

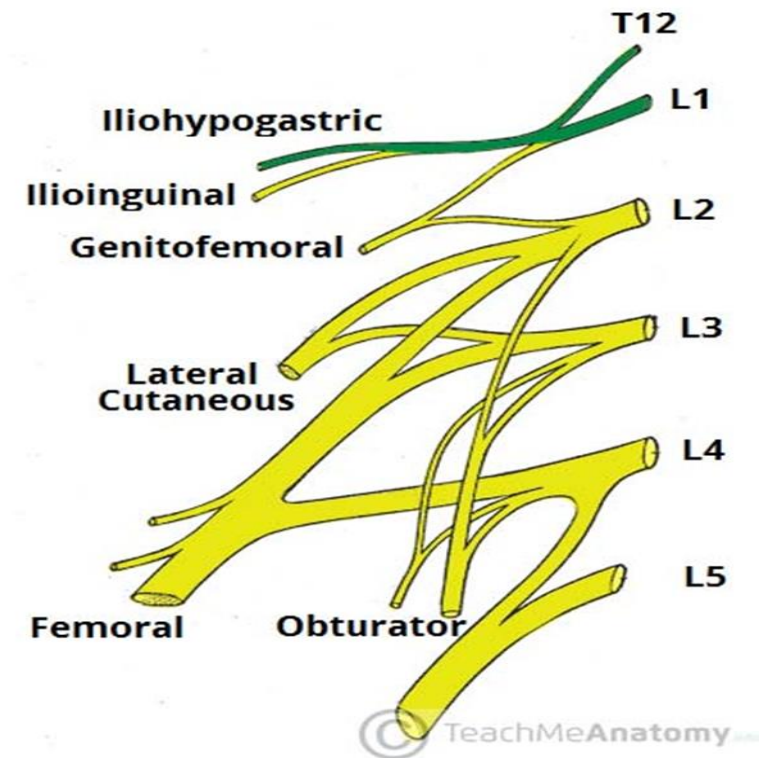
Nerves of lower limb

Dr. Attaullah DPT, MSPT*

Khyber Medical University

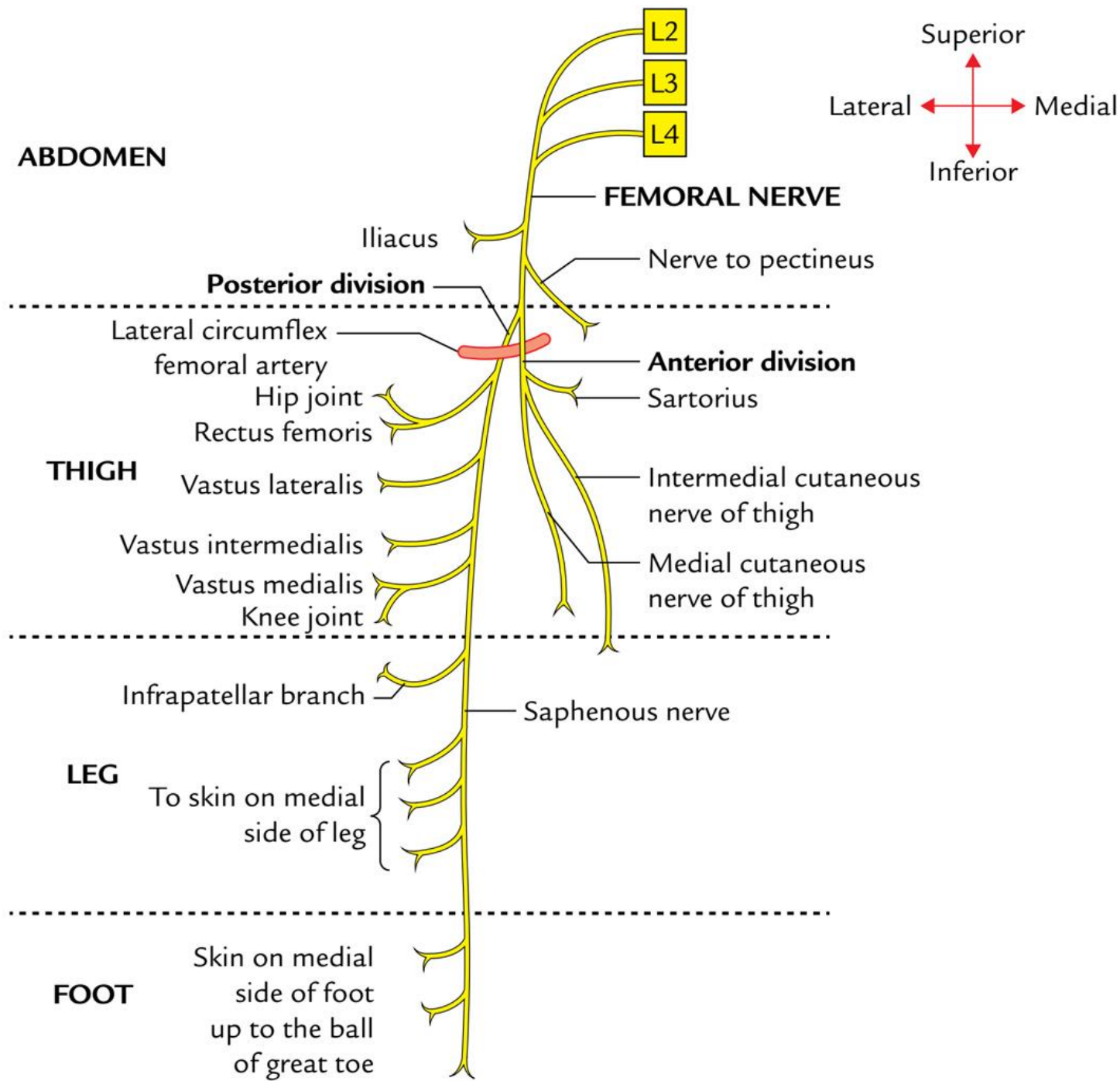
Introduction

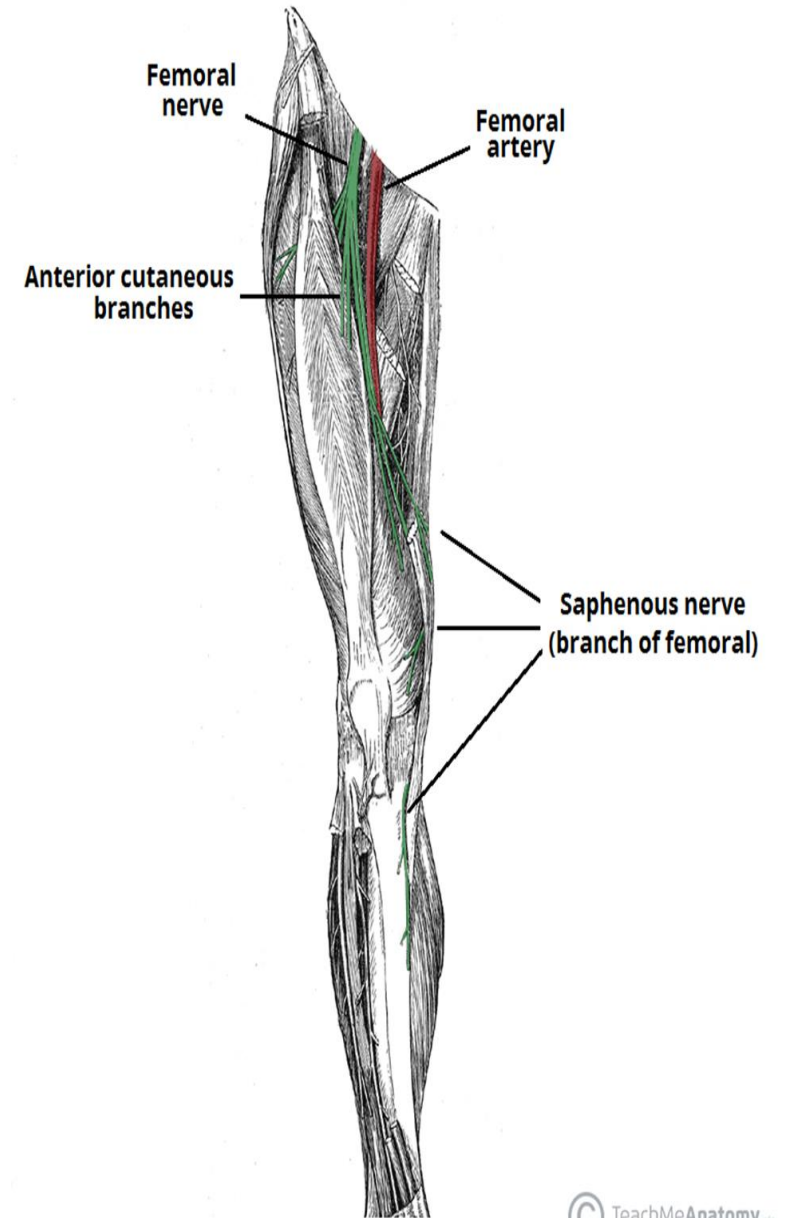
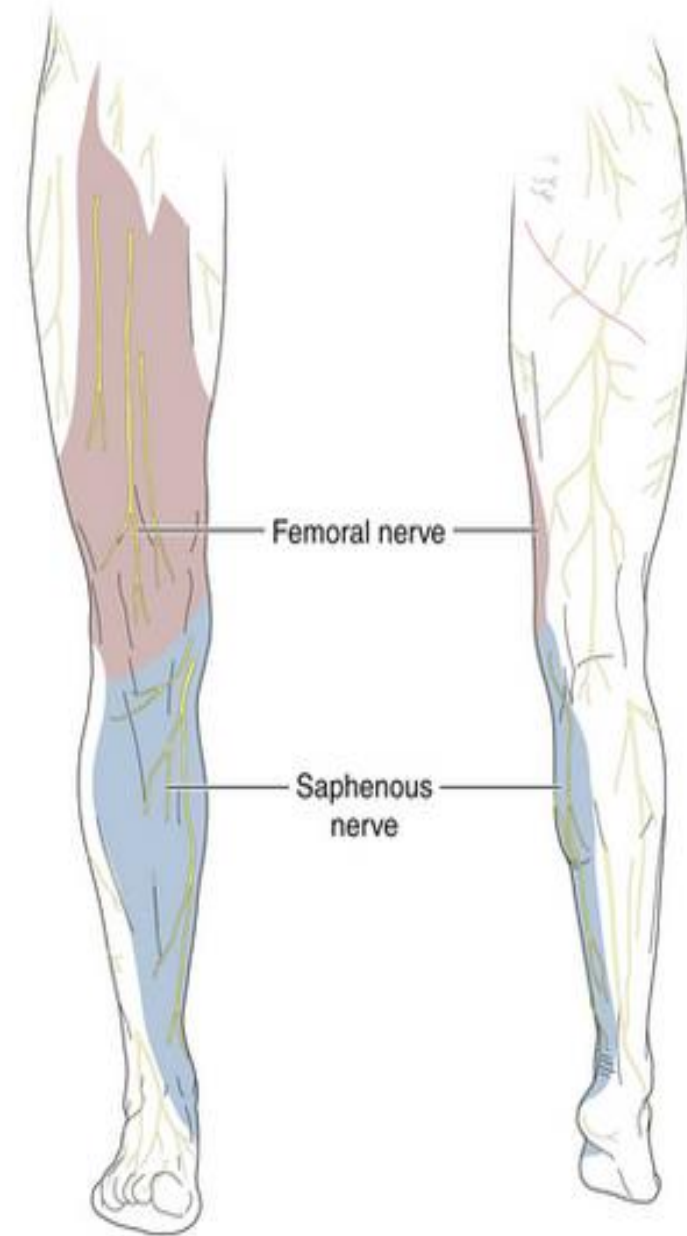
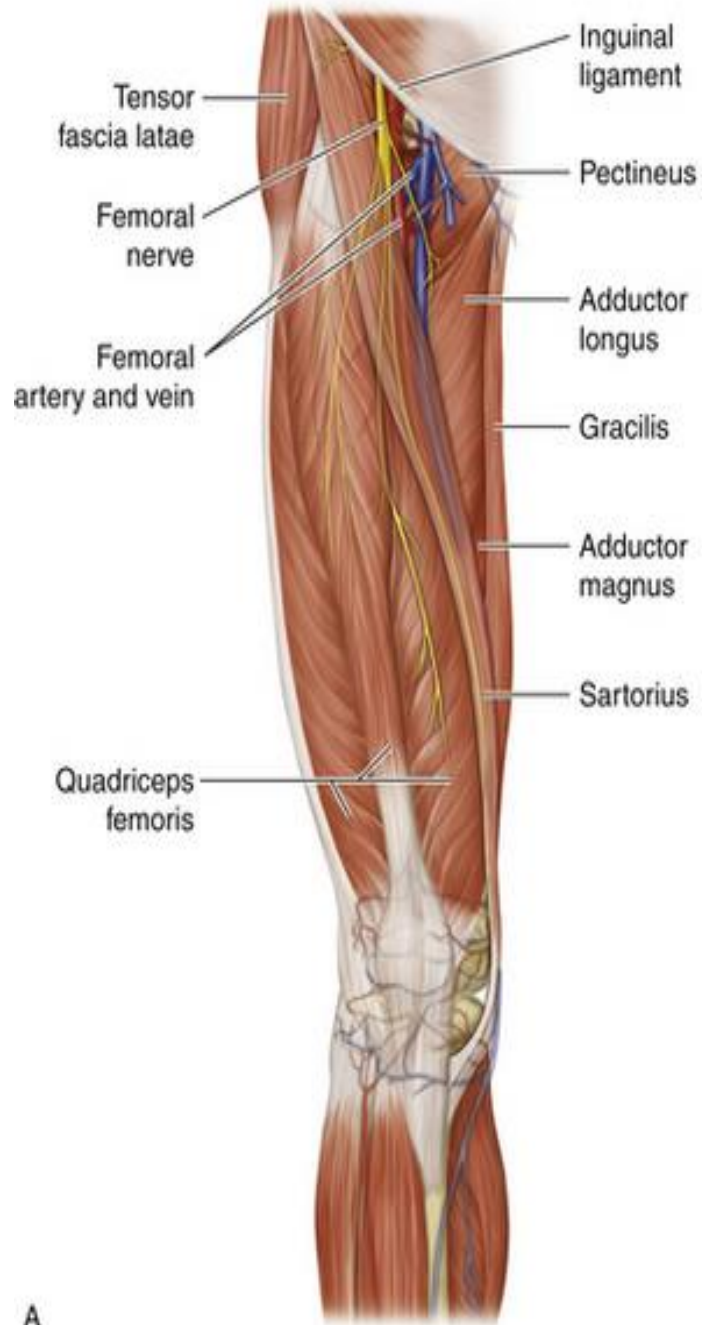
- The Nerves of the lower limb originate from lumbar and sacral nerves while creating the lumbar plexus (L1-L4) in the posterior abdominal wall and the sacral plexus (L4-S4) in the pelvis.
- The primary nerves of the lower limb are as follows:
 - Femoral nerve.
 - Obturator nerve.
 - Sciatic nerve.
 - Tibial nerve.
 - Common peroneal nerve.
 - Superficial peroneal nerve.
 - Deep peroneal nerve.



