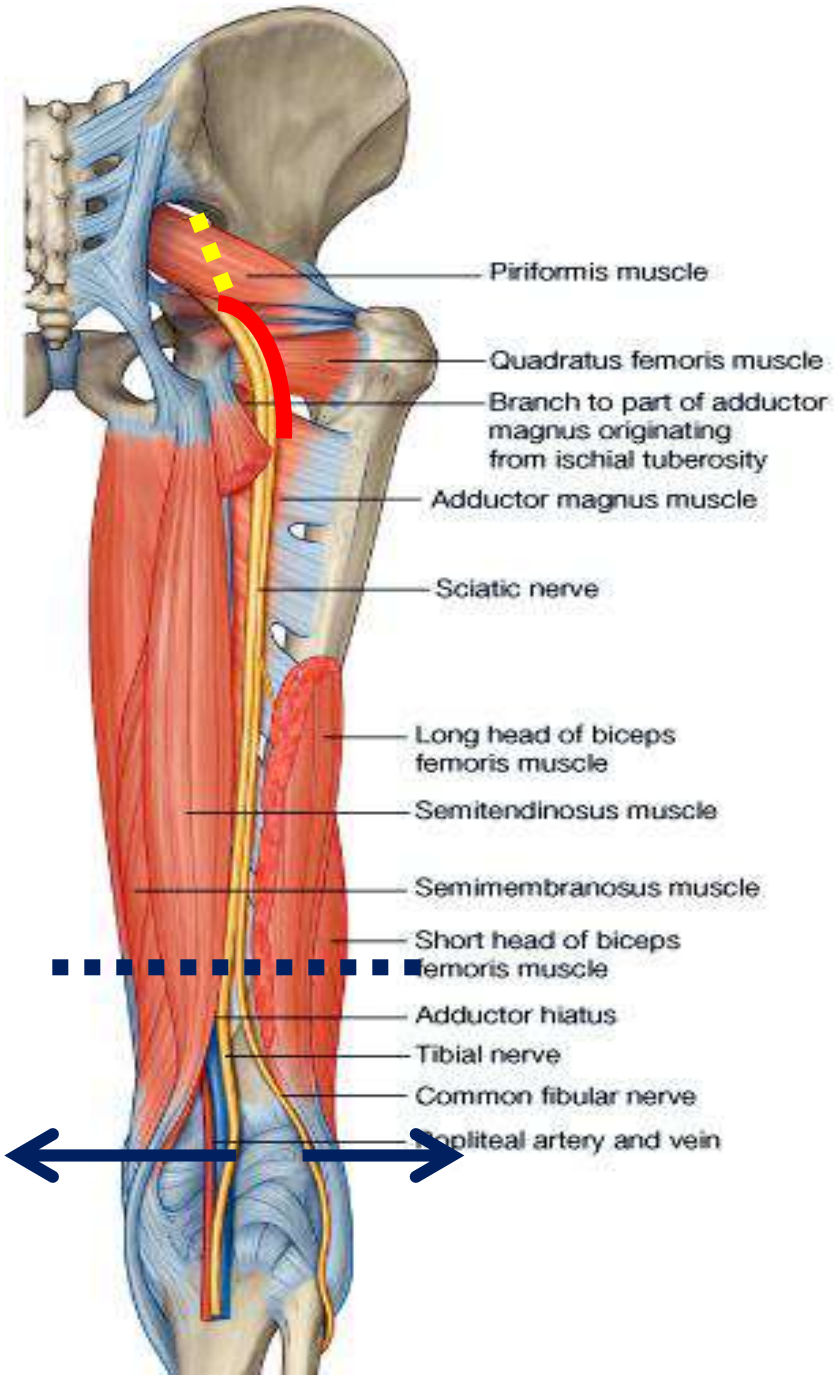
Course:

✓ ***In the pelvis,*** it lies in front of piriformis *muscle*.

✓ ***In gluteal region***, it leaves the plevis by passing below piriformis.

✓ ***It enters the back of thigh by*** passing midway between ischial tuberosity and greater trochanter .

✓ **At the superior angle of popliteal fossa,** it terminates by dividing into tibial and common peroneal nerves.



SCIATIC NERVE SUPPLIES

- **MOTOR BRANCHES TO:**

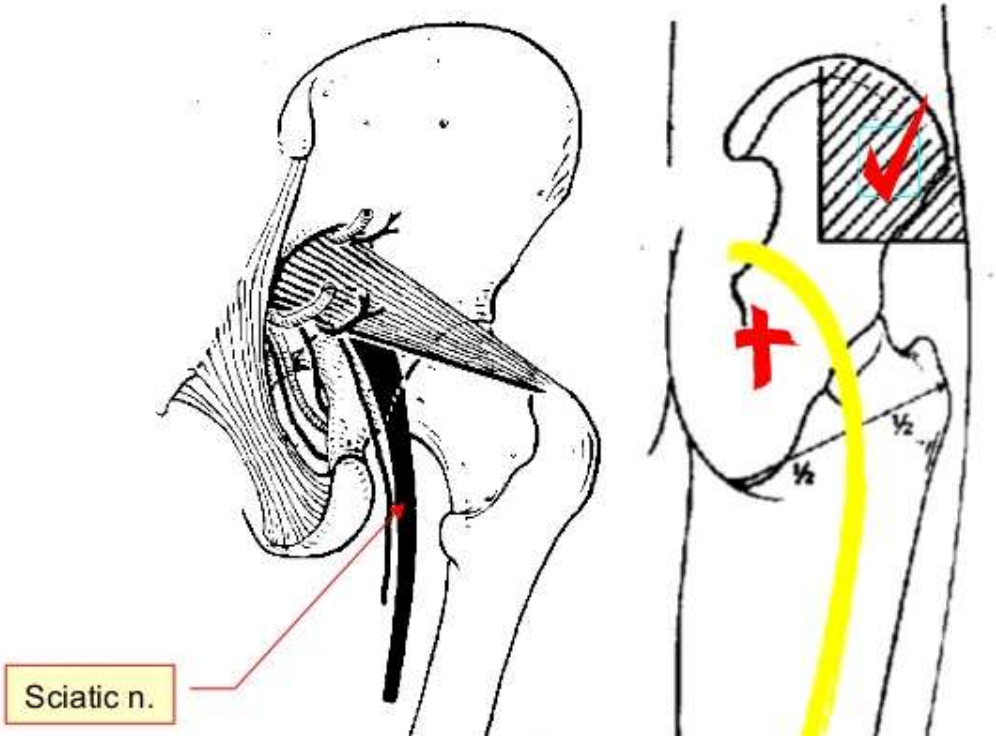
1. Hamstring muscles.
2. All muscles of the leg and foot through its terminal branches.

