



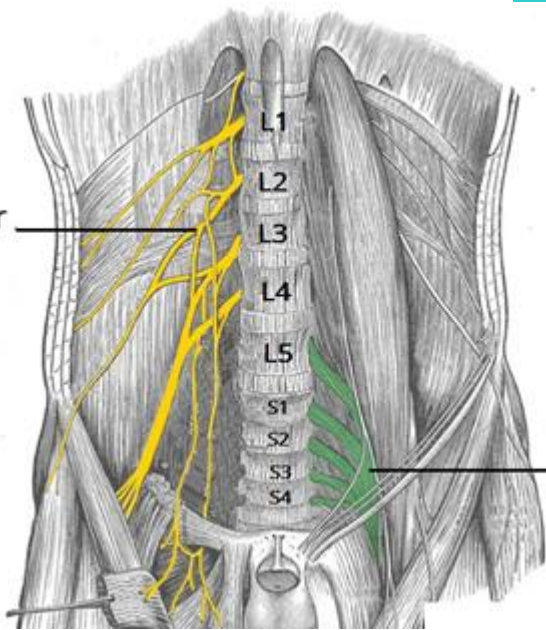
Peripheral Nerve Entrapment and Injury in the Lower Extremity

Dr. Maryam Abbaszadeh

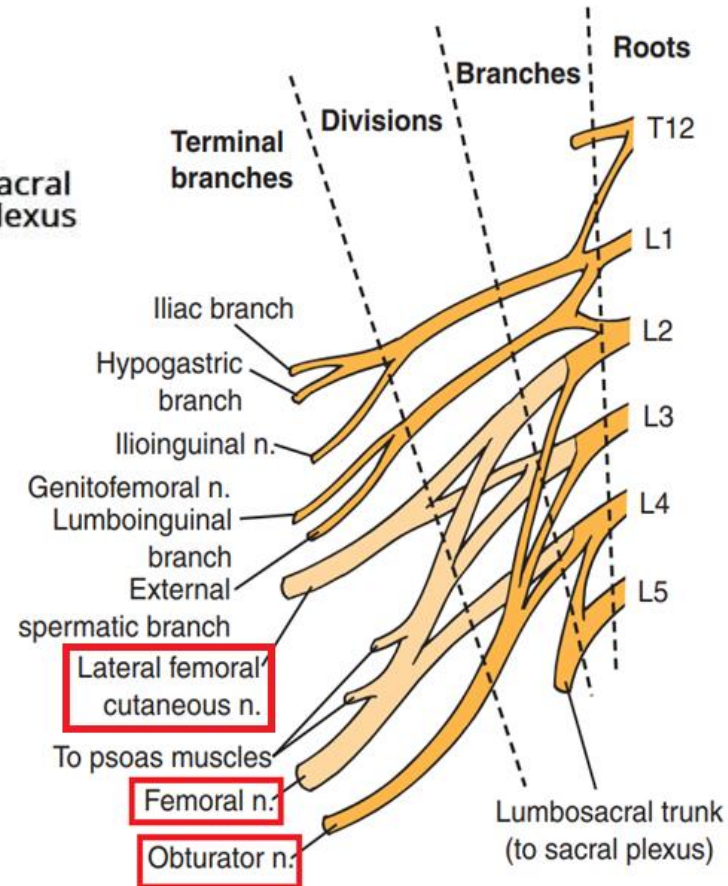
Babol University of Medical Sciences

LumboSacral Plexus

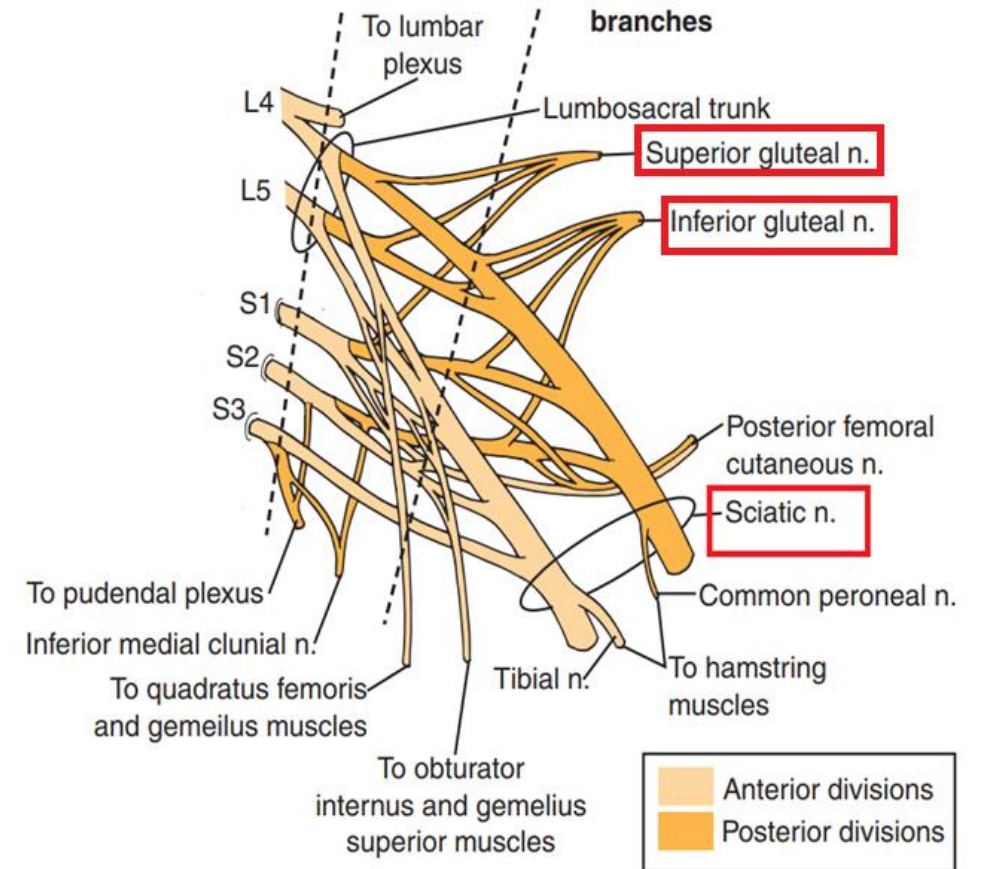
Lumbar Plexus



Sacral Plexus



Lumbar Plexus



Sacral Plexus

Mechanisms of Nerve Injury

➤ Compression

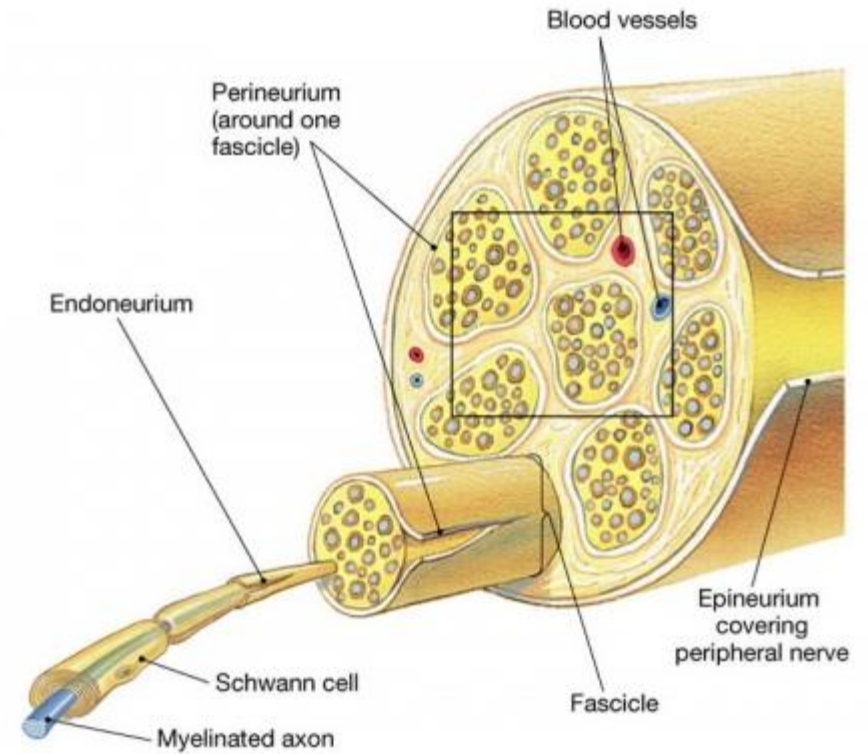
- sustained pressure externally (tourniquet, ...)
- sustained pressure internally (bone, tumor, edema, ...)