Femoral nerve

- The **femoral nerve** is one of the major peripheral nerves of the lower limb.
- **Nerve roots:** L2-L4
- **Motor functions:** Innervates the anterior thigh muscles that flex the hip joint (pectineus, iliacus, sartorius) and extend the knee (quadriceps femoris: rectus femoris, vastus lateralis, vastus medialis and vastus intermedius),
- **Sensory functions:** Supplies cutaneous branches to the anteromedial thigh (anterior cutaneous branches of the femoral nerve) and the medial side of the leg and foot (saphenous nerve).





A

B

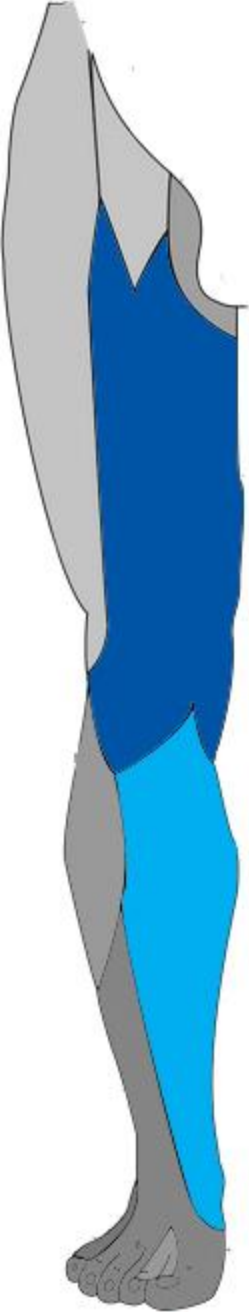
Anterior and posterior divisions:

Anterior division of the femoral nerve	Posterior division of the femoral nerve
<ul style="list-style-type: none">•Anterior cutaneous branches•Branch to sartorius•Branch to pectineus	<ul style="list-style-type: none">•Saphenous nerve•Branches to quadriceps femoris

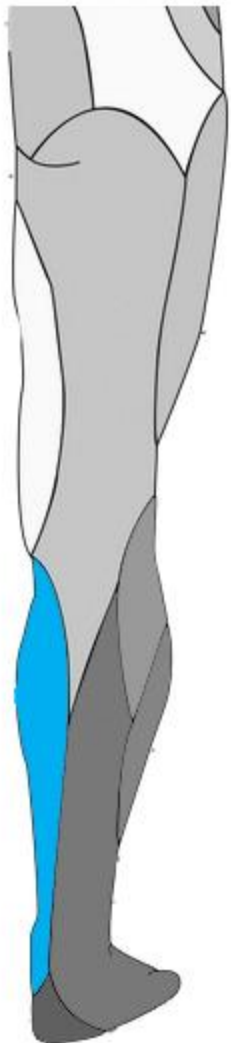
The terminal cutaneous branch of the femoral nerve is the saphenous nerve. It travels through the adductor canal (accompanied by the femoral artery and vein).

The saphenous nerve innervates the medial aspect of the leg and the foot.

- Anterior cutaneous branches (of femoral nerve)
- Saphenous nerve (branch of femoral nerve)



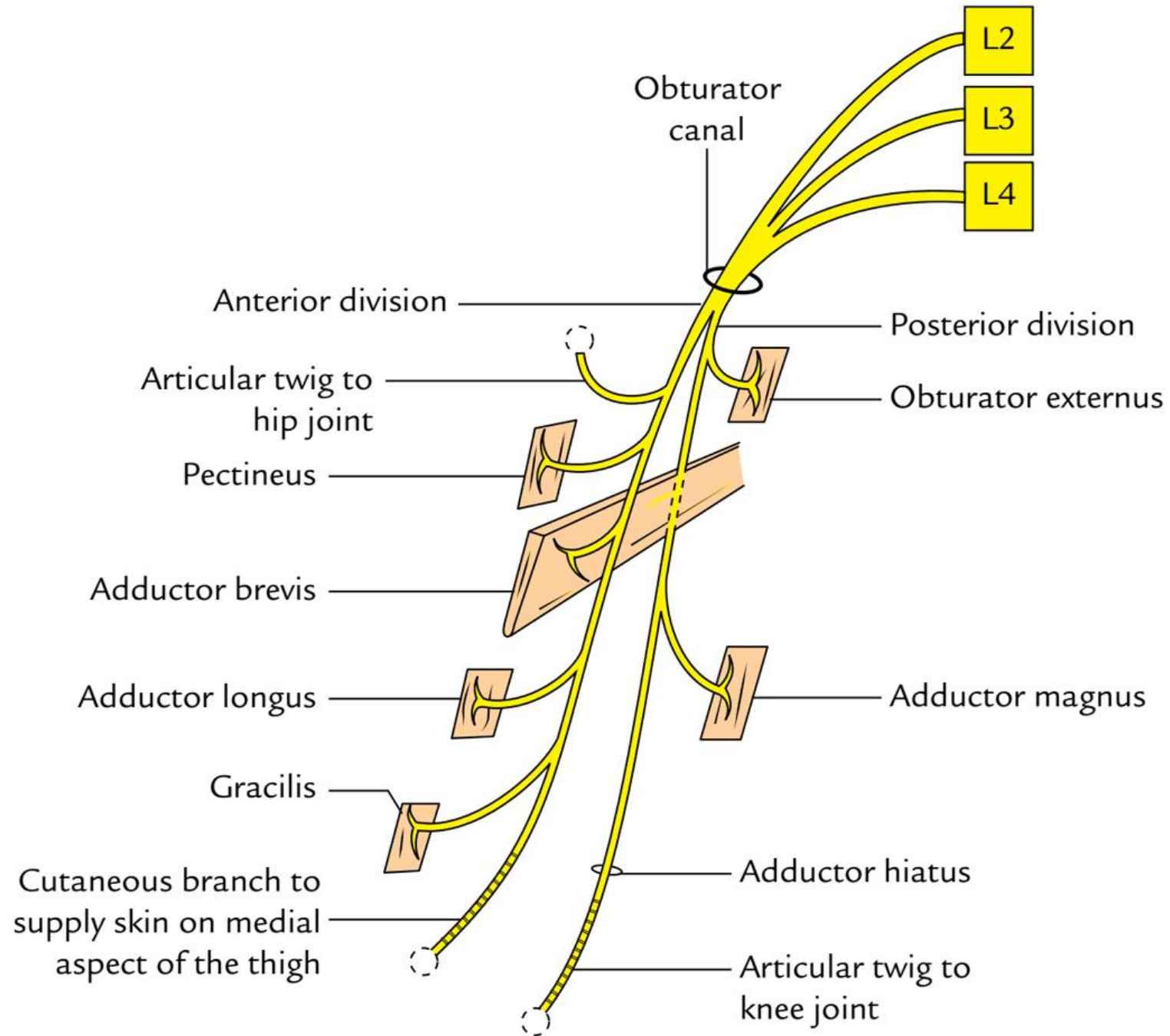
Anterior



Posterior

Obturator nerve

- The **obturator nerve** is a major peripheral nerve of the lower limb.
- **Nerve roots:** L2-L4
- **Motor functions:** Innervates the muscles of the medial compartment of the thigh (obturator externus, adductor longus, adductor brevis, adductor magnus and gracilis).
- **Sensory functions:** Cutaneous branches of the obturator nerve innervate the skin of the medial thigh

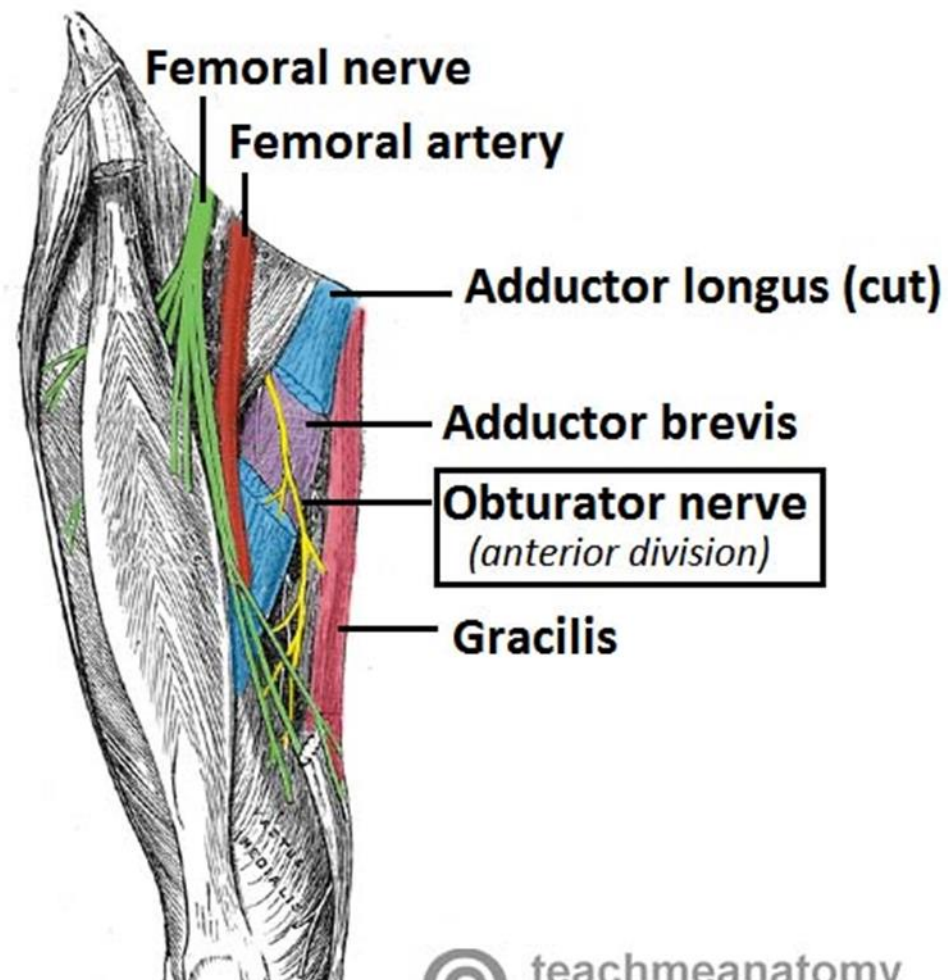
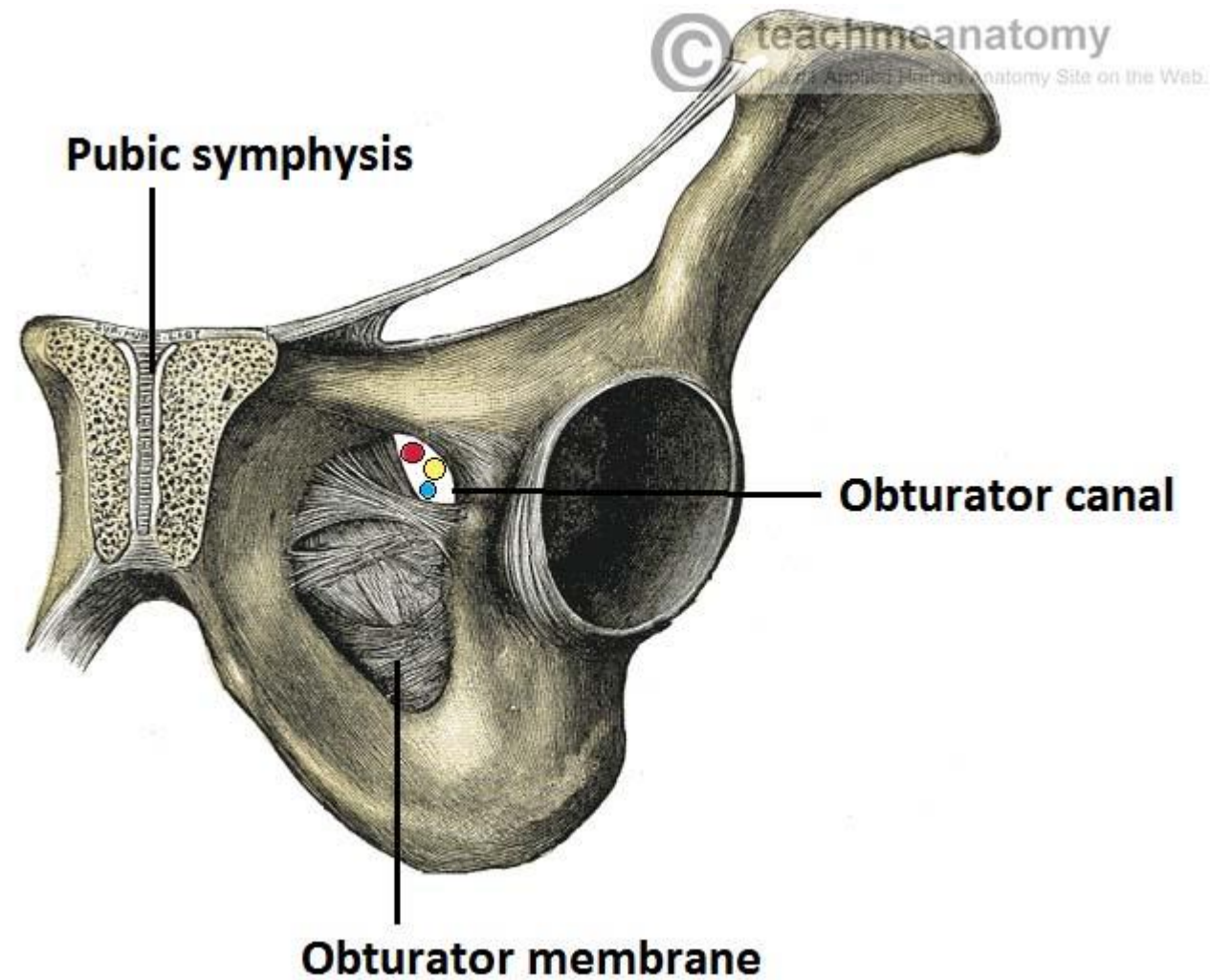


- **Anterior division:**

- Descends between the adductor longus and adductor brevis
- Here, it supplies motor fibres to the adductor longus, adductor brevis and gracilis. In rare cases, it can also supply the pectineus muscle.
- It then pierces the fascia lata to become the cutaneous branch of the obturator nerve.