- **SENSORY BRANCHES TO:**

Skin of leg and foot ***except the areas supplied by the saphenous nerve .***

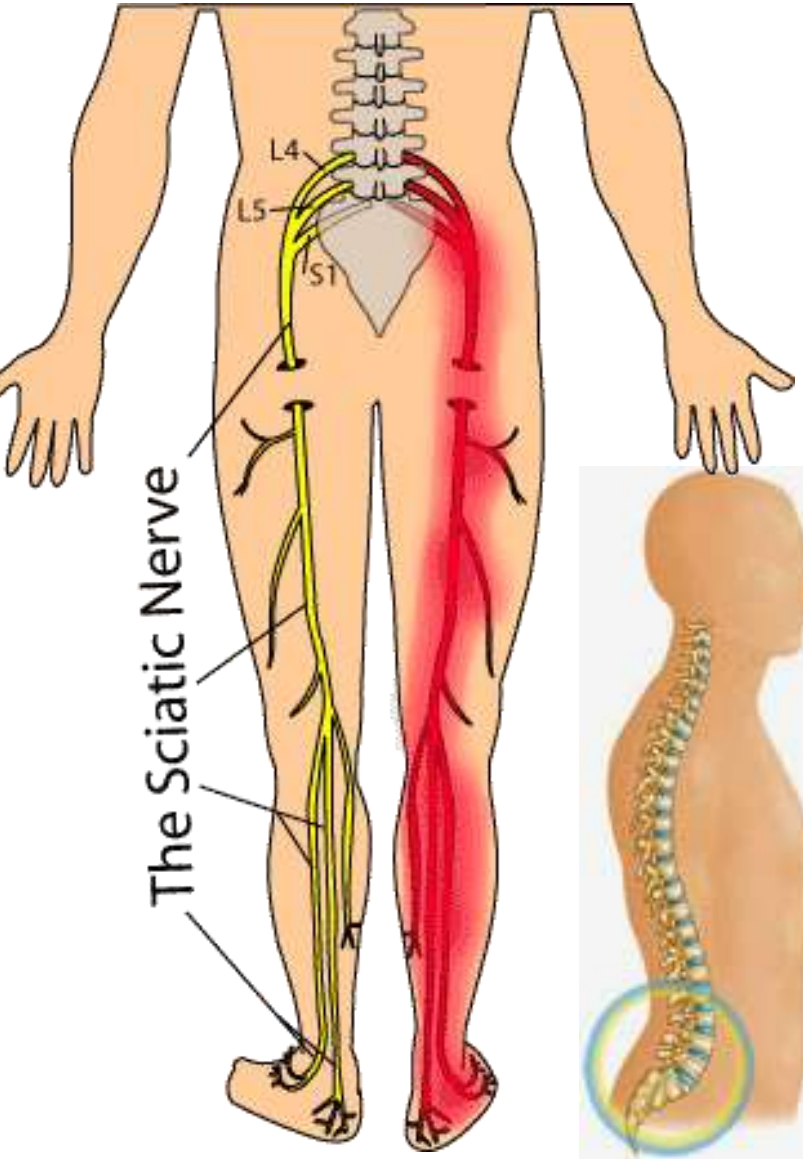
IM injections and the sciatic nerve

- There are no nerves and vessels of importance lateral to the sciatic nerve.
- Injections can be made safely into the <u>superior lateral quadrant</u> of the gluteal region where the injection is made into gluteus medius muscle, the part that is not covered by gluteus maximus.