- soft tissue impingement

➤ Stretch (excessive tension or tearing from traction forces)

➤ Laceration (knife, gunshot, surgical complication, or injection injury)

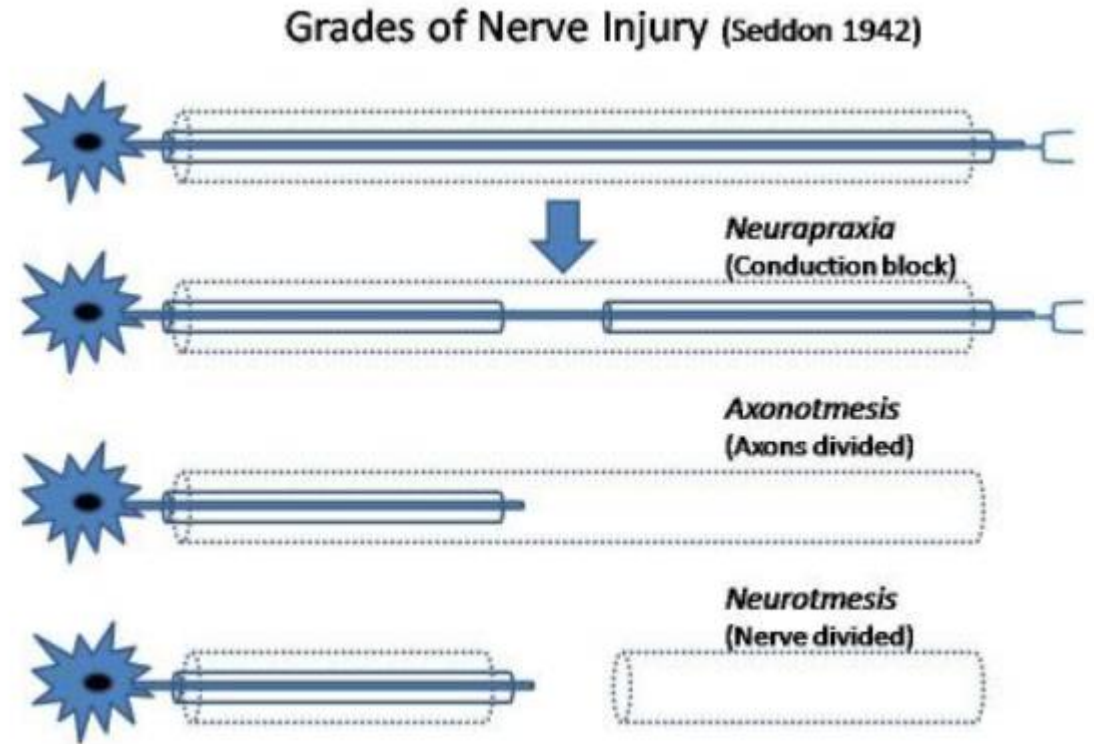
Nerve Mobility

- ✓ Nerves slide and glide relative to the adjacent tissue, both longitudinally and transversely
- ✓ This mobility is allowed without undue stress on the nerve tissue because connective tissue around the nerves (epineurium, perineurium, endoneurium)