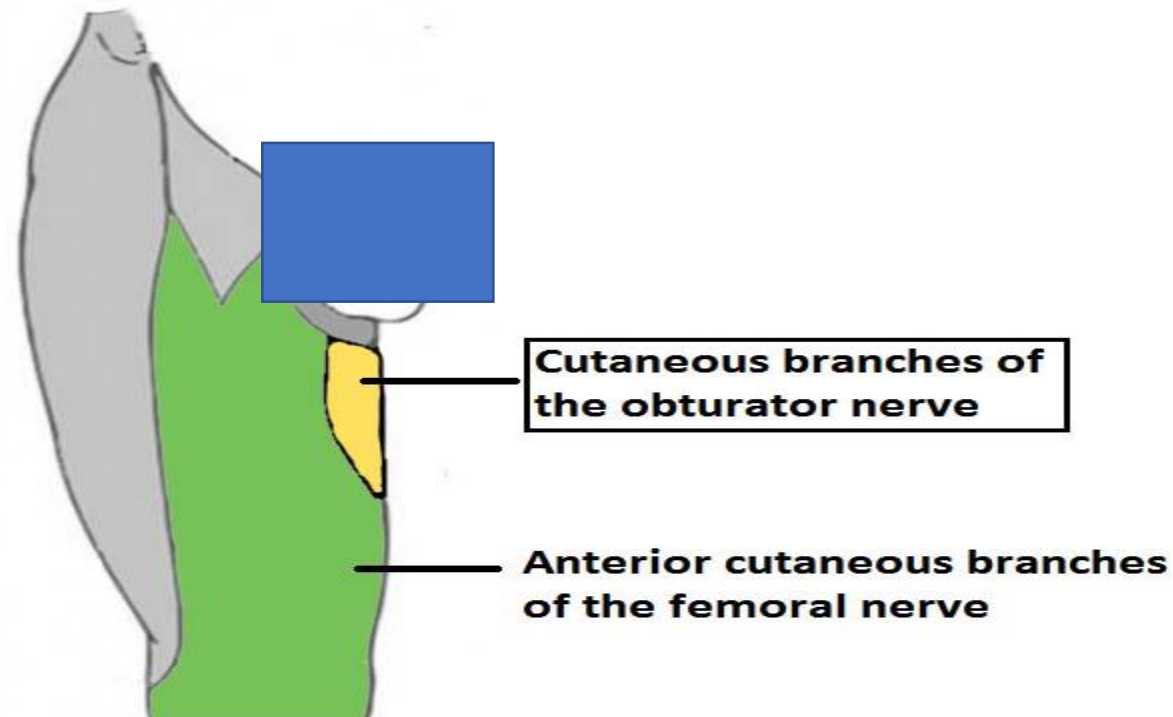
- **Posterior division:**

- Passes through the obturator externus muscle and then travels anteriorly to reach the adductor magnus.
- Innervates the obturator externus and adductor magnus muscles.



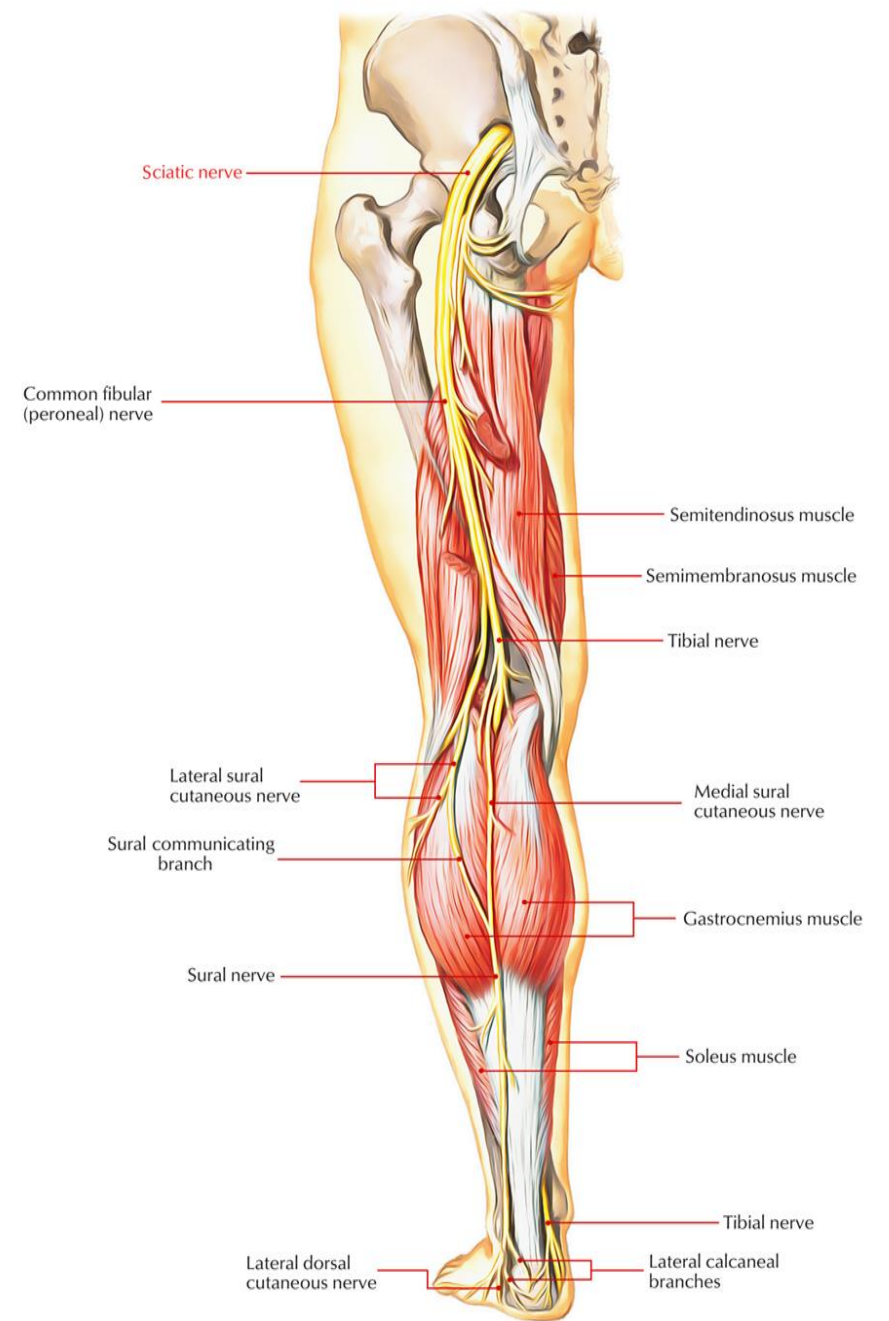
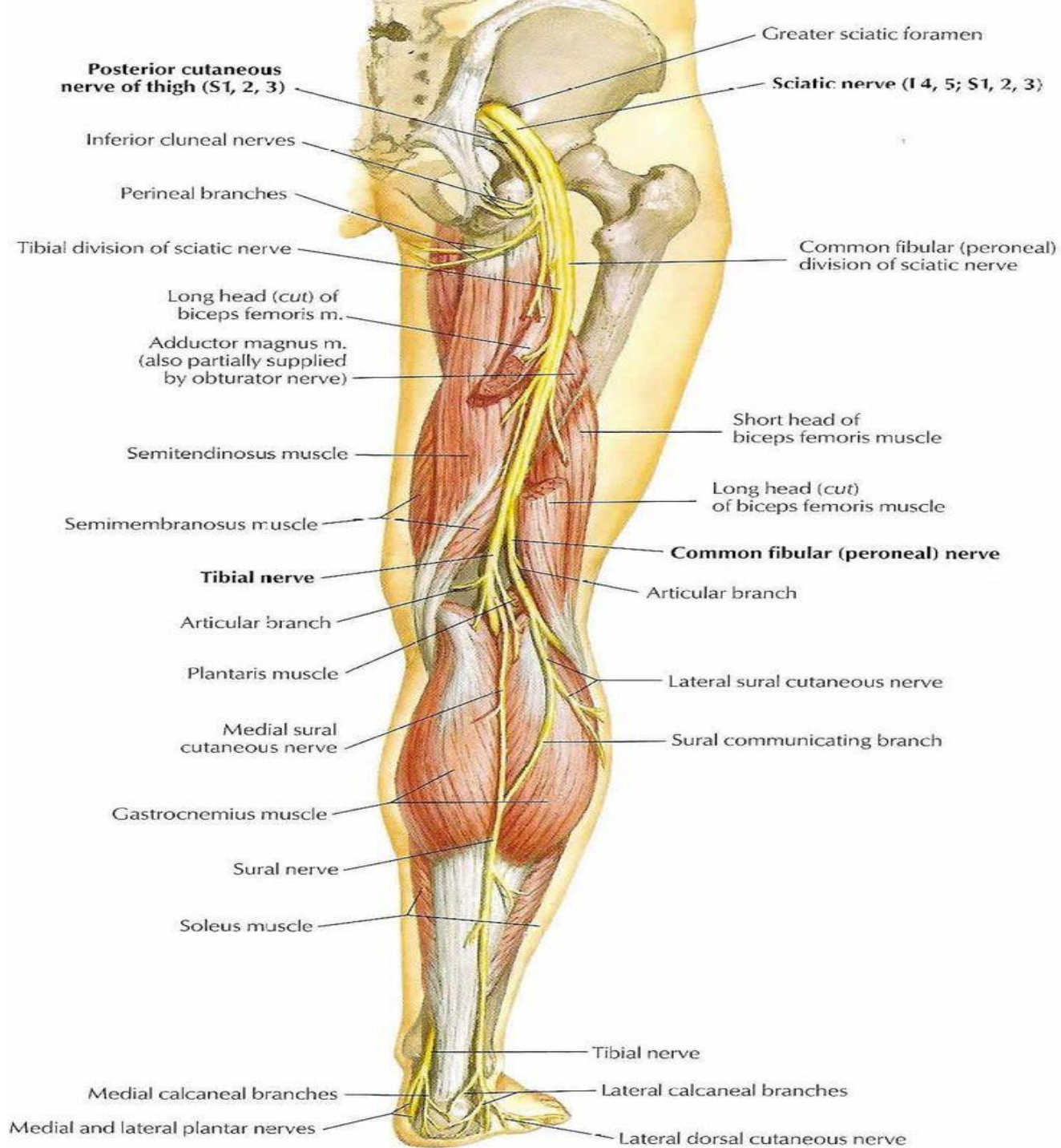
Sensory Function