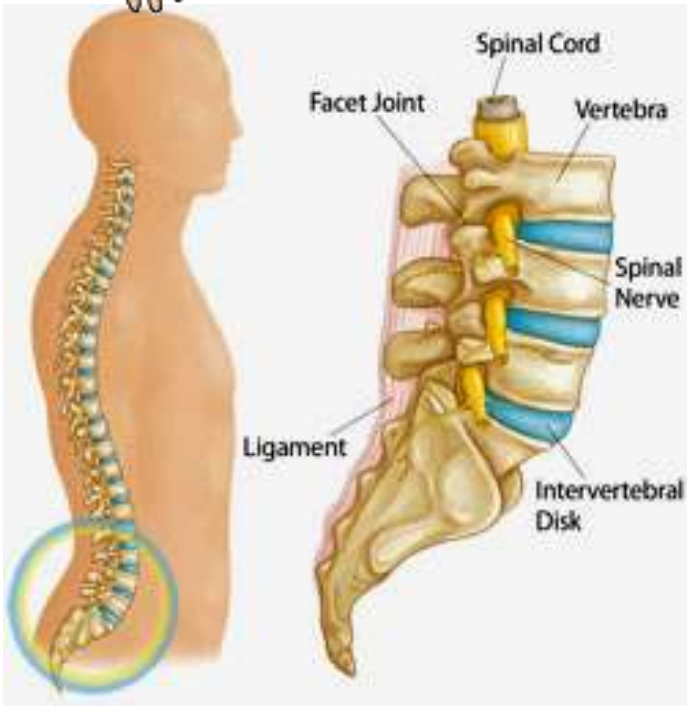


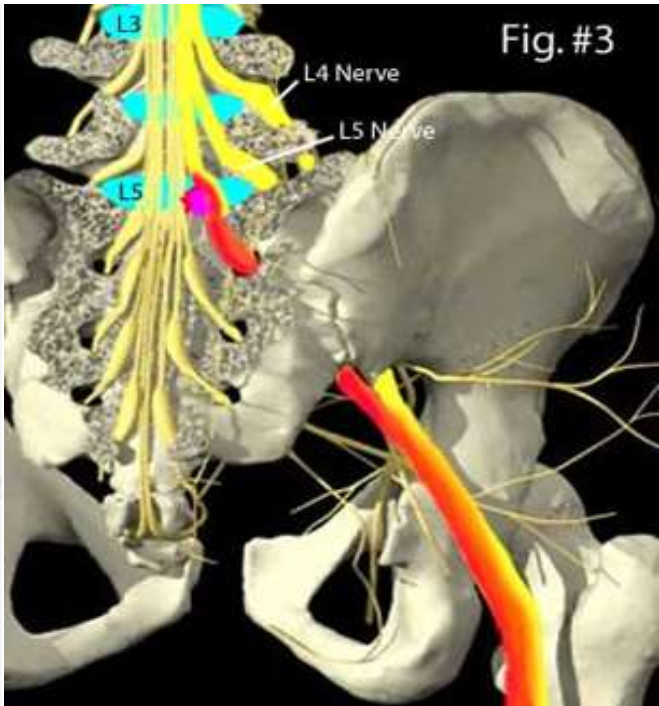
I- COMPRESSION

SCIATICA



Patients have pain along the sensory distribution of the sciatic nerve





Piriformis Syndrome

hypertrophy and spasm of the piriformis----------

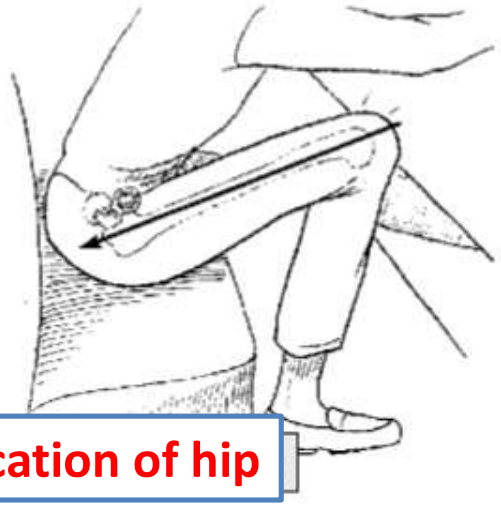
compression of the sciatic nerve ----------

pain radiating along sensory distribution of sciatic nerve

This affect the individuals involved in sports that require excessive use of the gluteal muscles

Sciatic nerve injury

- Stab wounds
- Fractures of the pelvis
- Posterior dislocation of the hip joint
- Badly-placed intramuscular injection in the gluteal region

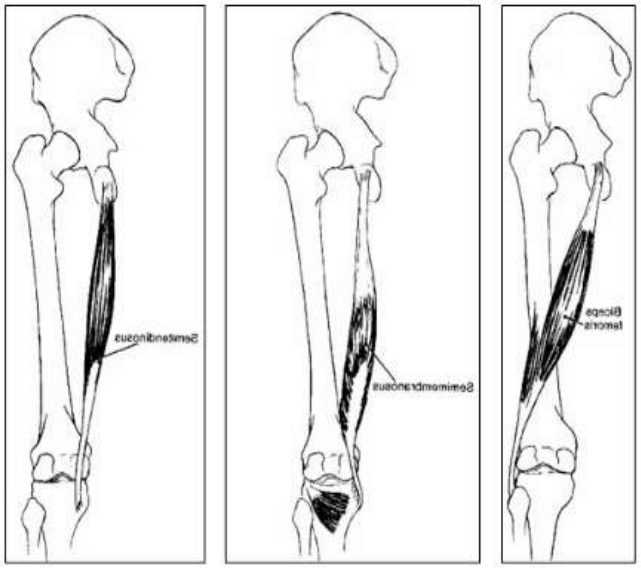


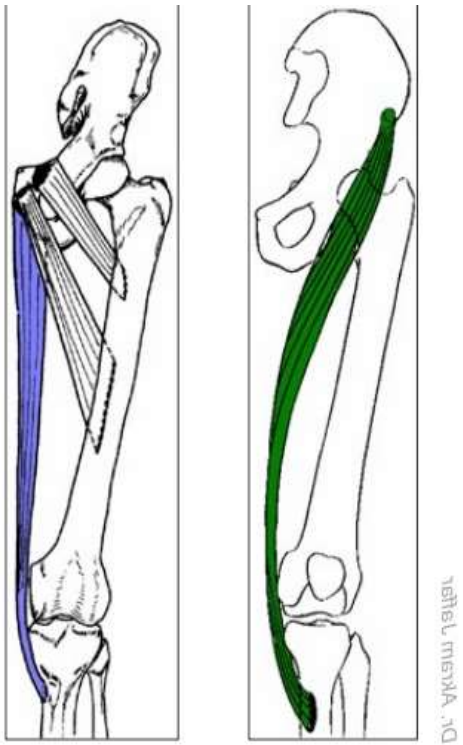
Car accidents can cause **Post. dislocation of hip**

EFFECT OF SCIATIC NERVE INJURY

- The **hamstring muscles** are paralyzed
- **Weak flexion of knee** is possible

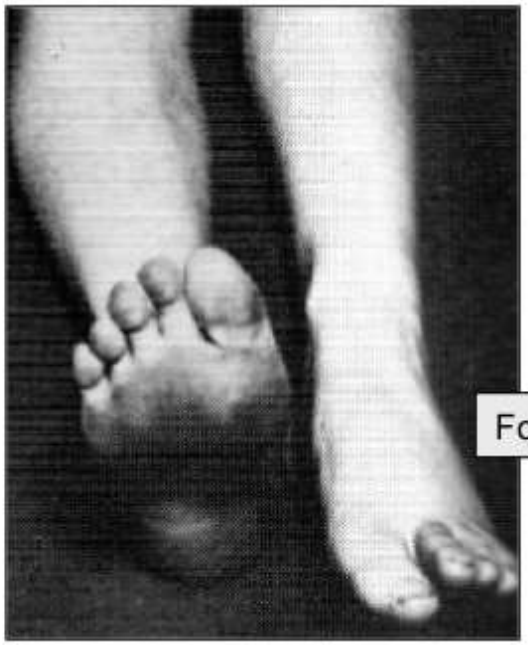
because of action of
sartorius (femoral n.)
gracilis (obturator n.)