Nerve injuries

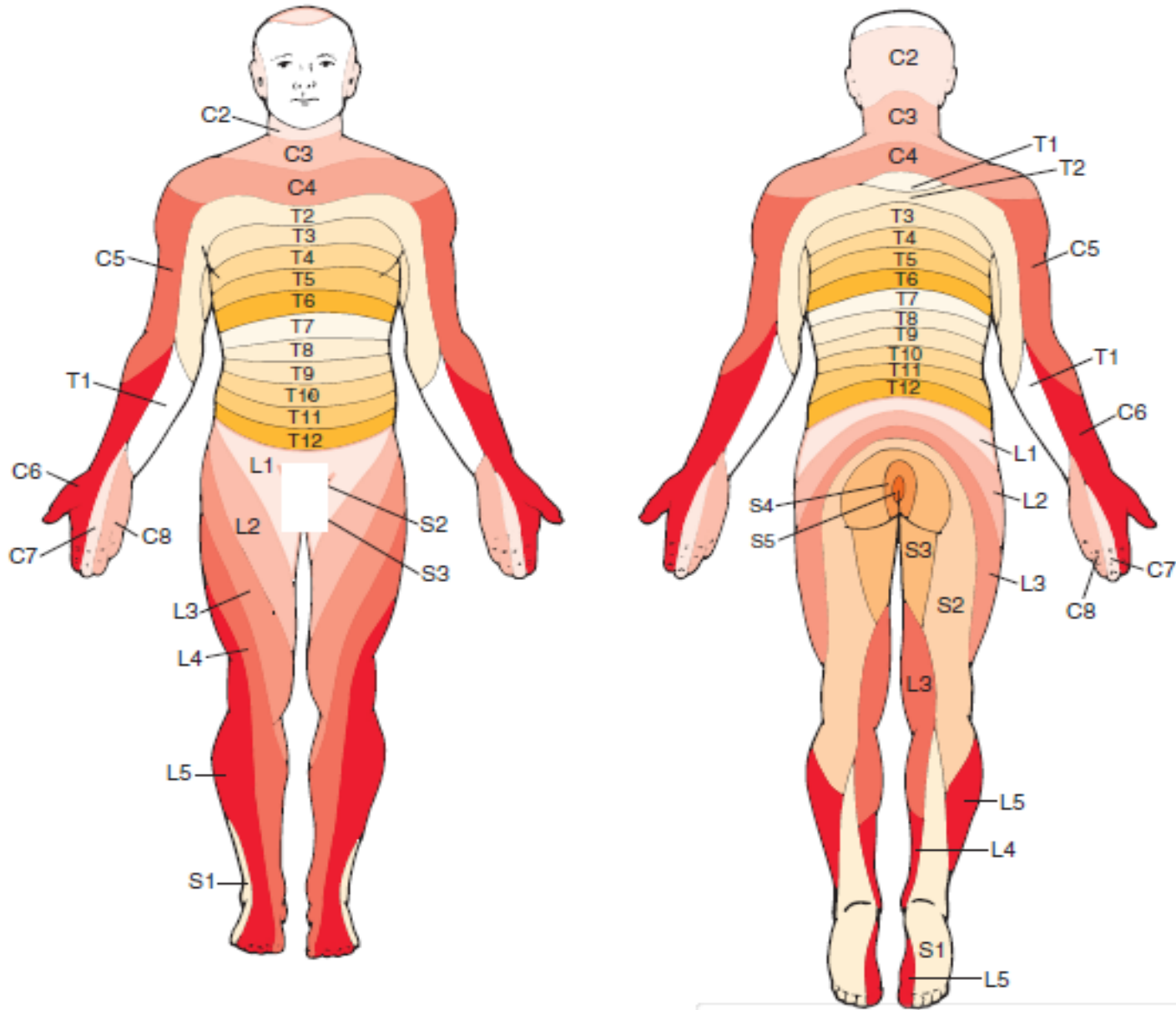
- Neuropraxia (most common)
- Axonotmesis
- Neurotmesis



symptoms seen in a nerve root or peripheral nerves lesion

- pain,
 - paresthesia,
 - muscle weakness
- ✓ Although the symptoms seen in a nerve root lesion may be similar to those seen in peripheral nerves, the area of paresthesia, where pain occurs, which muscles are weak) are commonly different.