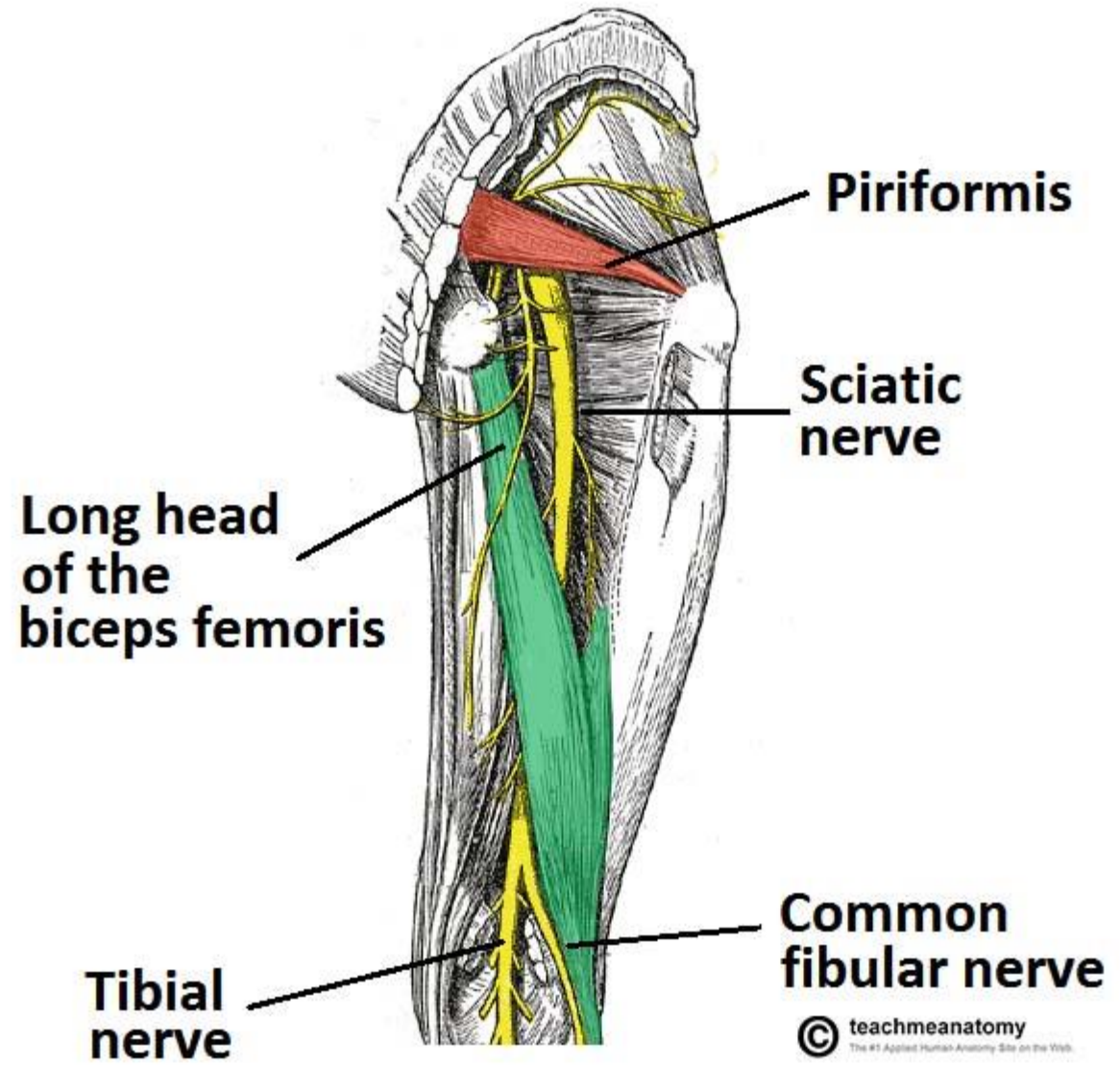
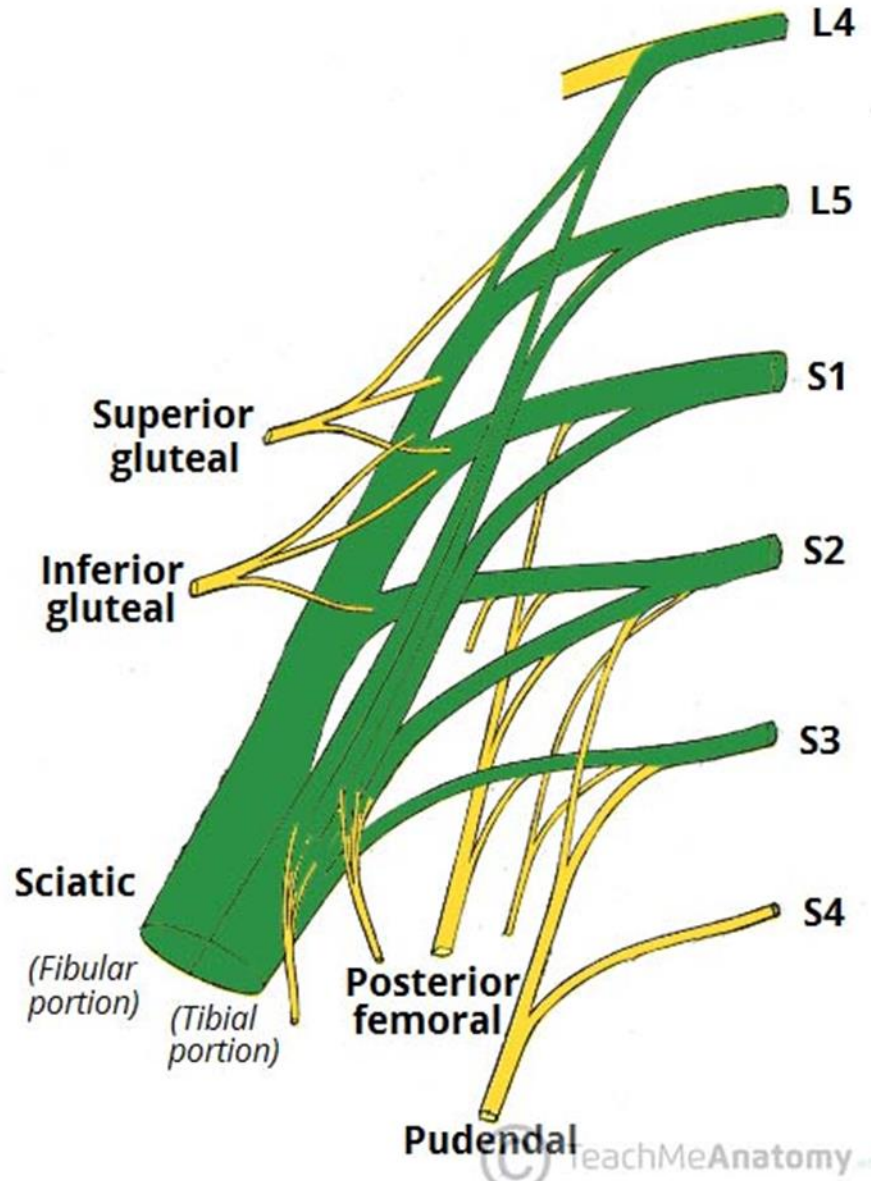
- The cutaneous branch of the obturator nerve supplies the skin of the middle part of the **medial thigh**.

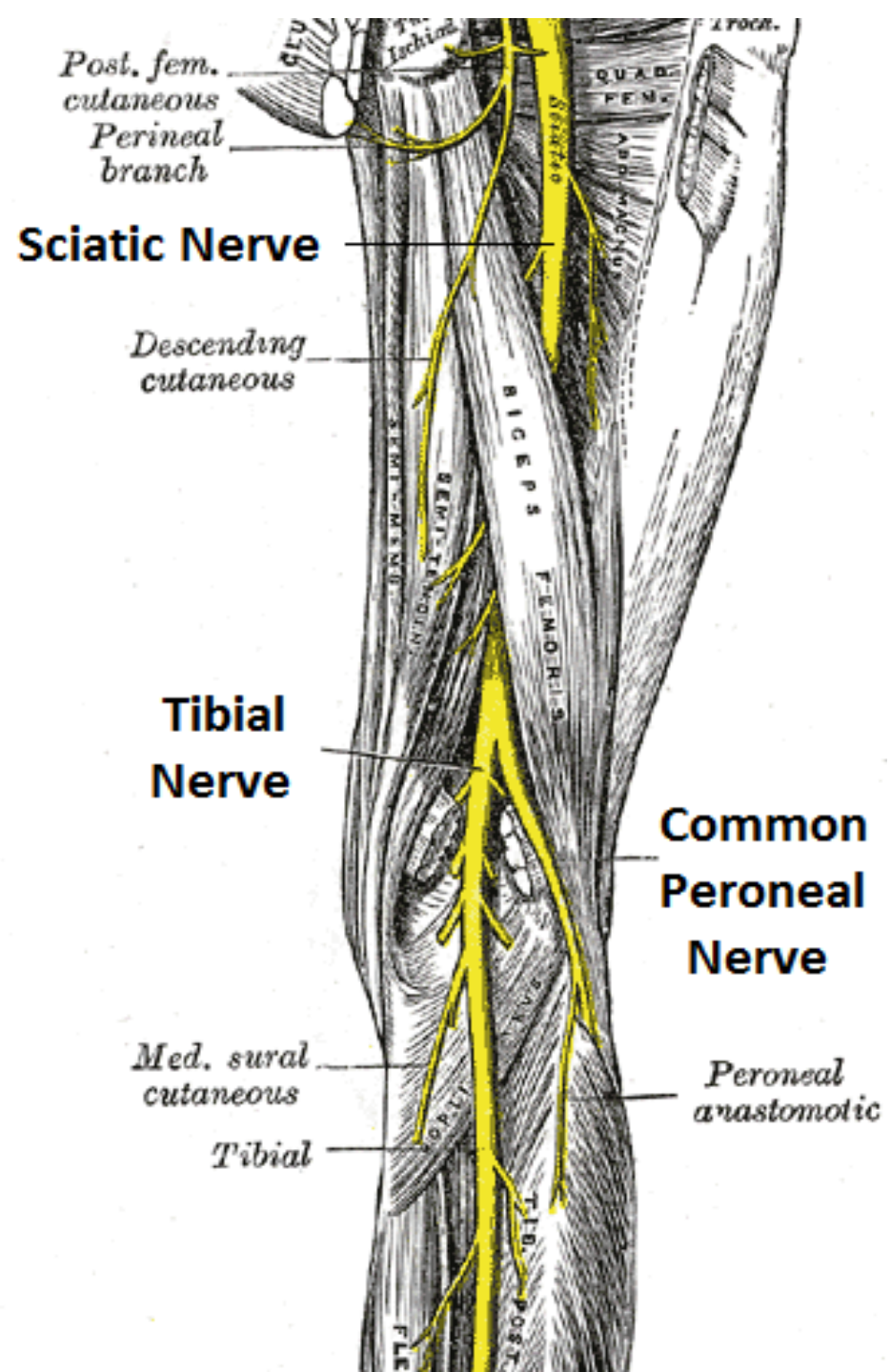
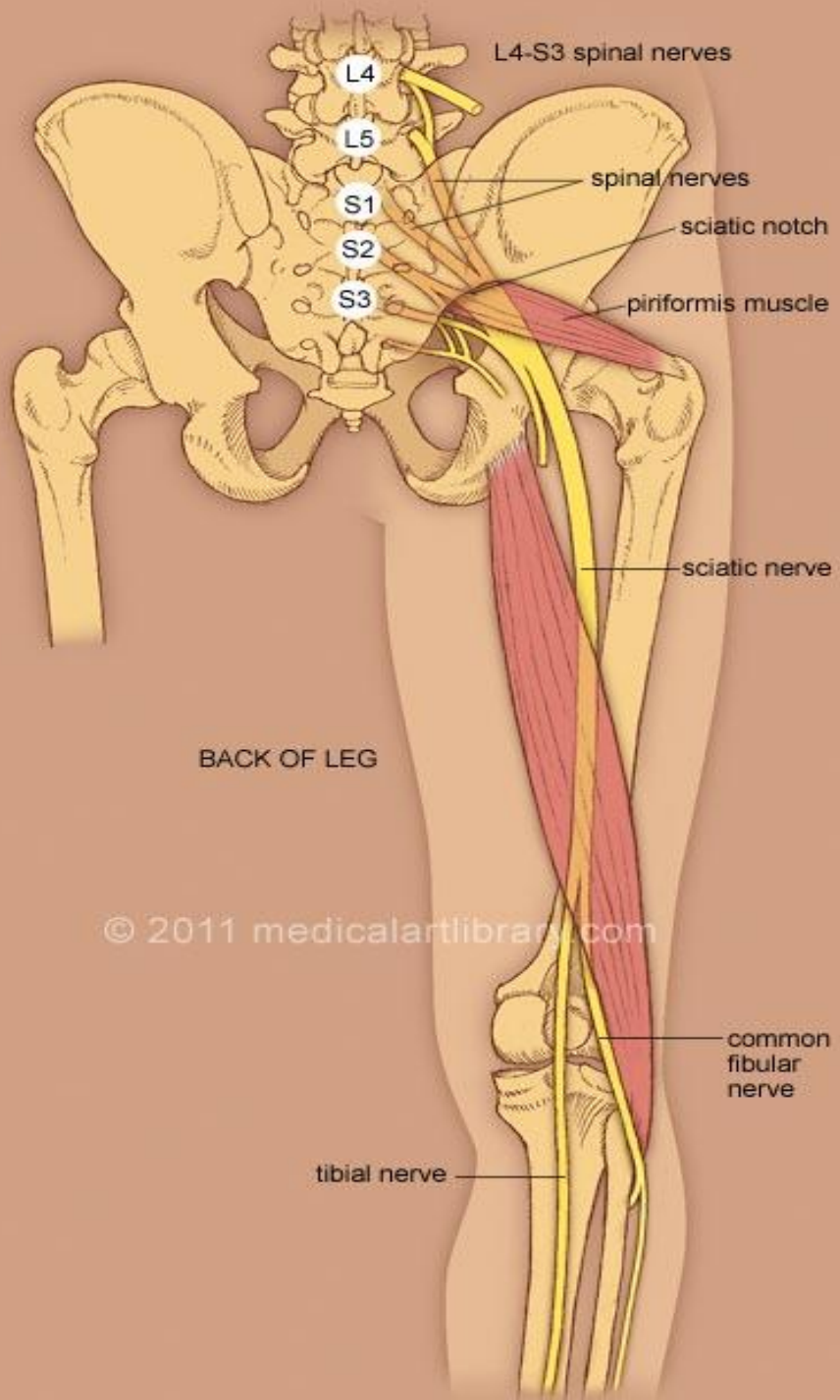


Sciatic nerve

- The **sciatic nerve** is a major nerve of the lower limb. It is a thick flat band, approximately 2cm wide – the largest nerve in the body.
- **Nerve roots:** L4-S3.
- **Motor functions:**
 - Innervates the muscles of the posterior thigh (biceps femoris, semimembranosus and semitendinosus) and the hamstring portion of the adductor magnus (remaining portion of which is supplied by the obturator nerve).
 - Indirectly innervates (via its terminal branches) all the muscles of the leg and foot.
- **Sensory functions:** No direct sensory functions in thigh region .(Indirectly innervates (via its terminal branches) the skin of the lateral leg, heel, and both the dorsal and plantar surfaces of the foot)



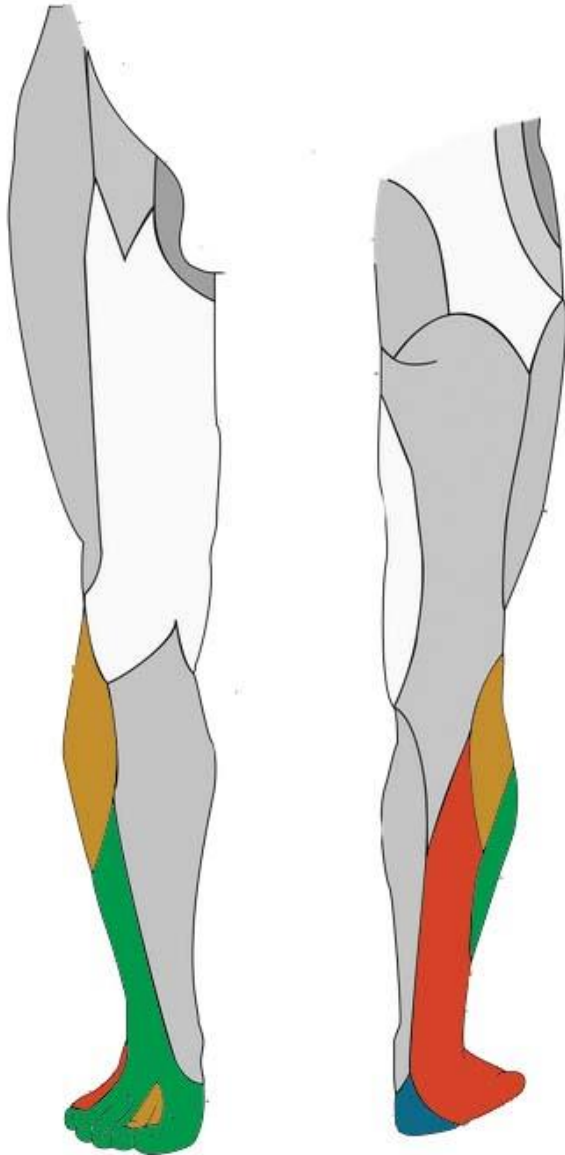


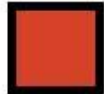
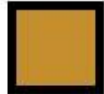