EFFECT OF SCIATIC NERVE INJURY

All the muscles below the knee are paralyzed, and the weight of the foot causes it to assume the **plantar-flexed position** **(foot drop)**


Foot drop


Wasting of calf muscles

EFFECT OF SCIATIC NERVE INJURY

SENSORY EFFECT

- Sensation is lost below the knee, **except**:

1. medial side of the leg
2. medial border of the foot as far as the ball of the big toe.

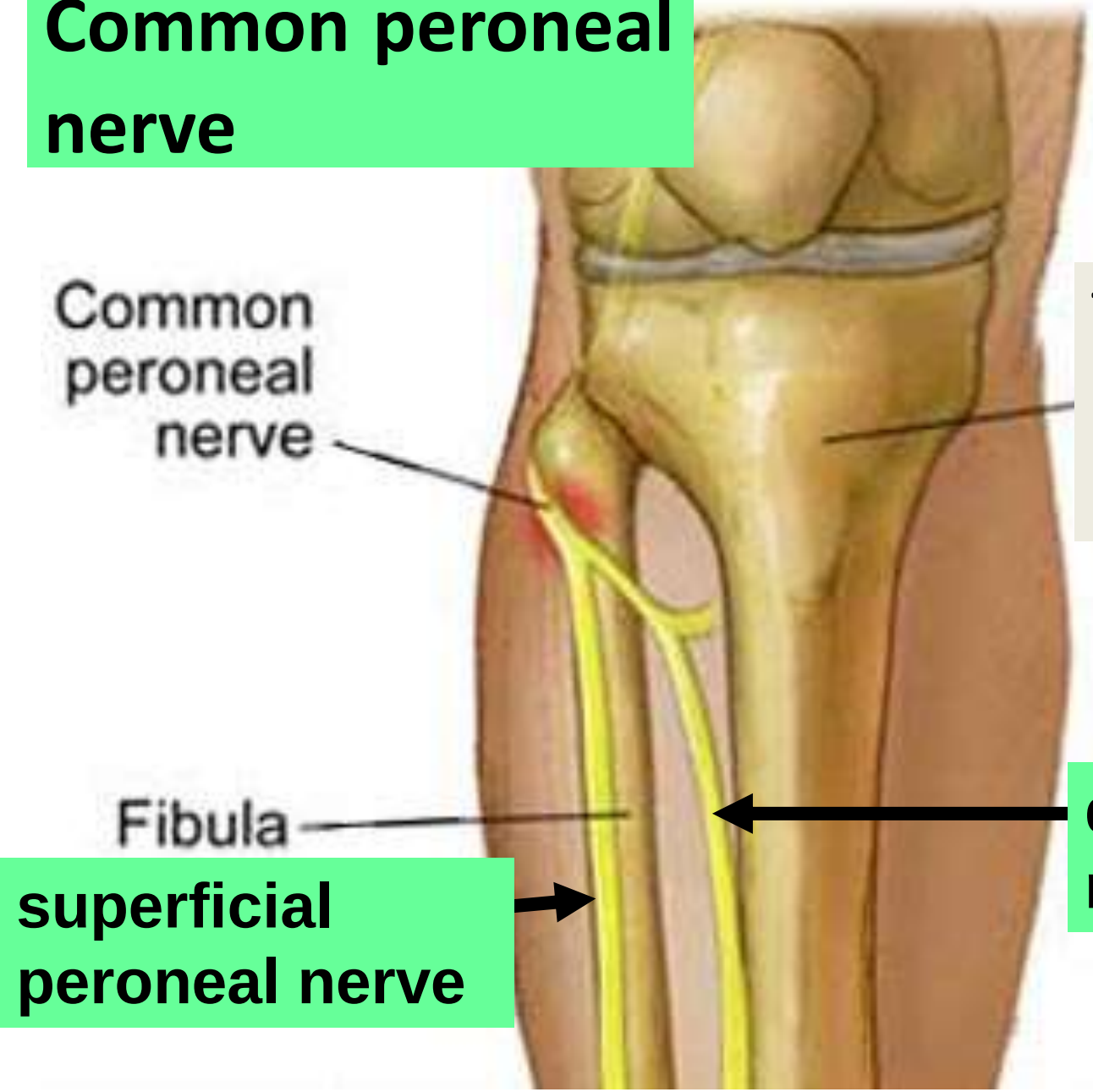
WHY???