Nerve Roots (dermatome)



Nerve Roots (myotome)

Myotomes of the Lumbar and Sacral Spines

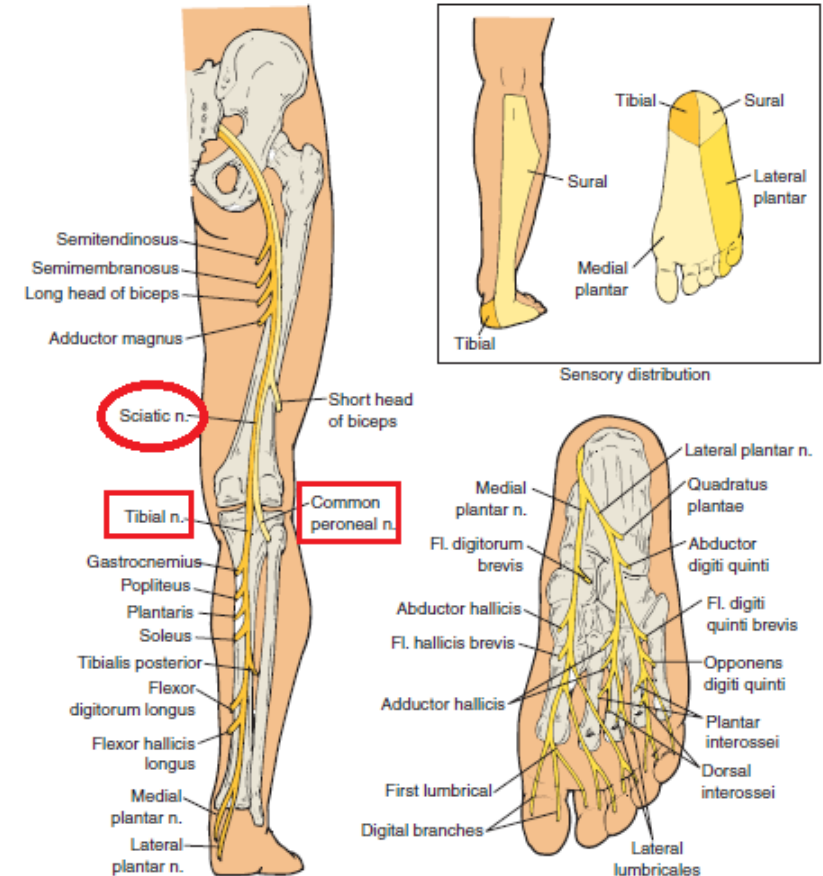
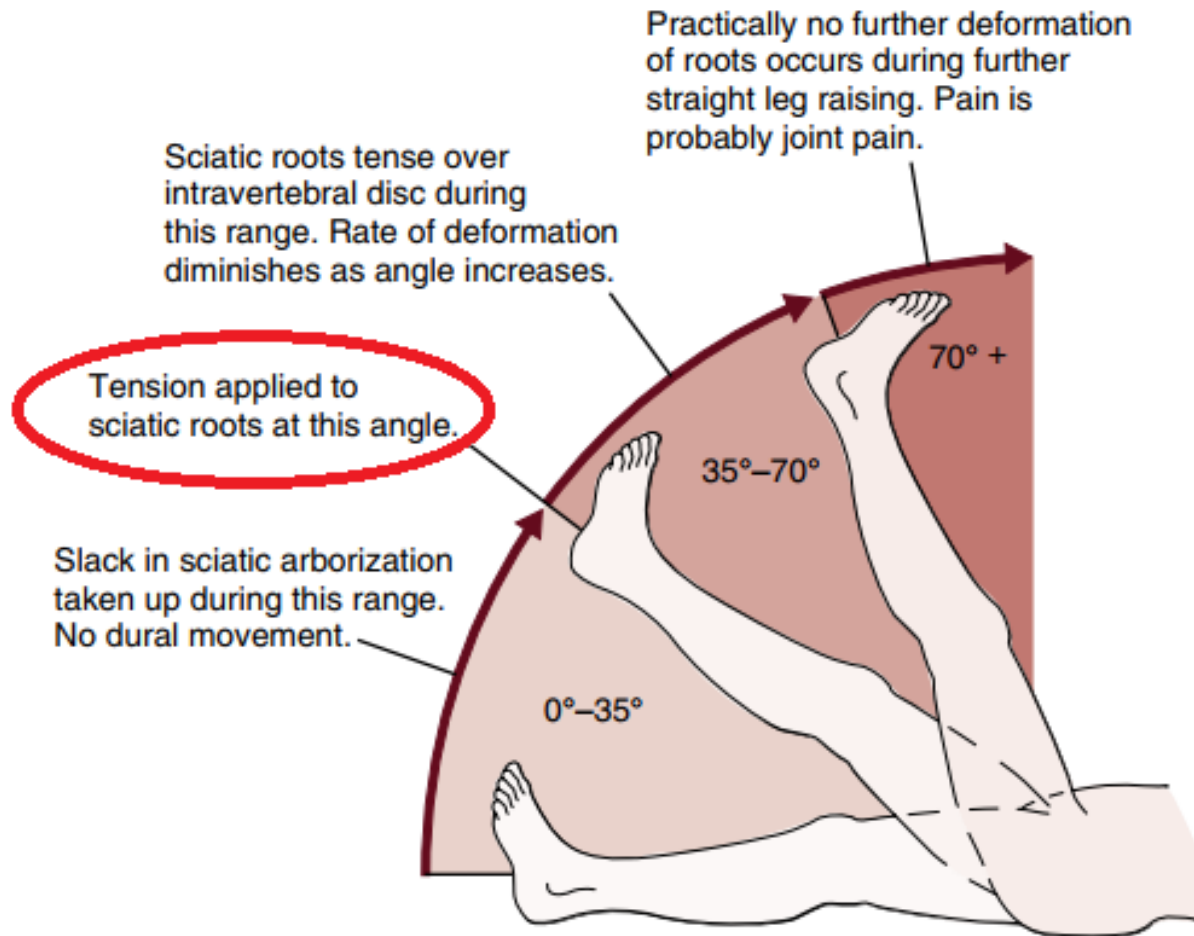
- L2: Hip flexion
- L3: Knee extension
- L4: Ankle dorsiflexion
- L5: Great toe extension
- S1: Ankle plantar flexion, ankle eversion, hip extension
- S2: Knee flexion