Motor Functions

- Although the sciatic nerve passes through the **gluteal region**, it does **not innervate any muscles there**. However, the sciatic nerve does directly innervate the muscles in the posterior compartment of the thigh and the hamstring portion of the **adductor magnus**.
- The sciatic nerve also indirectly innervates several other muscles, via its two terminal branches:
- **Tibial nerve** – the muscles of the posterior leg (calf muscles), and some of the intrinsic muscles of the foot.
- **Common fibular nerve** – the muscles of the anterior leg, lateral leg, and the remaining intrinsic foot muscles.
- ***IN TOTAL, THE SCIATIC NERVE INNERVATES THE MUSCLES OF THE POSTERIOR THIGH, ENTIRE LEG AND ENTIRE FOOT.***

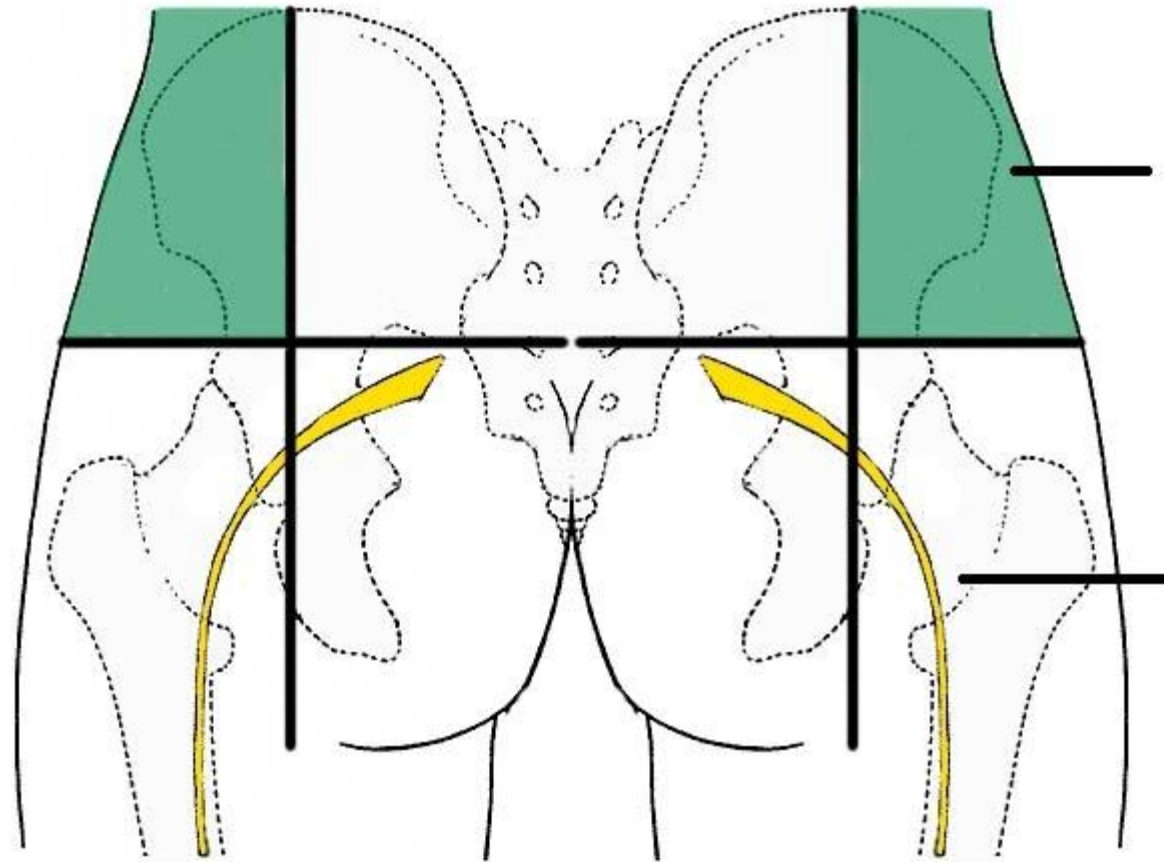
Sensory Innervation of the Sciatic Nerve



-  **Sural nerve** (*formed by branches of the common fibular and tibial nerves*)
-  **Deep fibular nerve** (*a branch of the common fibular nerve*)
-  **Superficial fibular nerve** (*a branch of the common fibular nerve*)
-  **Medial calcaneal branches** (*branches of the tibial nerve*)

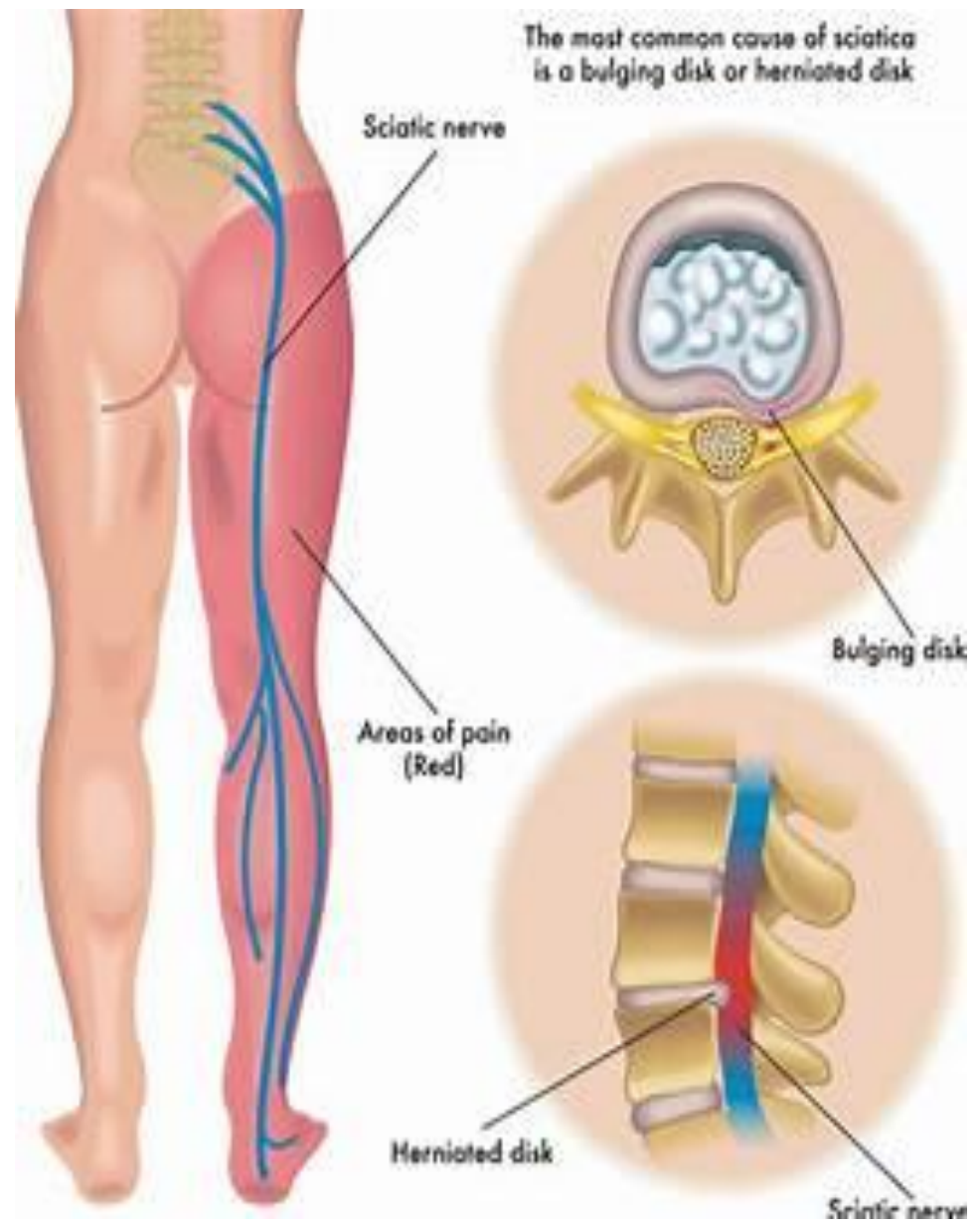
Clinical Relevance: Intramuscular Injections

- The anatomical course of the sciatic nerve must be considered when administering **intramuscular** injections into the gluteal region. The region can be divided into quadrants using 2 lines, marked by bony landmarks:
- One line descends vertically from the highest point on the iliac crest.
- The other horizontal line passes through the vertical line half way between the highest point on the iliac crest and ischial tuberosity.
- The sciatic nerve passes through the lower medial quadrant. To avoid damaging the sciatic nerve therefore, intramuscular injections are given only in the upper lateral quadrant of the gluteal region.



Upper lateral quadrant

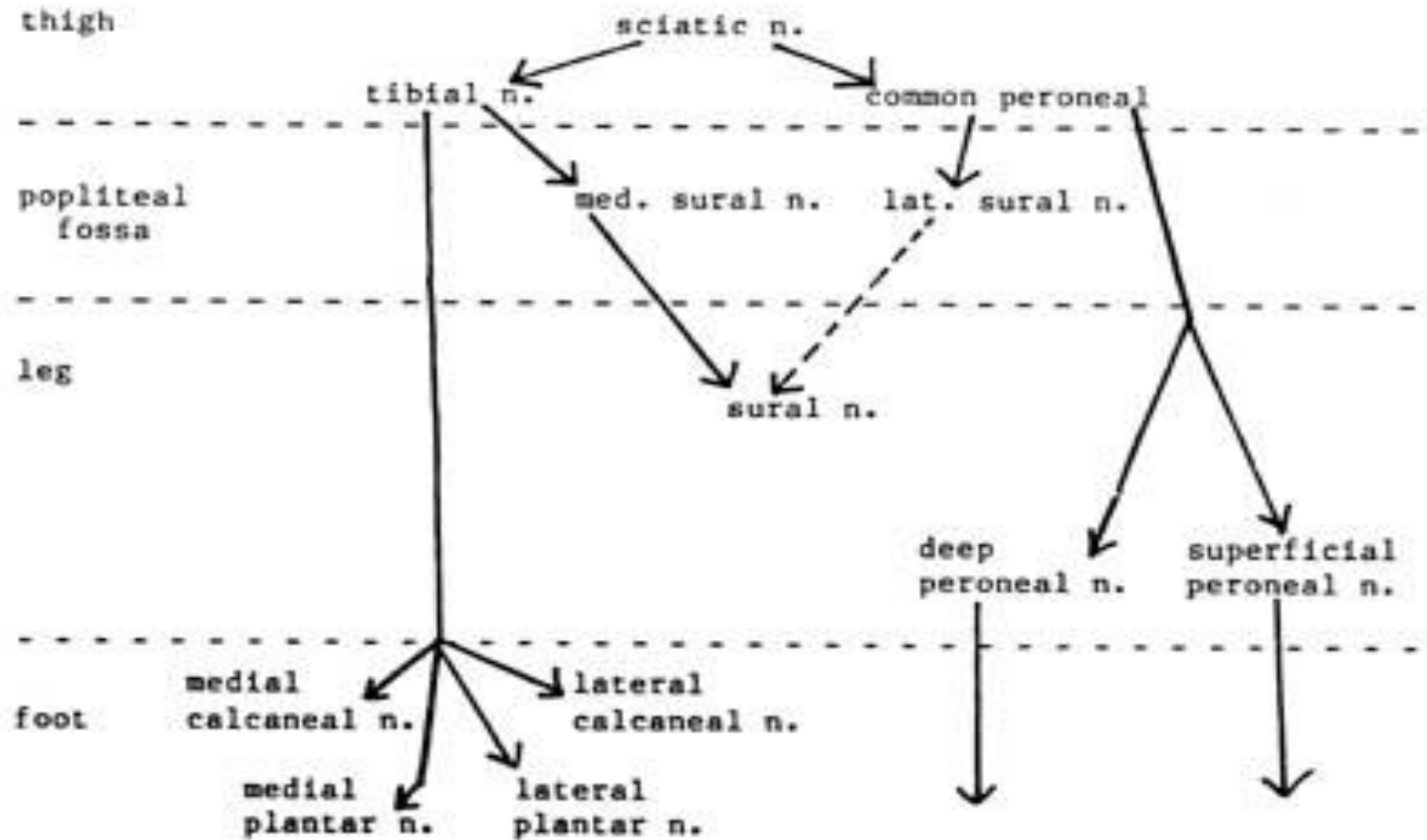
Sciatic nerve



Sleeping Foot

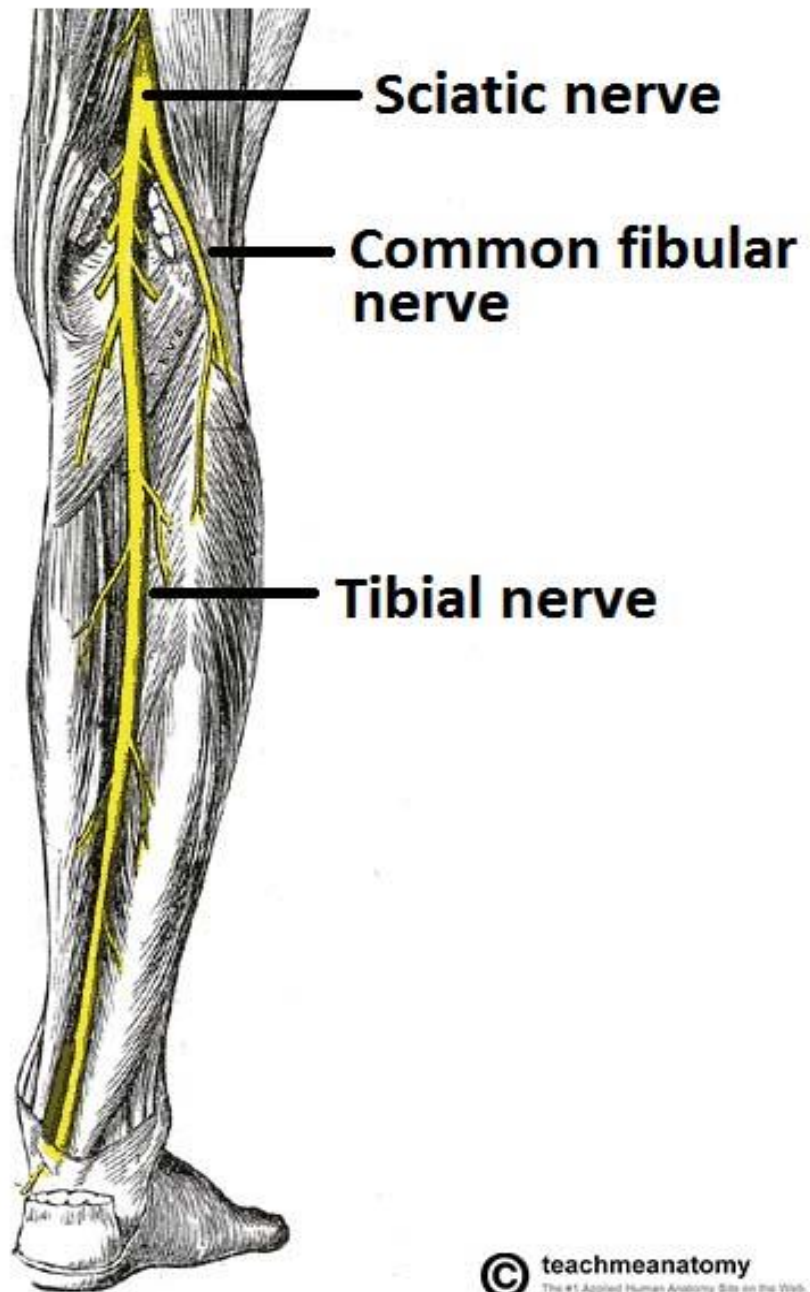
- The sciatic nerve is uncovered on the back of thigh in the angle between the lower border of gluteus maximus and long head of biceps femoris. The temporary compression of the sciatic nerve against femur at the lower border of gluteus maximus causes paresthesia in the lower limb. It's named "sleeping foot, example, when a man sits on the hard edge of the seat for a long time".