supplied by the **saphenous nerve (femoral nerve).**

Tibial nerve
L4,5 & **S** 1,2,3

Common peroneal n
L 4,5 & **S**1,2

Common peroneal nerve



Terminates into superficial & deep peroneal ns

deep peroneal nerve

superficial peroneal nerve

Common peroneal nerve

superficial peroneal nerve

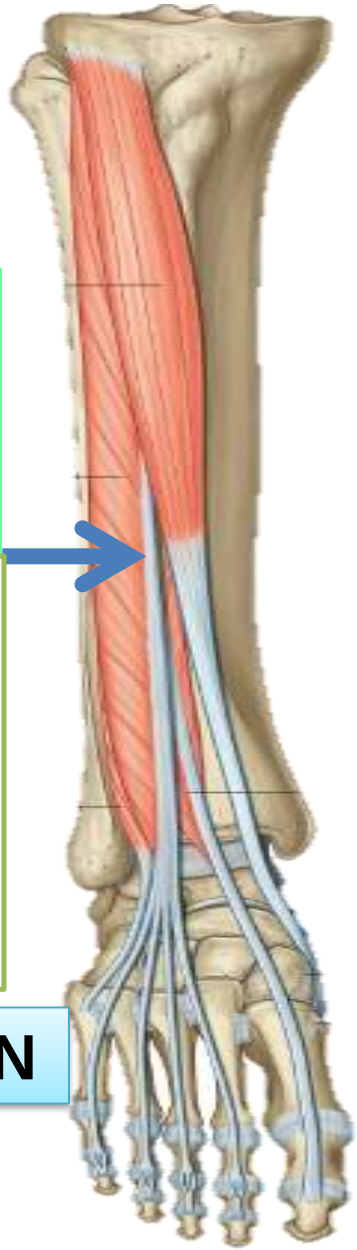
supplies **lateral leg muscles**

EVERSION

deep peroneal nerve

Supplies **anterior leg muscles**

DORSIFLEXION



Common peroneal nerve

superficial peroneal nerve

deep peroneal nerve

EVERSION

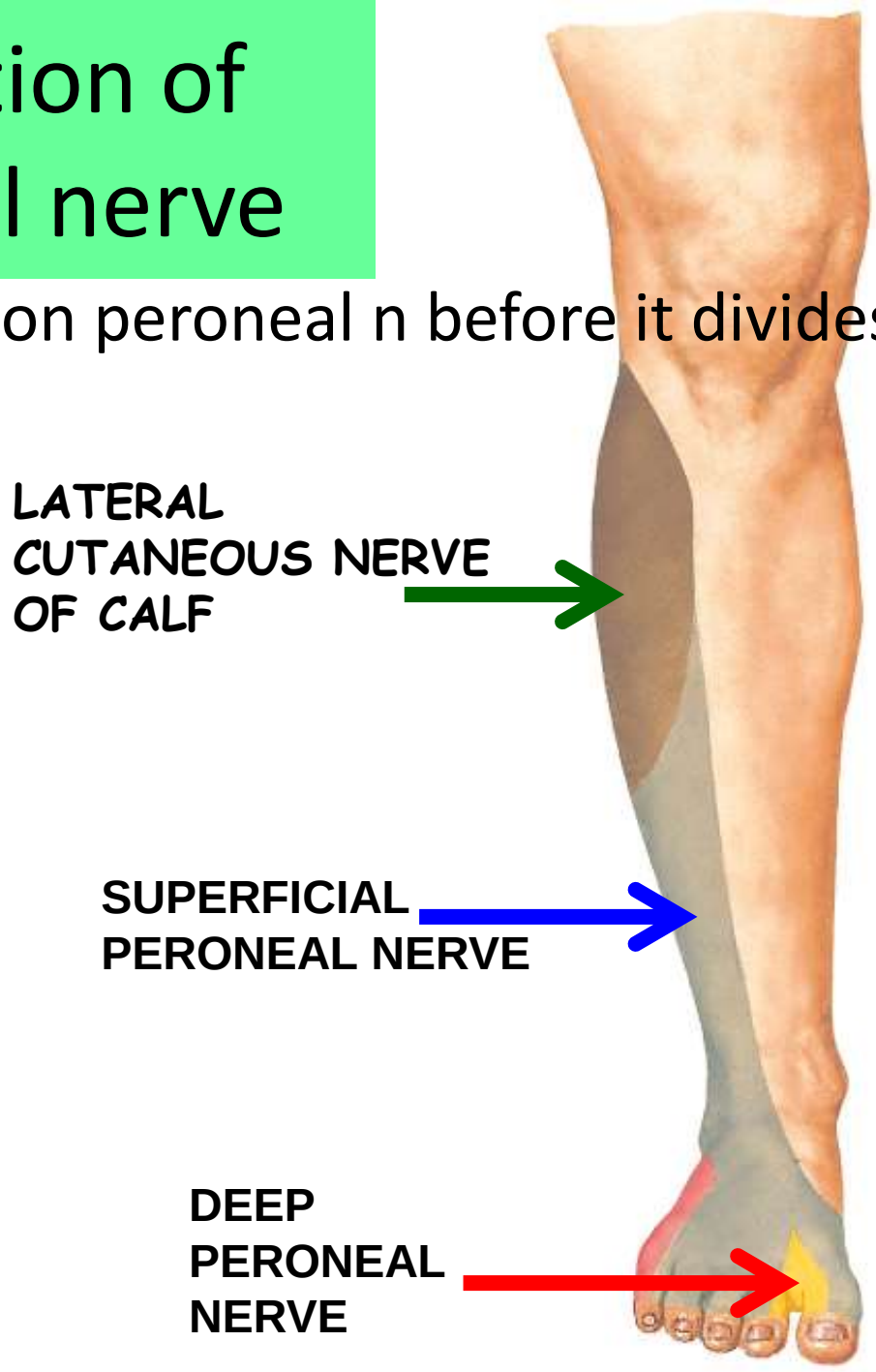
DORSIFLEXION

Sensory distribution of common peroneal nerve

2 cut brs arise from common peroneal n before it divides :