Neural Testing and Mobilization Techniques for the Lower limb

- **Straight Leg Raising (SLR)**
- **Slump-Sitting Maneuver**
- **Prone Knee Bend (PKB)**

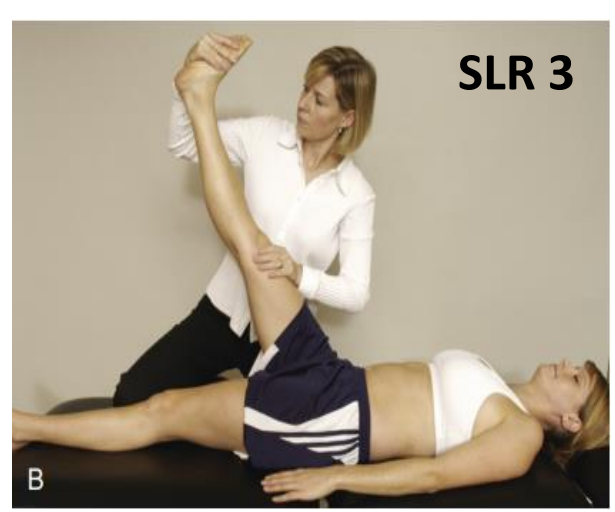
Straight Leg Raising (Lasegue's Test)

- the most common neurological tests of the lower limb.

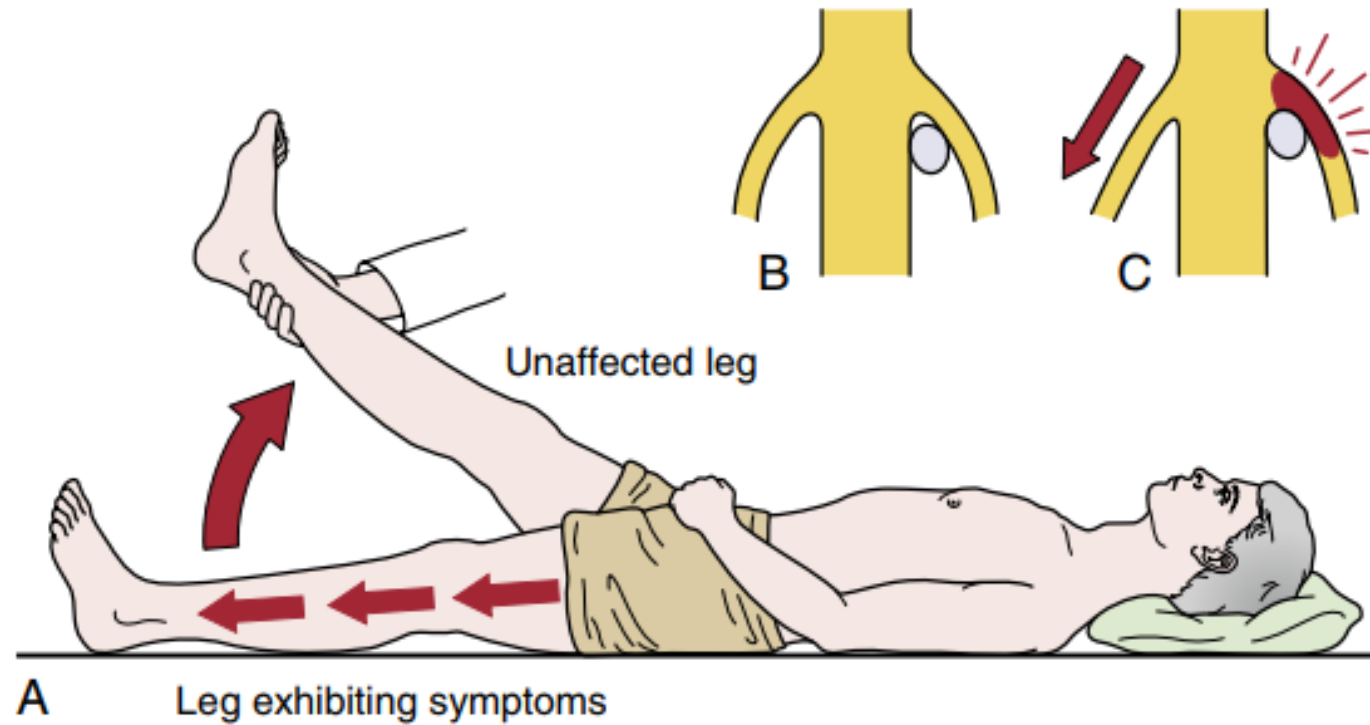


Straight Leg Raising Test and Its Modifications

	SLR (Basic)	SLR2	SLR3	SLR4	Cross (Well Leg) SLR5
Hip	Flexion and adduction	Flexion	Flexion	Flexion and medial rotation	Flexion
Knee	Extension	Extension	Extension	Extension	Extension
Ankle	Dorsiflexion	Dorsiflexion	Dorsiflexion	Plantar flexion	Dorsiflexion
Foot	—	Eversion	Inversion	Inversion	—
Toes	—	Extension	—	—	—
Nerve bias	Sciatic nerve and tibial nerve	Tibial nerve	Sural nerve	Common peroneal nerve	Nerve root (disc prolapse)



Cross SLR (Well leg SLR)



Slump-Sitting Maneuver

- The slump test is simply the SLR performed in sitting with the spinal flexion for greater overall neural tension
- indicates impingement of the sciatic nerve, nerve roots, dural lining, spinal cord.