NERVES OF LOWER LEG AND FOOT



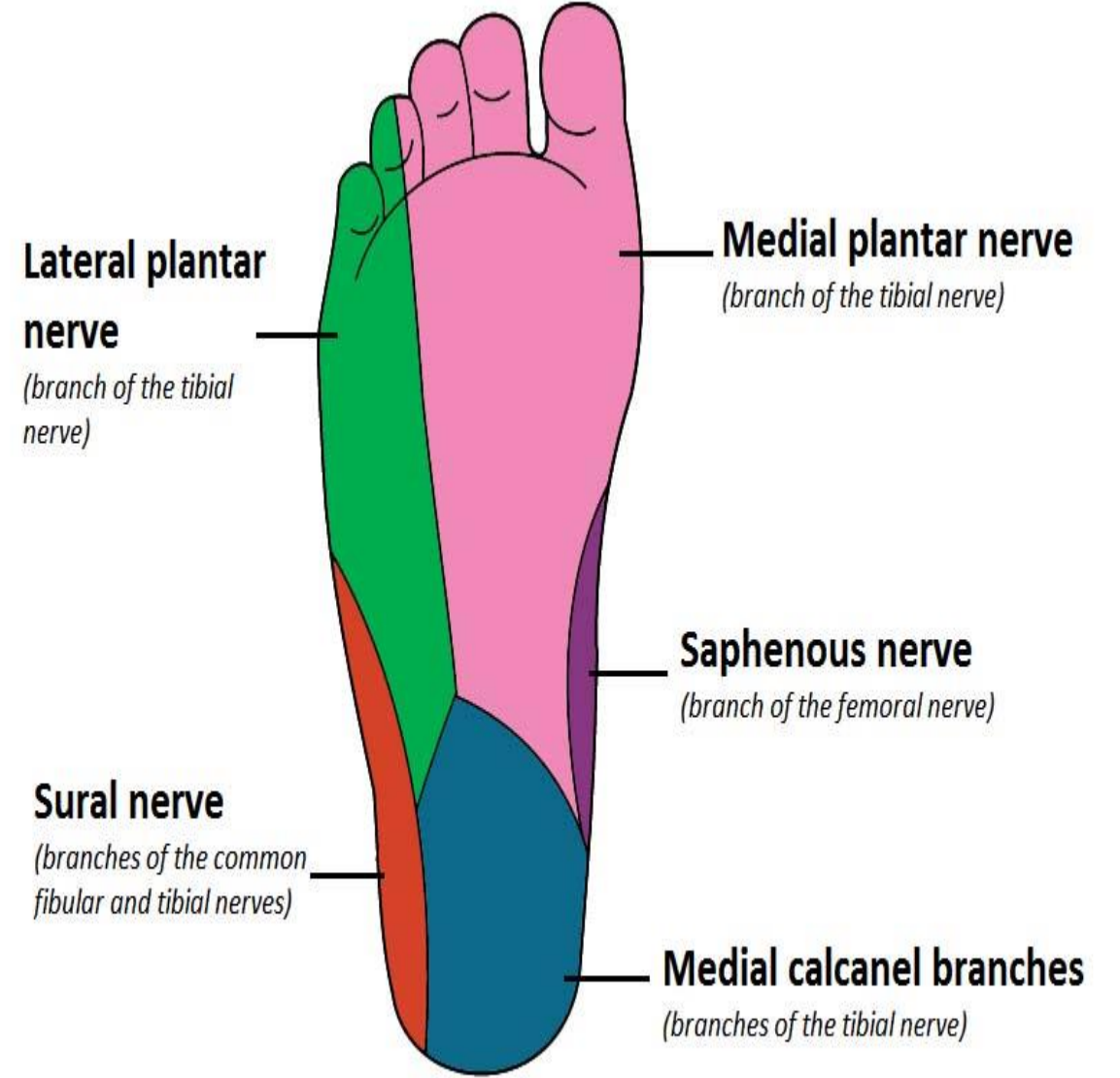
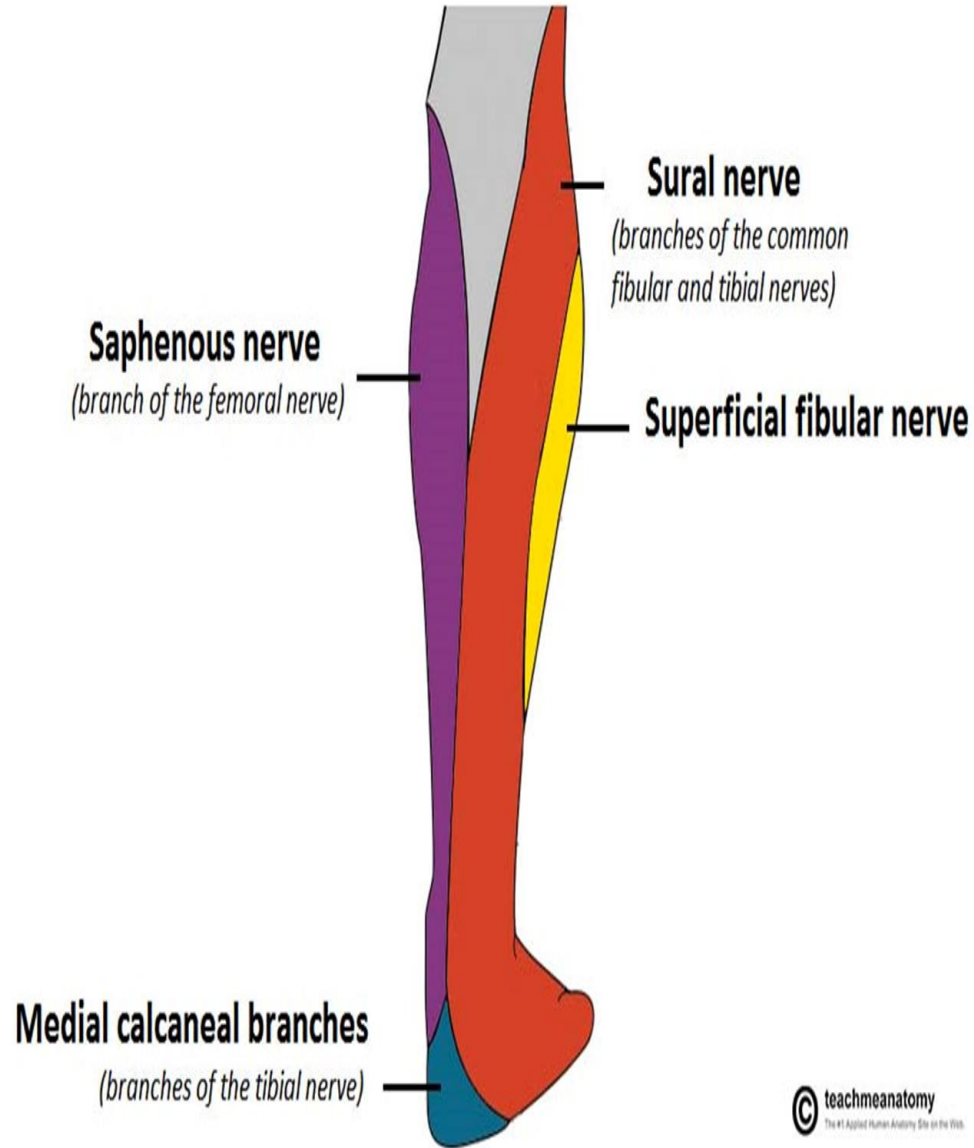
TIBIAL NERVE

- **Nerve roots:** L4-S3
- **Sensory:** Innervates the skin of the posterolateral side of the leg, lateral side of the foot, and the sole of the foot.
- **Motor:** Innervates the posterior compartment of the leg.



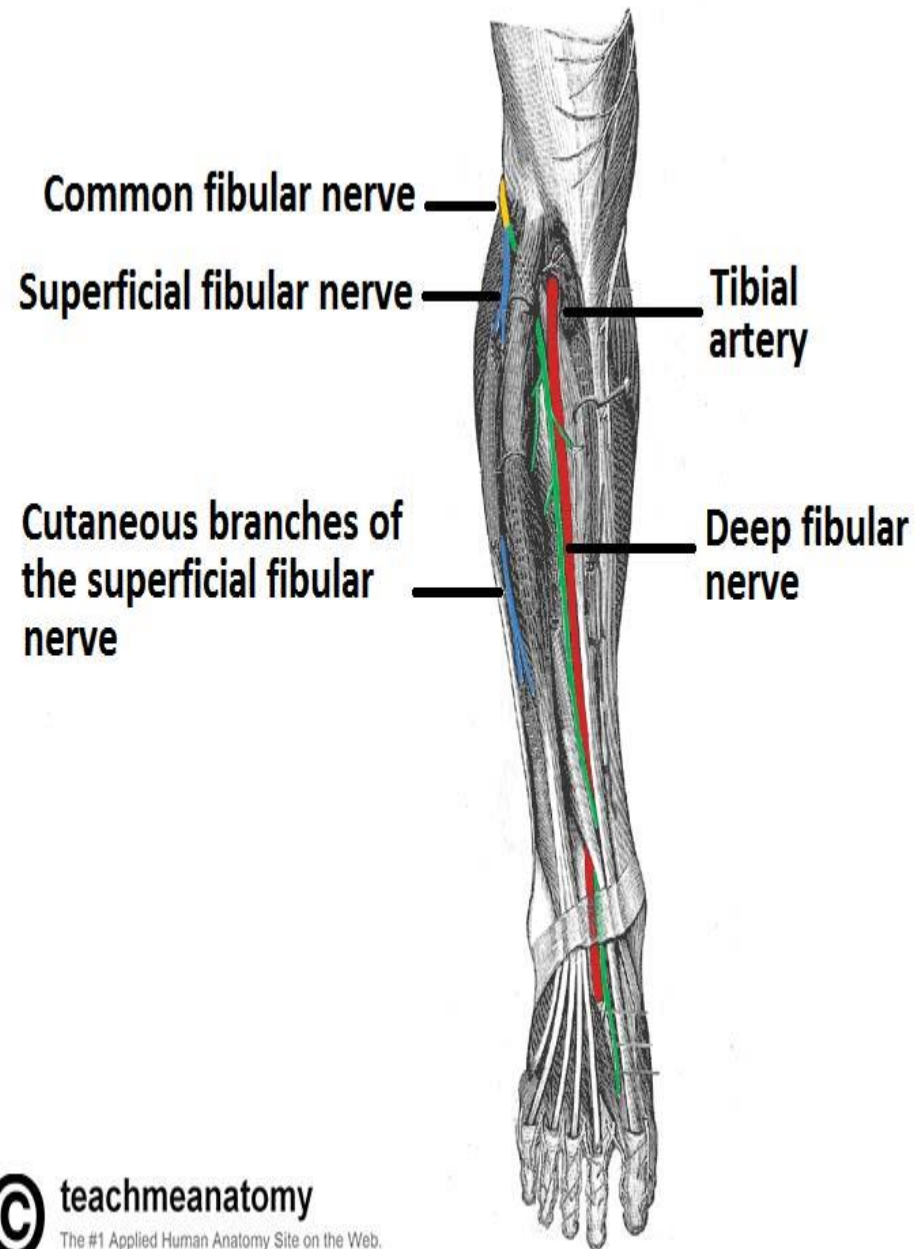
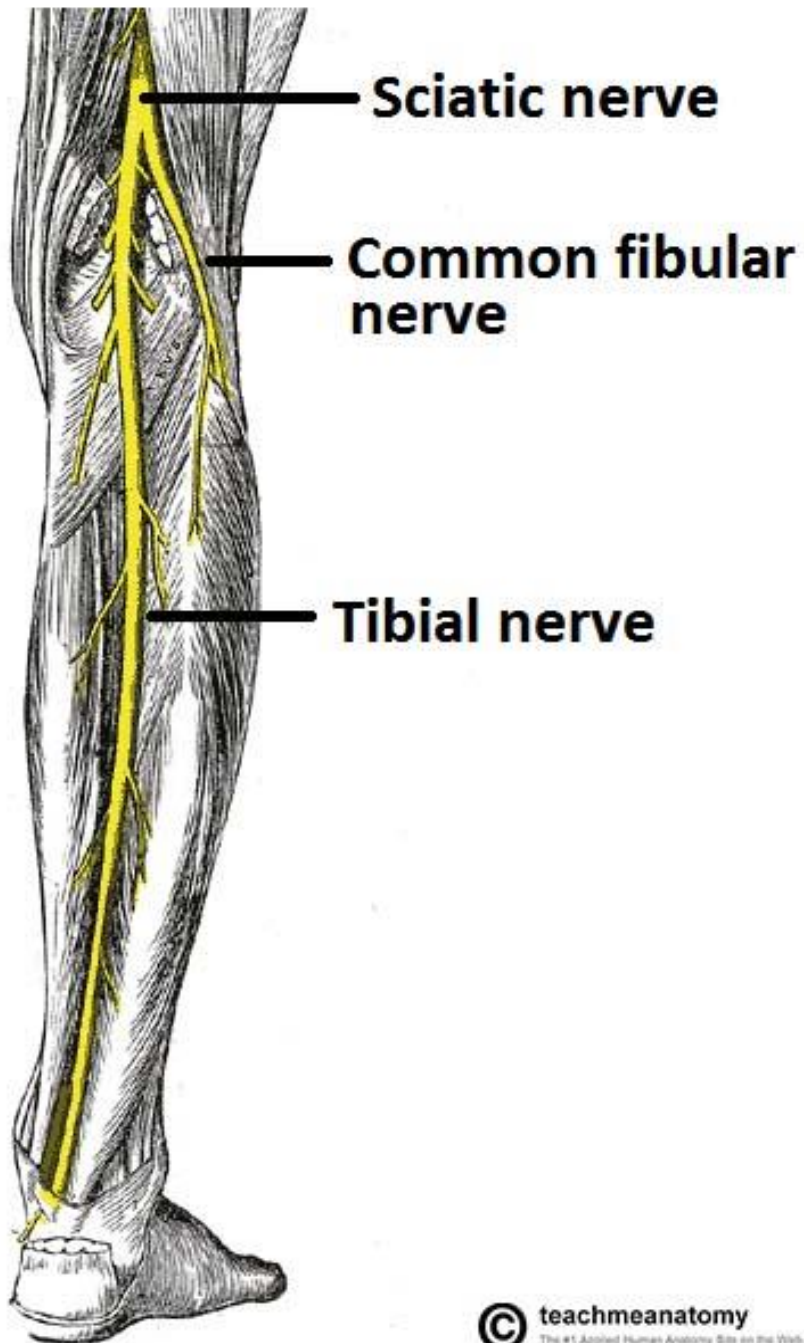
Clinical Relevance: Tarsal Tunnel Syndrome