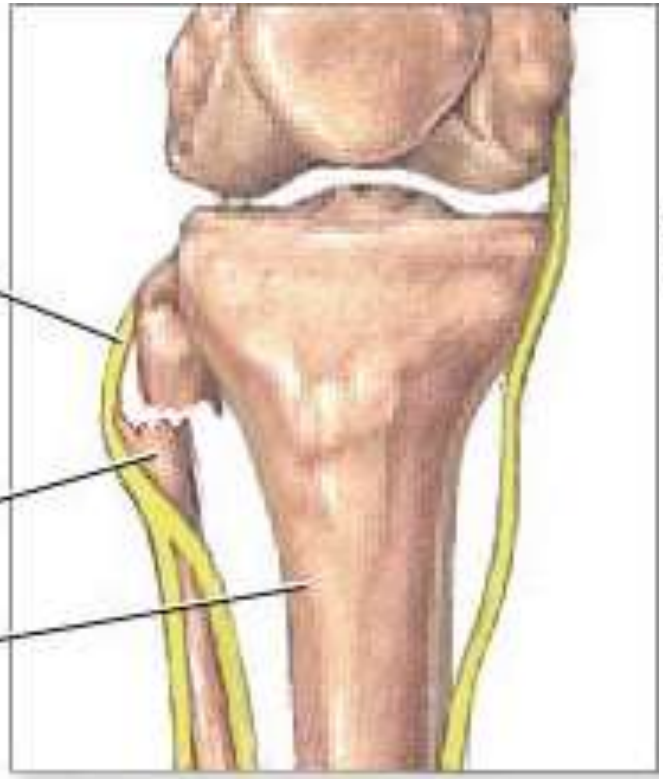
Sural communicating

Lat. Cut. N of calf



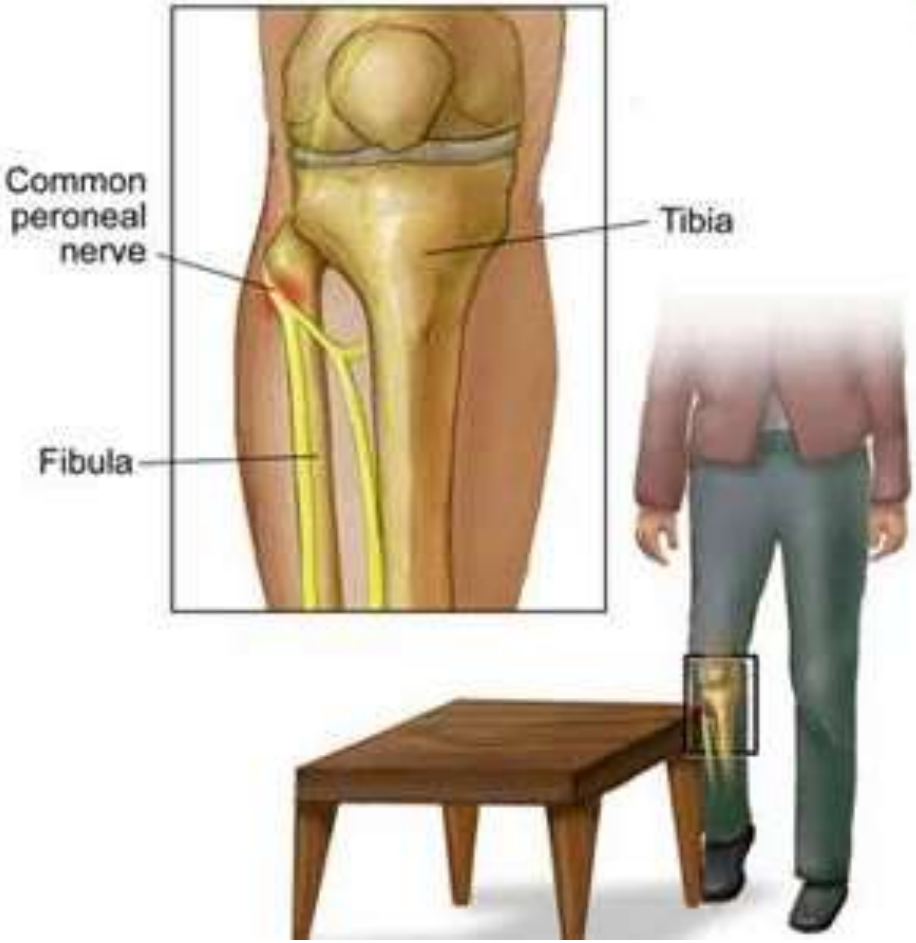
COMMON PERONEAL NERVE INJURY

TRAUMA



Broken fibula causes damage to peroneal nerve

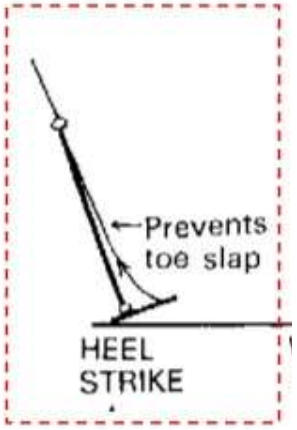
COMPRESSION



Common peroneal nerve injury

Deformity

- Abnormal gait (steppage gait): the patient raises the foot higher than usual and brings it down suddenly making a flapping noise since otherwise his toes drag and the tip of the shoe scratches the ground



Cause

- Paralysis of muscles of the extensor and peroneal compartments. The weight of the foot causes it to be plantar flexed.

Surgical treatment:

- Rerouting tibialis posterior to the front. Tibialis posterior is supplied by the tibial nerve.

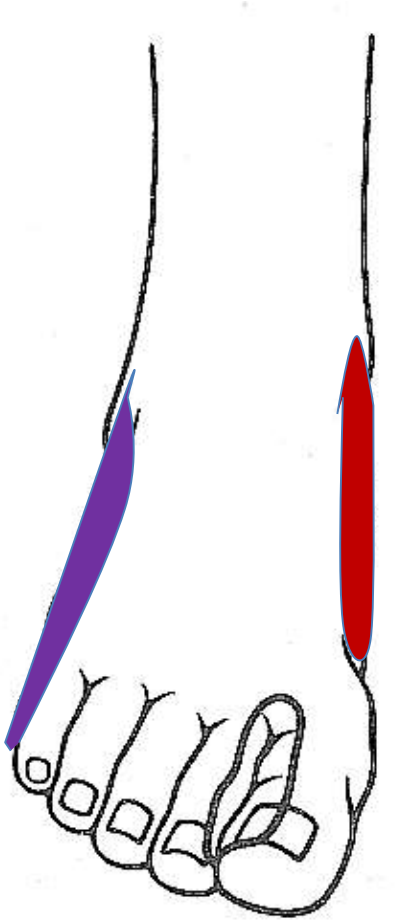
Dr. Akram Jaffar

Common peroneal nerve injury

Loss of SENSATION of dorsum of foot except:

At the *lateral* border of foot and lateral side of little toe (sural n).