Slump Test and Its Modifications

	Slump Test (ST1)	Slump Test (ST2)
Cervical spine	Flexion	Flexion
Thoracic and lumbar spine	Flexion (slump)	Flexion (slump)
Hip	Flexion (90°+)	Flexion (90°+), abduction
Knee	Extension	Extension
Ankle	Dorsiflexion	Dorsiflexion
Foot	—	—
Toes	—	—
Nerve bias	Spinal cord, cervical and lumbar nerve roots, <u>sciatic nerve</u>	<u>Obturator nerve</u>



Prone Knee Bend (PKB)

- Pain in the low back or neurological signs (change in sensation in the anterior thigh) are considered positive for upper lumbar nerve roots and femoral nerve tension

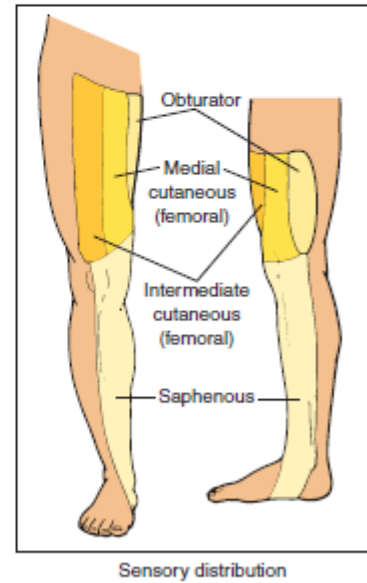
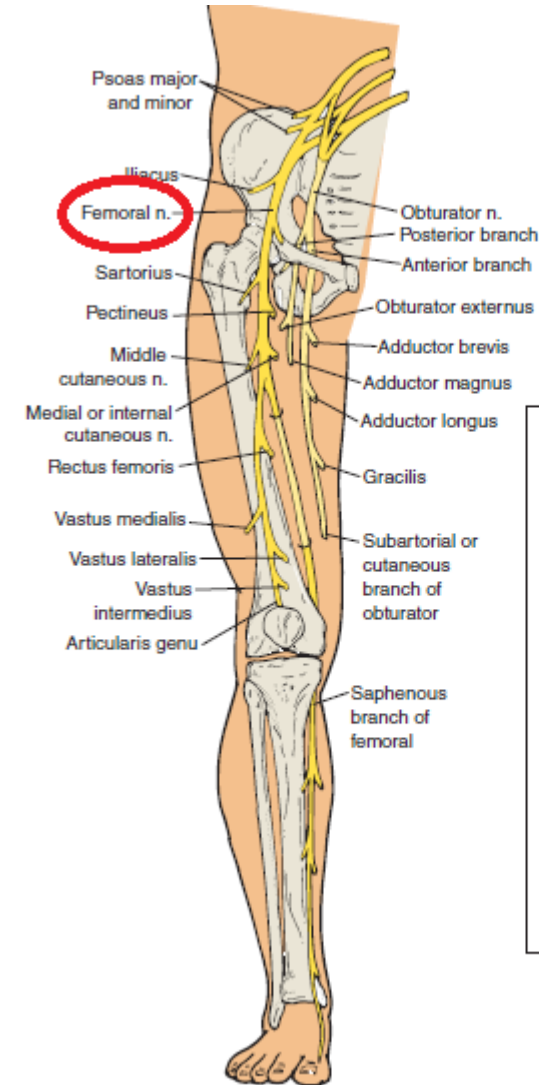
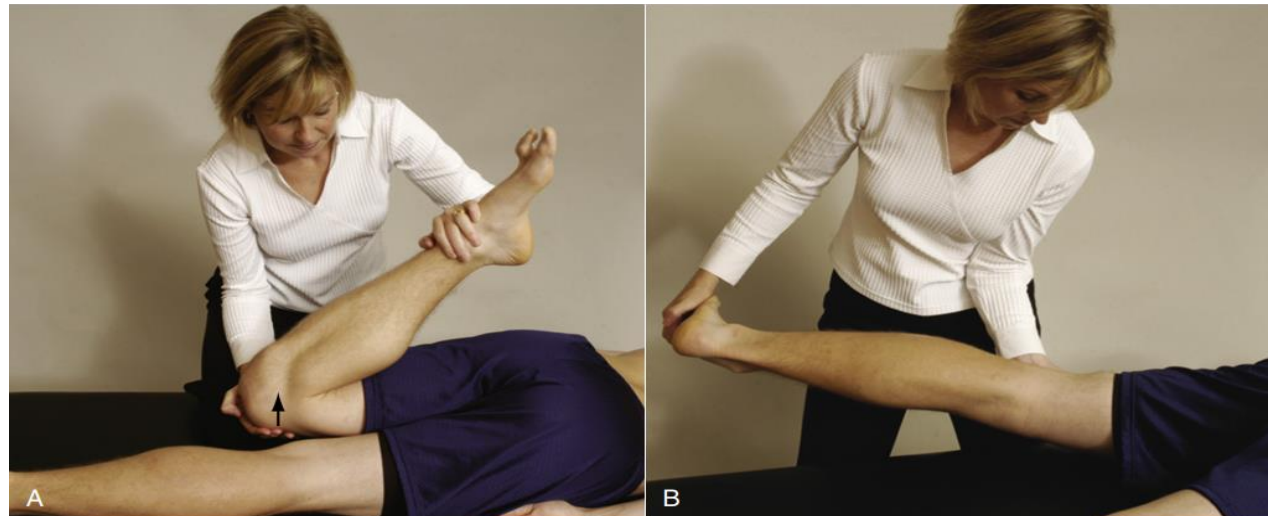


