MUSCULOSKELETAL SYSTEM

ANATOMY

NERVES OF THE LOWER LIMB 2

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# Sacral plexus:
emerges from the ventral rami of the spinal segments L4 - S4 and provides motor and sensory nerves for the posterior thigh, most of the lower leg and foot, and part of the pelvis.

- all nerves of the sacral plexus exits below the piriformis muscle except the superior gluteal nerve which exits above the piriformis.

- branches of the sacral plexus:

  Sciatic nerve:
  - mixed nerve (sensory & motor).
  - the cell bodies of the motor fibers (about 1m) are located in the grey matter in the spinal cord, coming from spinal segments L5-S1-S2, and runs until reaches the interossei muscles.
  - the sensory fibers are longer "huge neurons" (about 1.5m) because cell bodies of some sensory fibers are located in the dorsal roots ganglia, and the central axons will enter the spinal cord, and some fibers extends up to the medulla oblongata.

- Relations:
  - sciatic nerve exits through greater sciatic foramen just below the piriformis muscle.
  - the piriformis muscle originates from the anterolateral border of sacrum, leaves the pelvis through greater sciatic foramen and inserts on the greater trochanter of femur, helps in lateral rotation. when the piriformis muscle enlarges as in athletes it presses the sciatic nerve which result in pain.
- in the posterior thigh the sciatic nerve runs very deep to the gluteus maximus and biceps femoris.
- adductor magnus muscle is anterior to the sciatic nerve.
- the sciatic nerve is sandwiched between the adductor magnus, and gluteus maximus and biceps femoris.
- sciatic nerve runs in the posterior part of the thigh, exits below the biceps femoris, reaches the popliteal fossa behind the knee and becomes superficial, then at the beginning of the popliteal fossa it divides into two terminal branches: common peroneal and tibial nerve.
- the sciatic nerve injury Results from: Penetrating wounds, fractures of the pelvis, or dislocation of the hip bone, and Faulty IM injections in the gluteal region. Complete injury is rare and 90% of the cases affect the common peroneal part (more superficial), results in Paralysis of the hamstring muscles and all muscles below knee "Foot drop" (planter flexed position) and Loss of sensation below knee except for the medial part (femoral nerve) and Trophic ulcers of the sole.
- sciatica is the pain from the mechanical pressure on the sciatic nerve and its pain is radiating, it maybe a result of prolaps in the disc so it presses the roots, or because of vertebrae at the inter vertebral foramen presses the nerve, or a result from the pressure from the piriformis muscle.

**Superior gluteal nerve:**
- runs alongside with the superior gluteal vessels through vascular bundle, and innervates the gluteus medius and minimus and tensor fascia lata muscles (the abductors at the hip joint and thigh).

if the superior gluteal nerve was injured the patient will lose the abduction action at the hip.
Inferior gluteal nerve:
- runs inferior to the piriformis muscle and supplies the gluteus maximus (the major extensor of the hip joint)

Nerve to quadratus femoris muscle:
- runs inferior to the piriformis muscle and anterior to: sciatic nerve, superior & inferior gemellus muscles, and the tendon of obturator internus muscle.
- supplies the quadratus femoris and inferior gemellus muscles (deep muscles).

Nerve to obturator internus muscle:
- obturator internus muscle is located inside the obturator foramen (medial to it) in the pelvis, and because of the levator ani muscle forms the pelvic diaphragm between the pelvis above and the perineum below and the obturator internus is trapped in the midway, the nerve leaves the pelvis through the greater sciatic foramen and then enters the perineum through the lesser sciatic foramen to reach the obturator internus, and while running this way it gives branches to superior gemellus muscle.

Tibial nerve:
- crosses the popliteal fossa in its midline, from the upper angle to lower angle, and it is superficial.

structures of popliteal fossa:
- femoral artery, femoral vein, tibial nerve
- most deep, most superficial
- the tibial nerve then leaves the popliteal fossa to enter the posterior compartment of the leg between the superficial and deep layers in the posterior compartment.

- gastrocnemius and soleus muscles are superficial to the tibial nerve.

- while running in the leg it will be accompanied with the posterior tibial artery, and when it reaches the ankle it will inter the sole of the foot via the flexor retinaculum (deep to it).

- in the sole, the tibial nerve will divide into medial and lateral plantar nerves and they will keep running side by side.

- the medial plantar nerve will be accompanied with the medial plantar artery, deep to abductor hallucis, gives two branches;
  
  1- cutaneous branch for the medial side of the sole and three and half toes
  
  2- muscular branch for abductor hallucis, flexor digitorum brevis, flexor hallucis brevis, and first lumbrical muscle.

- the lateral plantar nerve will be accompanied with the lateral plantar artery, deep to abductor hallucis and flexor digitorum brevis, gives two branches;

  1- cutaneous branch for lateral side of the sole and one and half toes
  
  2- muscular branch for abductor digiti minimi, flexor digiti minimi brevis, abductor hallucis, 2-4 lumbricals, and interosseous muscles.

- while in the popliteal fossa, the tibial nerve gives rise to a branch called: sural nerve, and it is accompanied with the small saphenous vein.

- the sural nerve is a cutaneous nerve and it supplies the lateral and posterior parts of the leg.
- sural nerve receives branches from both tibial and peroneal nerves.
- all the posterior compartment of the leg is innervated by the tibial nerve (superficial or deep).
- injury of tibial nerve will cause paralysis of the posterior compartment of the leg and sole, which results in impairment in the plantar flexion and inversion actions of the ankle joint and the result is dorsi flexion and eversion (calcaneo valgus) and loss of sensation in the soles.

Common peroneal nerve:
- crosses the popliteal fossa on the side, to the fibula crossing on its neck (superficial nerve) and traverses peroneus longus muscle to reach the anterior and lateral compartment, then it divides into two terminal branches: superficial and deep.
- peroneal nerve gives some branches which are:
  1- cutaneous branches: sural communicating branch & lateral cutaneous nerve of the calf
  2- muscular branch for the short head of biceps femoris
  3- articular branche for the knee
  4- superficial peroneal nerve (between peroneus longus and brevis)
  5- deep peroneal nerve.
- superficial peroneal nerve descends in the lateral compartment between peroneus longus and peroneus brevis and gives two branches:

1. cutaneous branch for the skin over the lower anterior leg and the dorsum of foot
2. muscular branch for the lateral compartment.

- deep peroneal nerve descends in the anterior compartment deep to the extensor digitorum longus muscle, Anterior to the interosseous membrane, and Accompanies the anterior tibial vessels and the anterior tibial nerve and gives three branches:

1. cutaneous branch between first and second toes
2. muscular branch for anterior compartment and extensor digitorum brevis in the dorsum of the foot
3. articular branch for the ankle and tarsals.

- peroneal nerve can be easily injured because it is very superficial at the neck of fibula, injuries Results from: Fractures of the neck of the fibula, Paralysis of the muscles of the anterior and lateral compartments of the leg results in: Equinovarus (Plantar flexion (foot drop) and inversion) and Loss of sensation on the anterior and lateral sides of leg & dorsum of foot.

Pudendal nerve:

- is a branch of the sacral plexus, the main nerve of the perineum, exits below the piriformis from the greater sciatic foramen and inter the perineum through lesser sciatic foramen.

*skip the remaining slides about pudendal nerve*