At the *medial* border of foot as far as the ball of big toe (saphenous n).




nous nerve
Saphenous nerve
Superficial fibular nerve
Sural nerve
Deep fibular nerve
Lateral plantar nerve
Medial plantar nerve

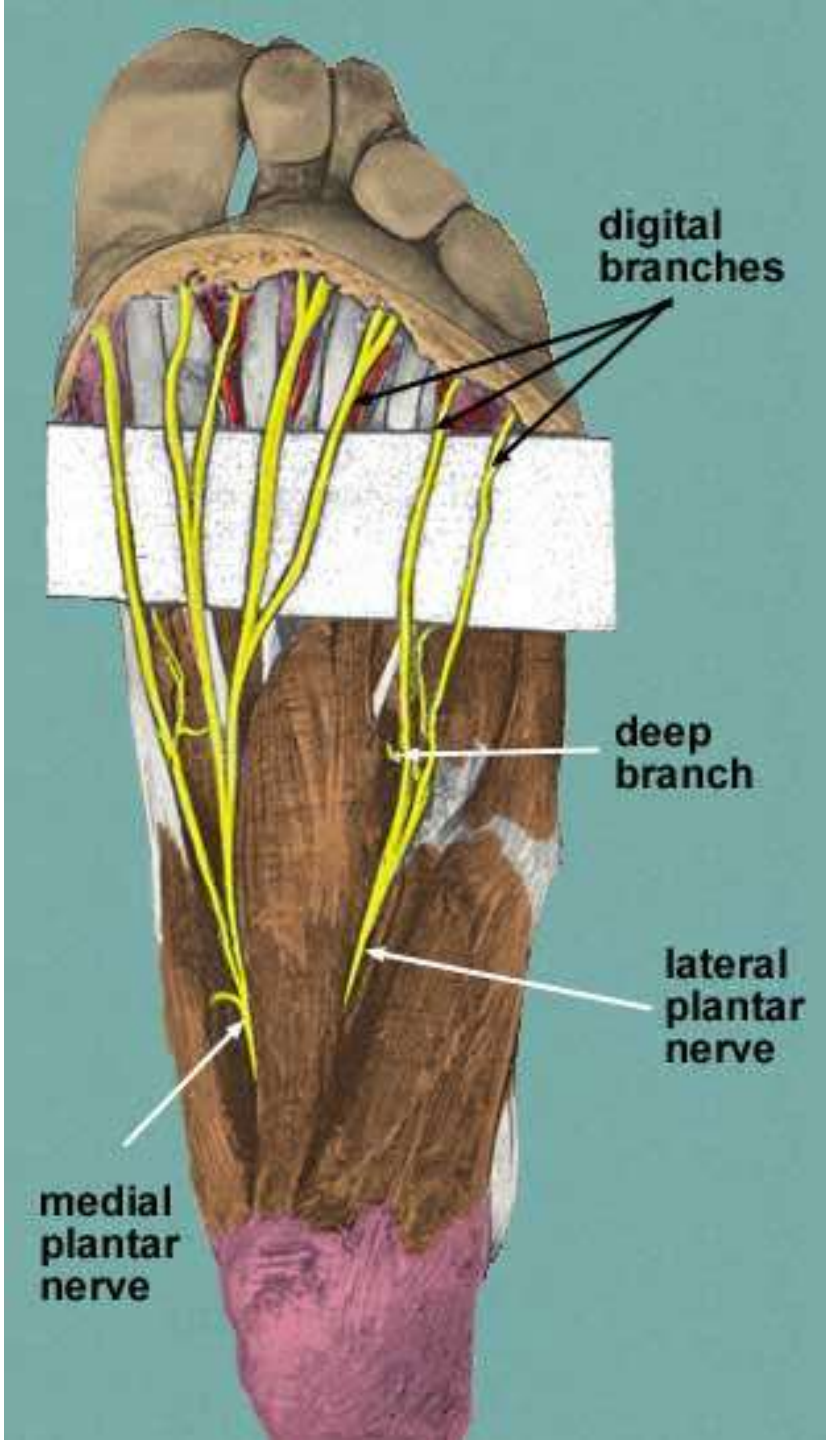
Tibial nerve
L4,5 & **S** 1,2,3

cutaneous: (*sural n*)

muscular : *gastrocnemius,*
soleus,
plantaris
popliteus

ms posterior comp of *the leg*

It divides into *medial & lateral plantar nerves* beneath flexor retinaculum



Action of muscles of post.compartment (supplied by tibial n)