TABLE 9.15**Prone Knee Bending Test and Its Modification**

	Basic Prone Knee Bending (PKB1)	Prone Knee Bending (PKB2)	Prone Knee Extension (PKE)
Cervical spine	Rotation to test side	Rotation to test side	—
Thoracic and lumbar spine	Neutral	Neutral	Neutral
Hip	Neutral	Extension, adduction	Extension, abduction, lateral rotation
Knee	Flexion	Flexion	Extended
Ankle	—	—	Dorsiflexion
Foot	—	—	Eversion
Toes	—	—	—
Nerve bias	Femoral nerve, L2–L4 nerve root	<u>Lateral femoral cutaneous nerve</u>	<u>Saphenous nerve</u>



Side-Lying Slump Test

Side-Lying Slump Test (ST3)

Cervical spine	Flexion
Thoracic and lumbar spine	Flexion (slump)
Hip	Flexion (20°)
Knee	Flexion
Ankle	Plantar flexion
Foot	—
Toes	—
Nerve bias	Femoral nerve

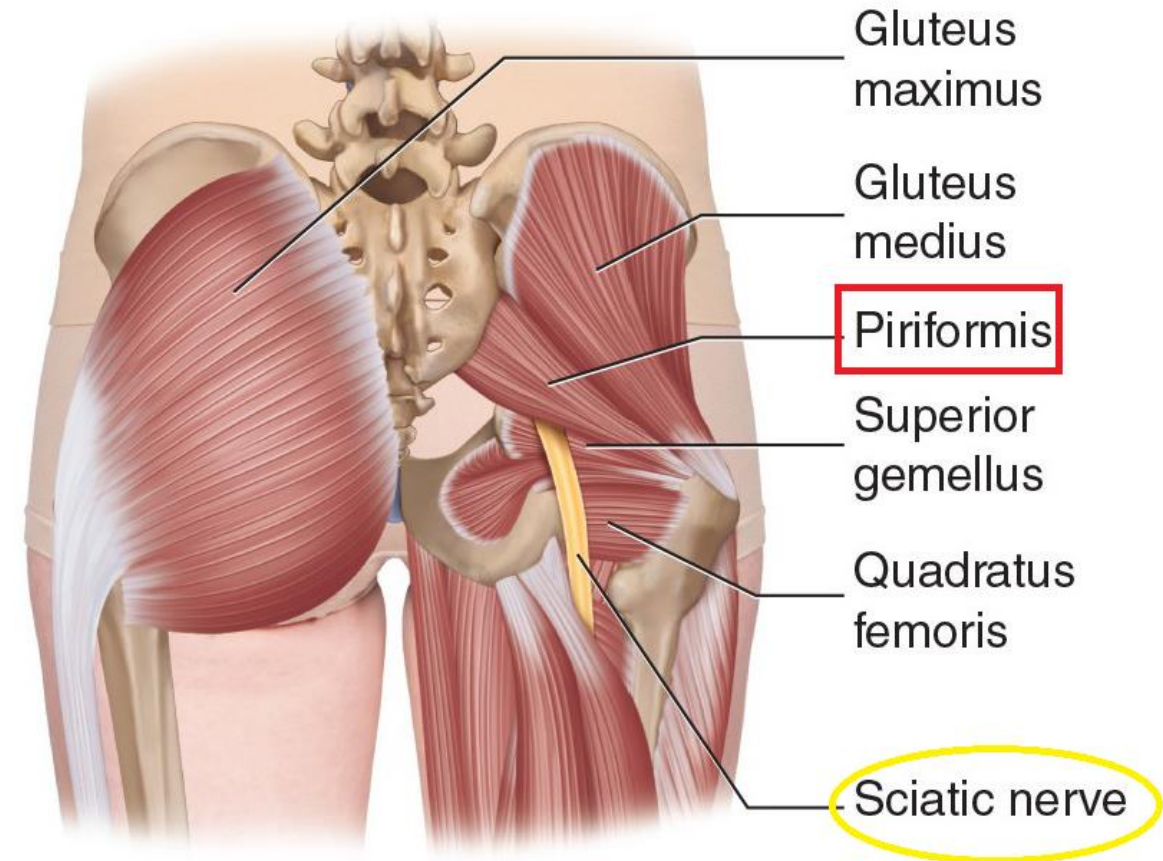


Piriformis syndrome

- Symptom:
 - ✓ Referred pain is typically to the posterior thigh, buttock, and sacroiliac joint
 - ✓ Tenderness over the piriformis muscle

➤ Short Piriformis Syndrome

➤ Long Piriformis Syndrome



Cont...

Short Piriformis	Long Piriformis
Glute pain with or without radiating pain down the posterior thigh	Glute pain with or without radiating pain down the posterior thigh
Painful when pressing deep into glute	Painful when pressing deep into glute
Pain often <u>increases</u> with prolonged sitting	Pain often <u>decreases</u> with sitting
<u>Limited</u> medial rotation on affected hip	<u>Excessive</u> medial rotation on affected hip
Responds well to <u>stretching</u>	Responds well to <u>strengthening</u>

Cont...