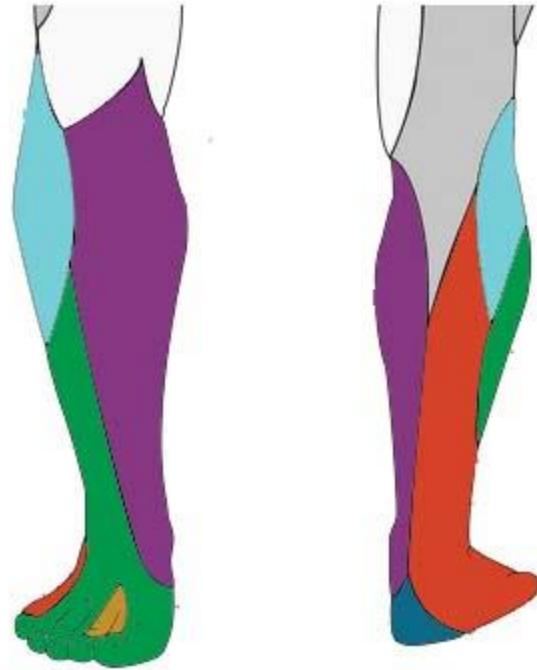
- This is a condition where the tibial nerve is compressed within the **tarsal tunnel** (posterior to the medial malleolus). There are varying causes, of which the main three are:
 - Osteoarthritis
 - Rheumatoid arthritis
 - Post-trauma ankle deformities
- Patients complain of **paraesthesia** in the ankle and sole of the foot, which can radiate up the leg slightly. It is aggravated by activity and relieved by rest.
- Tarsal tunnel symptoms can be treated conservatively by anti-inflammatory drugs and changes in footwear.
- If these interventions are not successful, the **flexor retinaculum** can be cut surgically, which releases the pressure.



THE COMMON PERONEAL NERVE (COMMON FIBULAR NERVE)

- **Nerve roots**: L4 – S2
- **Motor**: Innervates the short head of the biceps femoris directly. Also supplies (via branches) the muscles in the lateral and anterior compartments of the leg.
- **Sensory**: Innervates the skin over the upper lateral and lower posterolateral leg. Also supplies (via branches) cutaneous innervation to the skin of the anterolateral leg, and the dorsum of the foot.

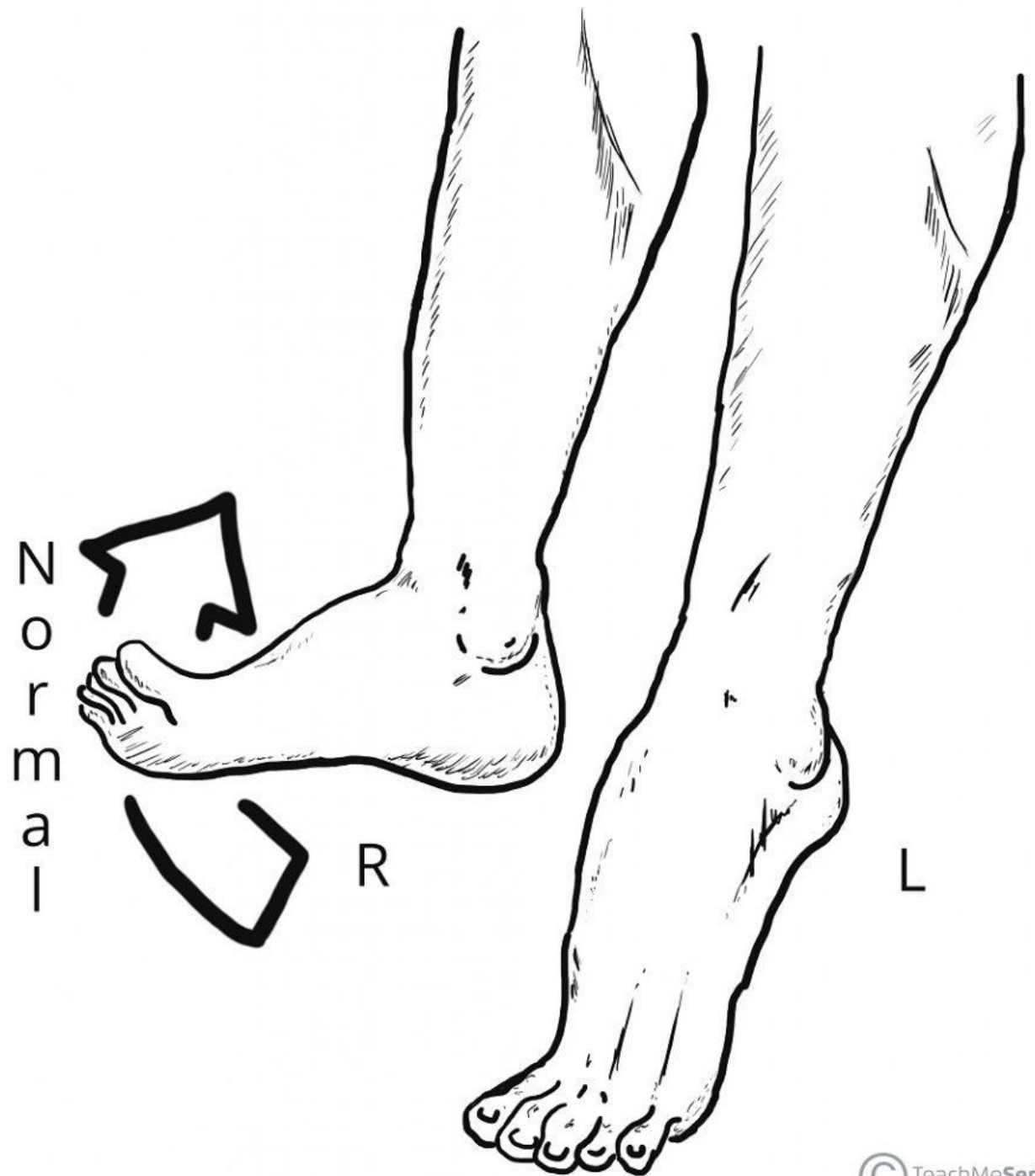




- Saphenous** (*from femoral*)
- Lateral sural** (*from common fibular*)
- Sural** (*from common fibular and tibial*)
- Superficial fibular**
- Deep fibular**
- Medial calcaneal** (*from tibial*)

Clinical Relevance: Damage to the Common Fibular Nerve

- The common fibular nerve is most commonly damaged by a **fracture** of the fibula, or the use of a **tight plaster cast**. The anatomical course of the common fibular nerve causes it to wrap round the **neck** of the fibular, and so any fractures of the fibular neck can cause nerve palsy.
- Patients with common fibular nerve damage will lose the ability to **dorsiflex** the foot at the ankle joint. Hence the foot will appear permanently plantarflexed – known as **foot drop**.
- There will also be a loss of sensation over the **dorsum** of the foot, and **lateral side** of the leg. Innervation is preserved on the medial side of the leg (supplied by the saphenous nerve, a branch of the femoral), and the heel and sole.