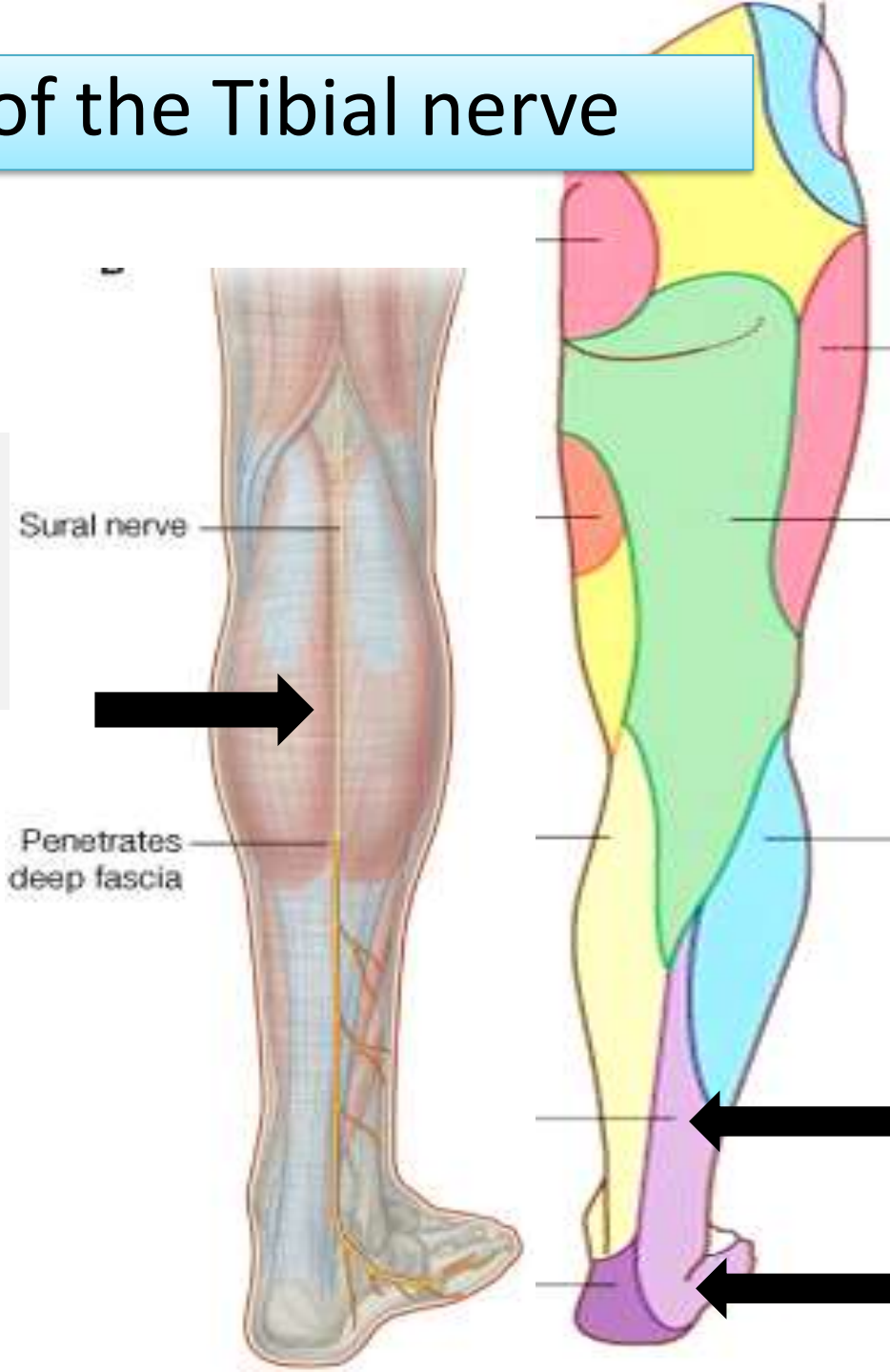
PLANTAR FLEXION

INVERSION

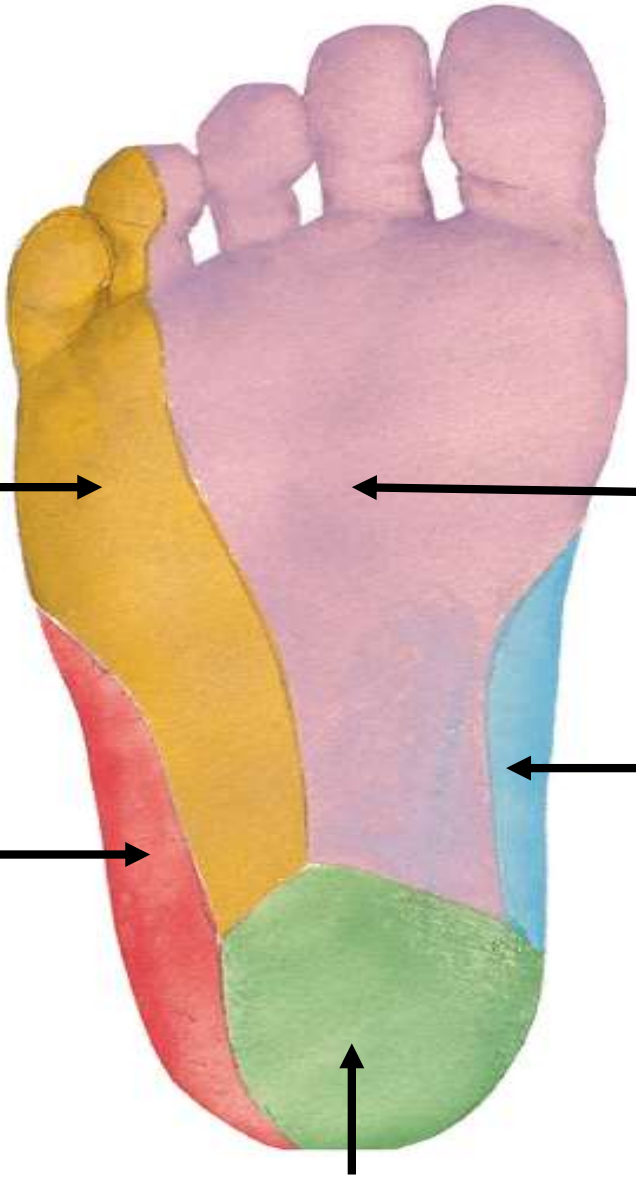
Cutanous distribution of the Tibial nerve

SURAL NERVE

Supply skin of :
lower 1/3 of leg (post-lat) &
lat. border of foot & little toe



Cutanous distribution of the Tibial nerve



Lateral plantar nerve

Medial plantar nerve

Saphenous

Sural nerve

Calcanean brs of tibial n

TIBIAL NERVE INJURY (MOTOR)

- All the muscles in the ***back of the leg*** and the ***sole of the foot*** are paralyzed.
- Loss of plantar flexion & ***weak*** inversion of foot.
- Test : stand on tiptoes

DORSIFLEXION

PLANTAR FLEXION

anterior leg muscles

Ms of back of the leg

deep peroneal nerve

Tibial nerve


Faculty of Medicine
كلية الطب البشري
The Hashemite University


الجامعة الهاشمية
The Hashemite University

Thank you