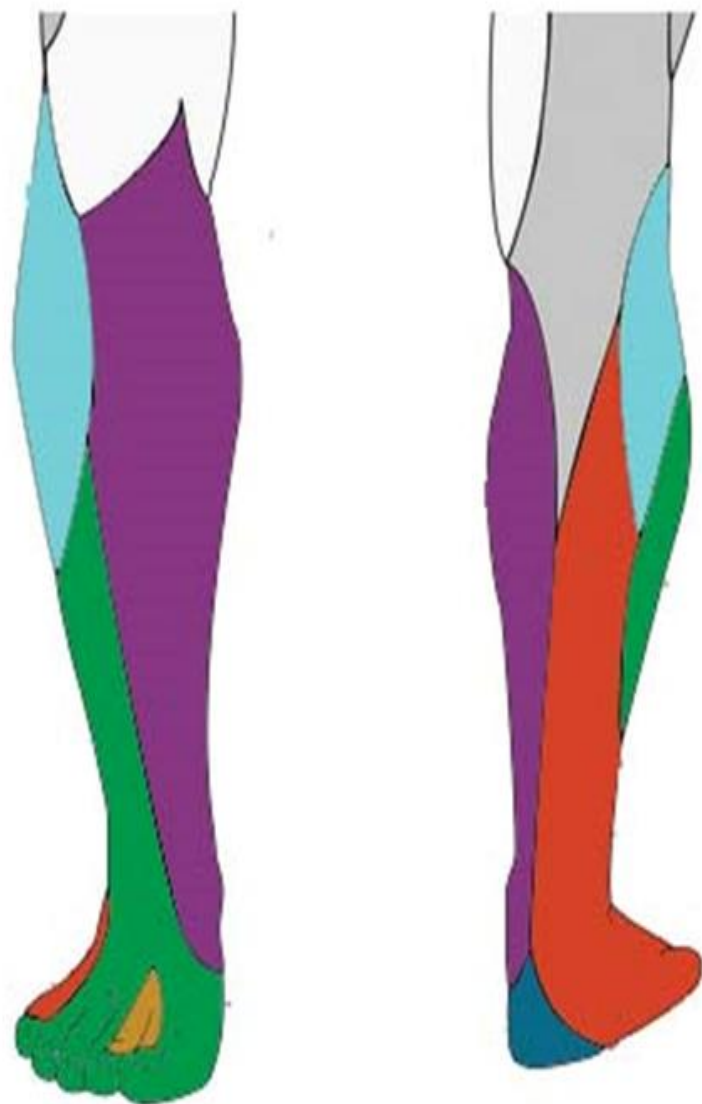
Normal

R

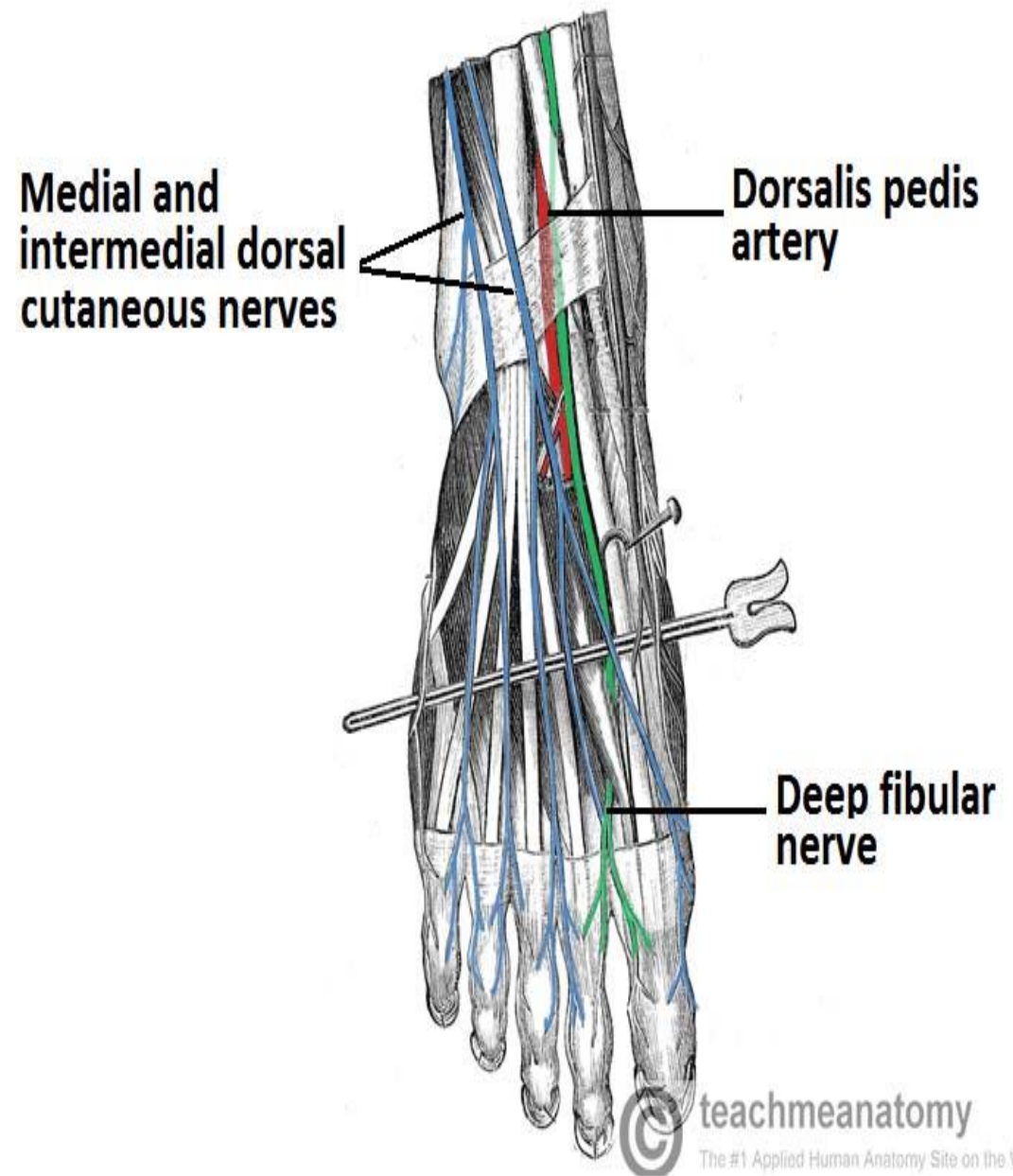
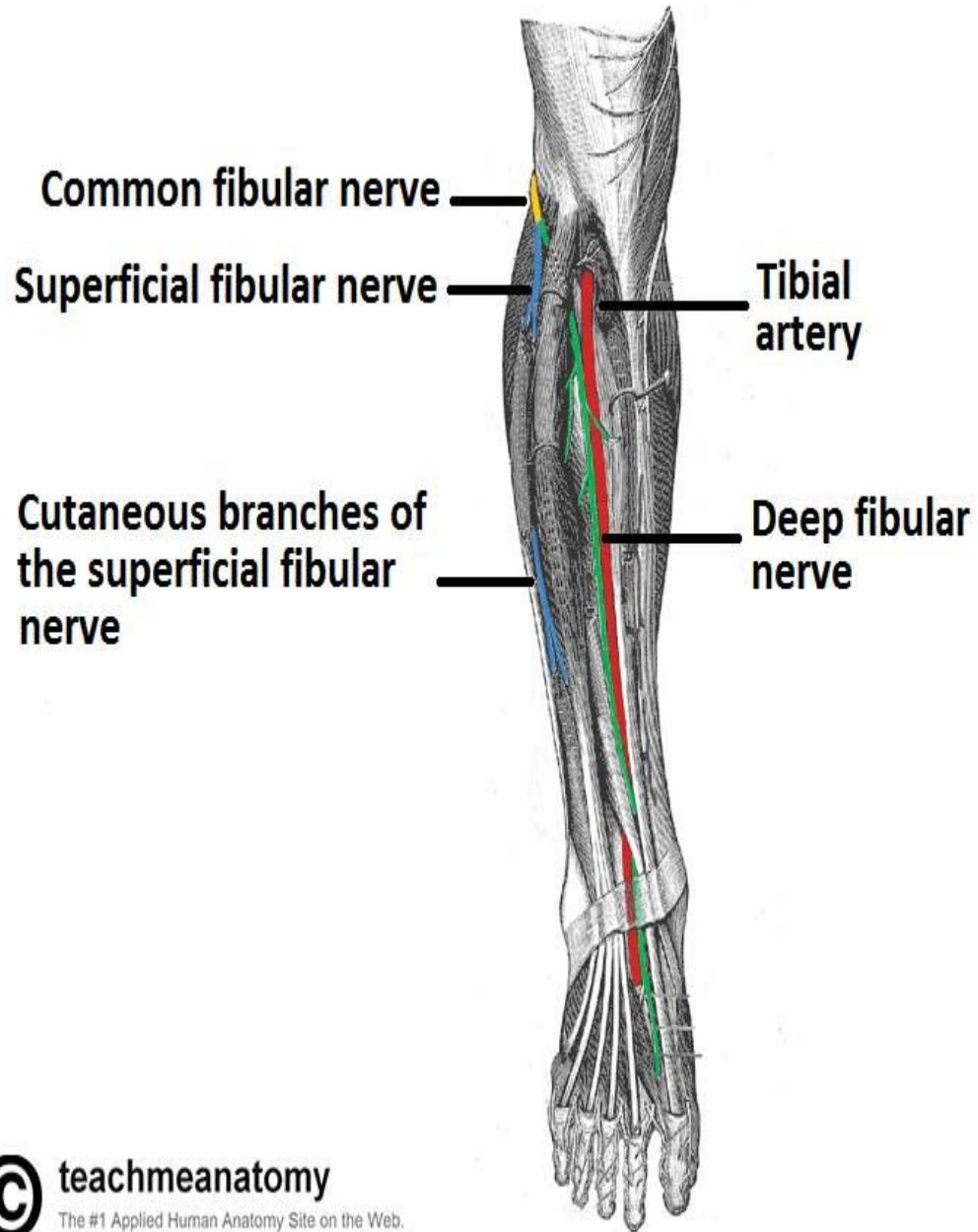
L

The superficial fibular nerve

- The superficial fibular nerve is a nerve of the lower limb. In older texts, it is known as the superficial peroneal nerve.
- **Nerve roots:** L4-S1
- **Motor:** Innervates the muscles in the [lateral compartment of the leg](#).
- **Sensory:** Supplies the vast majority of the skin over the dorsum of the foot, apart from the webbing between the hallux and the second digit.
- It also supplies the anterior and lateral aspect of the inferior third of the leg.



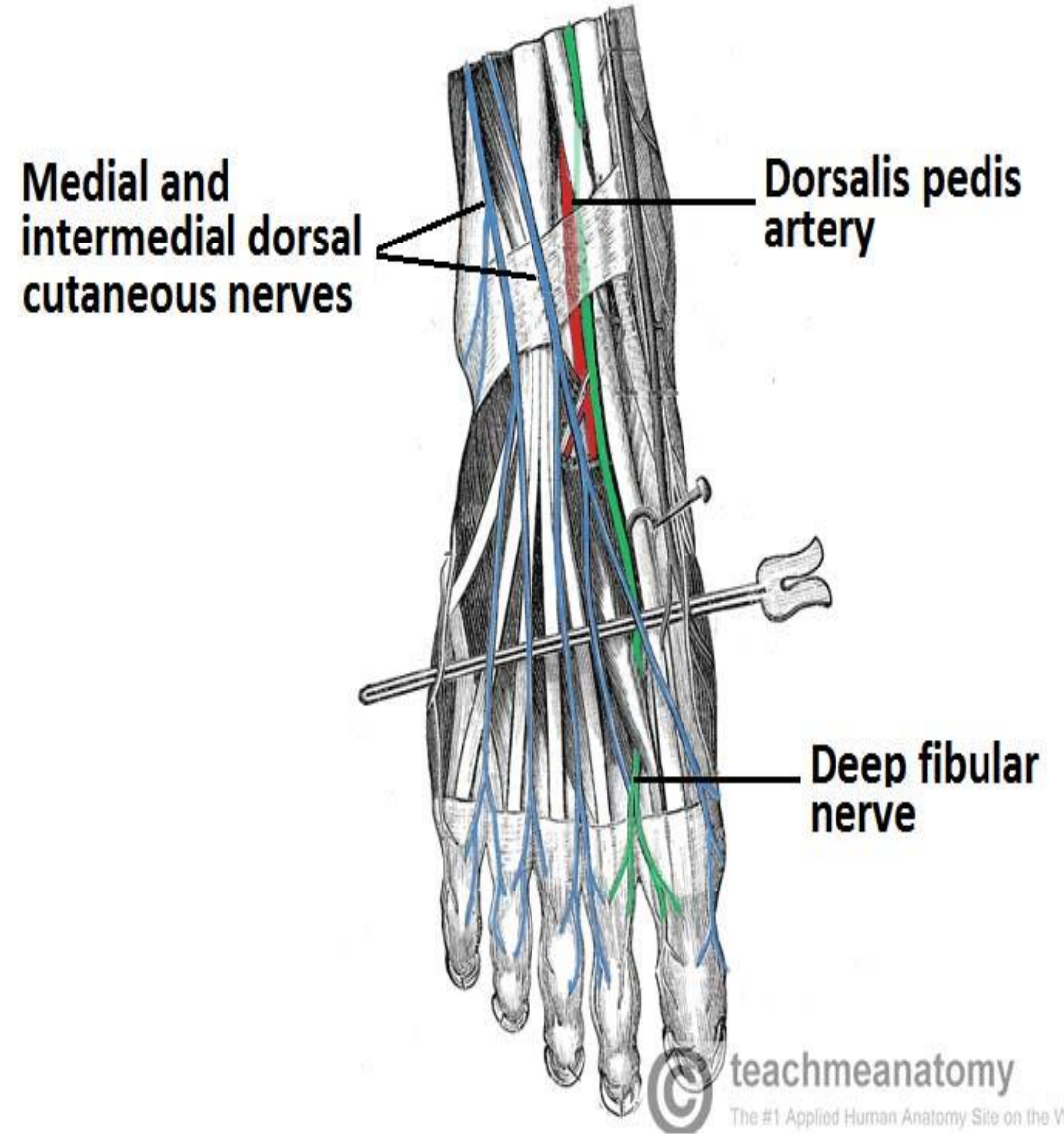
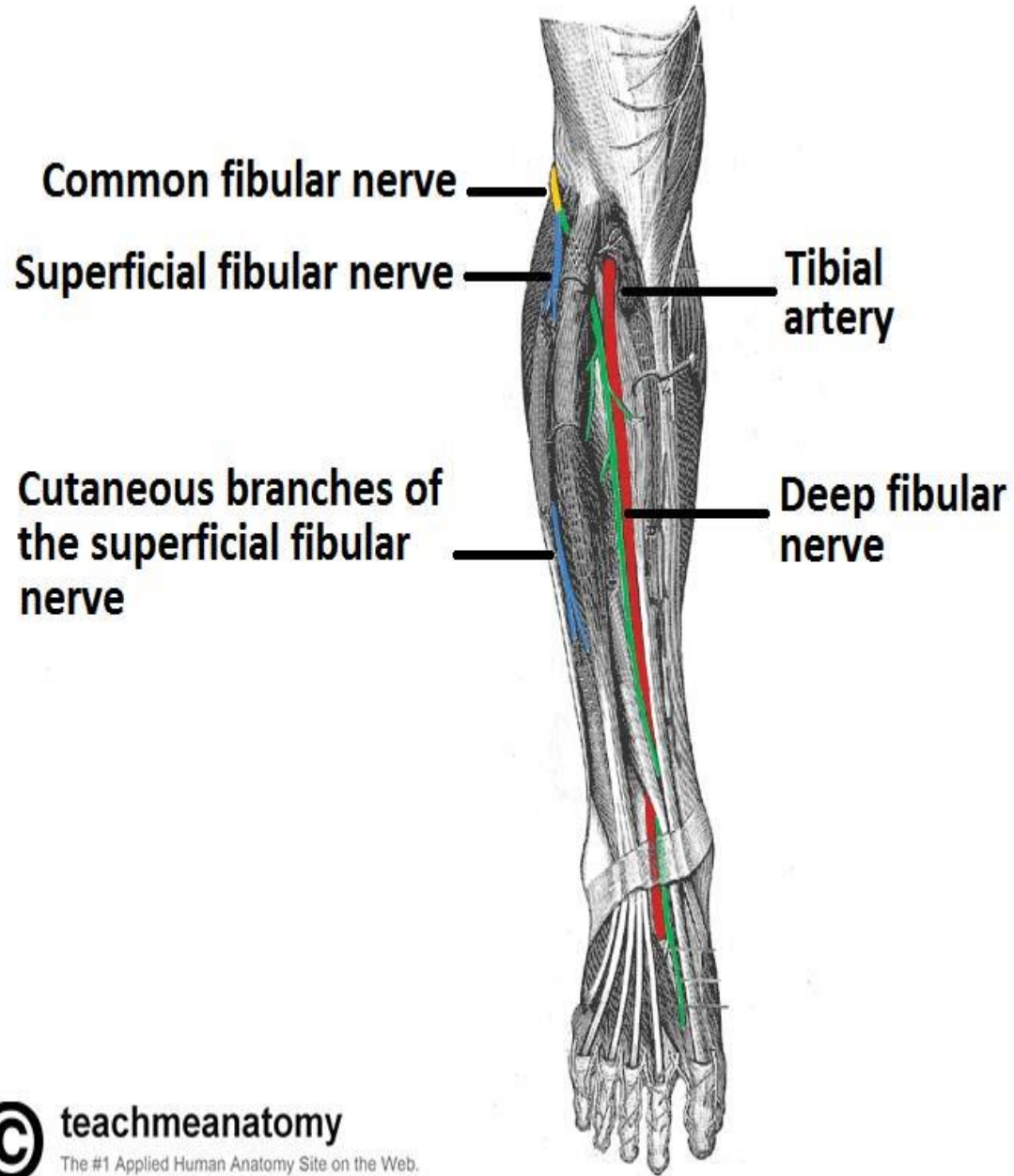
- Saphenous** (*from femoral*)
- Lateral sural** (*from common fibular*)
- Sural** (*from common fibular and tibial*)
- Superficial fibular**
- Deep fibular**
- Medial calcaneal** (*from tibial*)



THE DEEP FIBULAR NERVE

- The **deep fibular nerve** (deep peroneal nerve) is a nerve of the leg. It is one of the terminal branches of the common fibular nerve.
- **Nerve roots:** L4-S1.
- **Motor function:** Innervates the muscles in the [anterior compartment of the leg](#), as well as some of the intrinsic muscles of the foot.
- **Sensory function:** Supplies the triangular region of skin between the 1st and 2nd toes.

- The deep fibular nerve crosses the **ankle joint**, passing anterior to the distal tibia, and travels deep to the **extensor retinaculum**. It terminates in the dorsum of the foot, where it divides into:
 - **A lateral branch:** Supplies motor innervation to some of the intrinsic muscles of the foot,
 - **A medial branch:** A cutaneous nerve, innervating the skin between the 1st and 2nd toes.



Thank You!