clamshell exercise

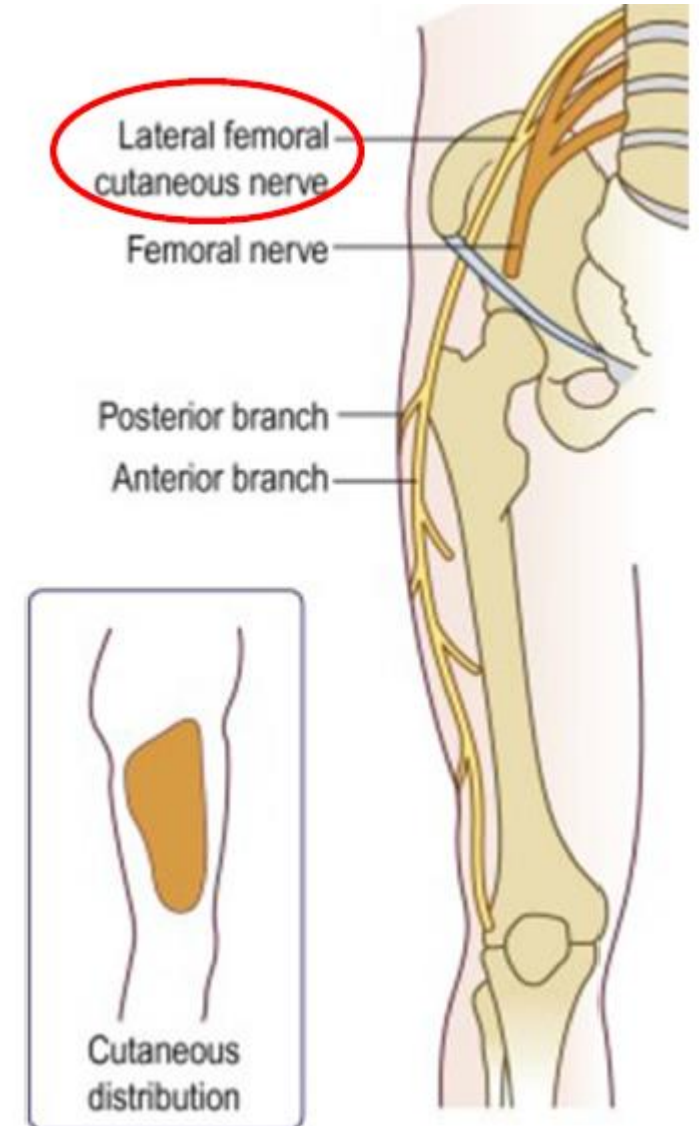


Figure 4 Piriformis stretch



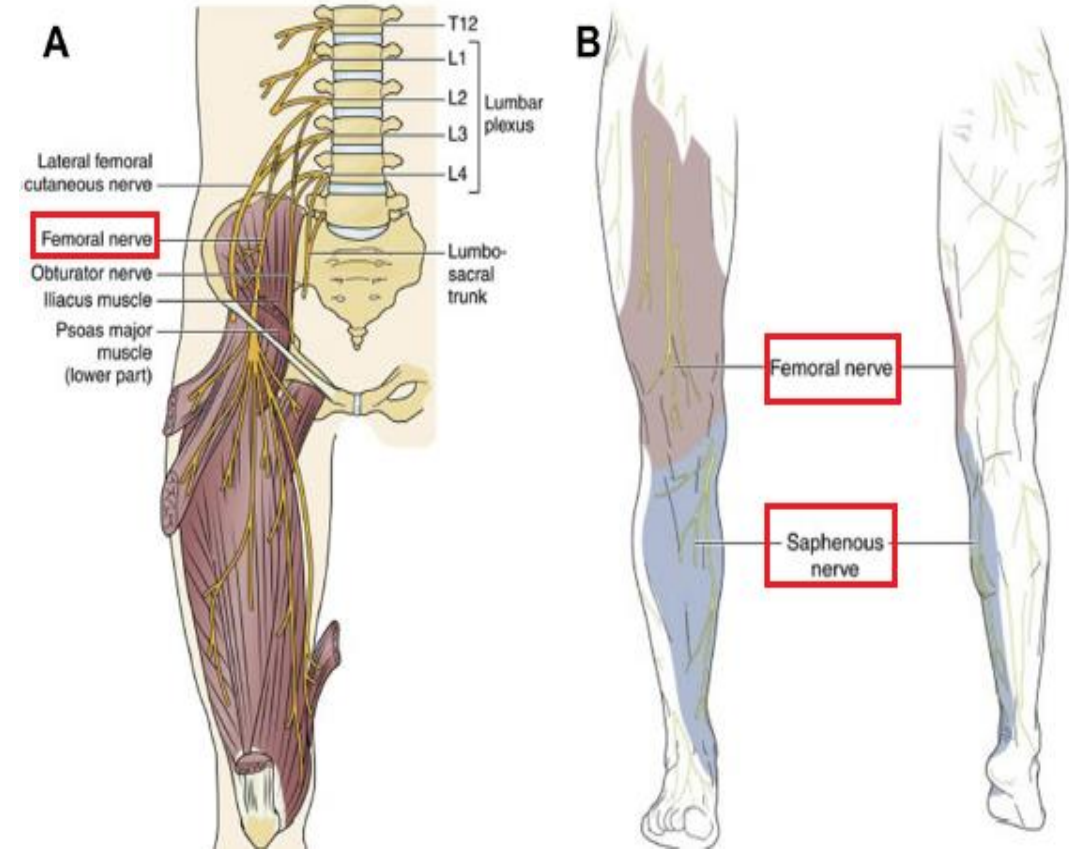
Meralgia paresthetica (lateral femoral cutaneous neuropathy)

- Second most common mononeuropathy in the lower extremities
- Compressive under the inguinal ligament
- Nerve is a pure sensory nerve
- Pain, numbness, and paresthesia over the anterolateral aspect of the thigh
- The diagnosis is largely clinical
- History and examination
- Risk factor: Obesity, Tight clothing/tight belts, Prolonged prone position during surgery, Prolonged hip flexion, Cesarean section, hip arthroplasty, Pelvic bone fracture
- The presence of motor deficits can differentiate meralgia paresthetica from a radiculopathy at L2.



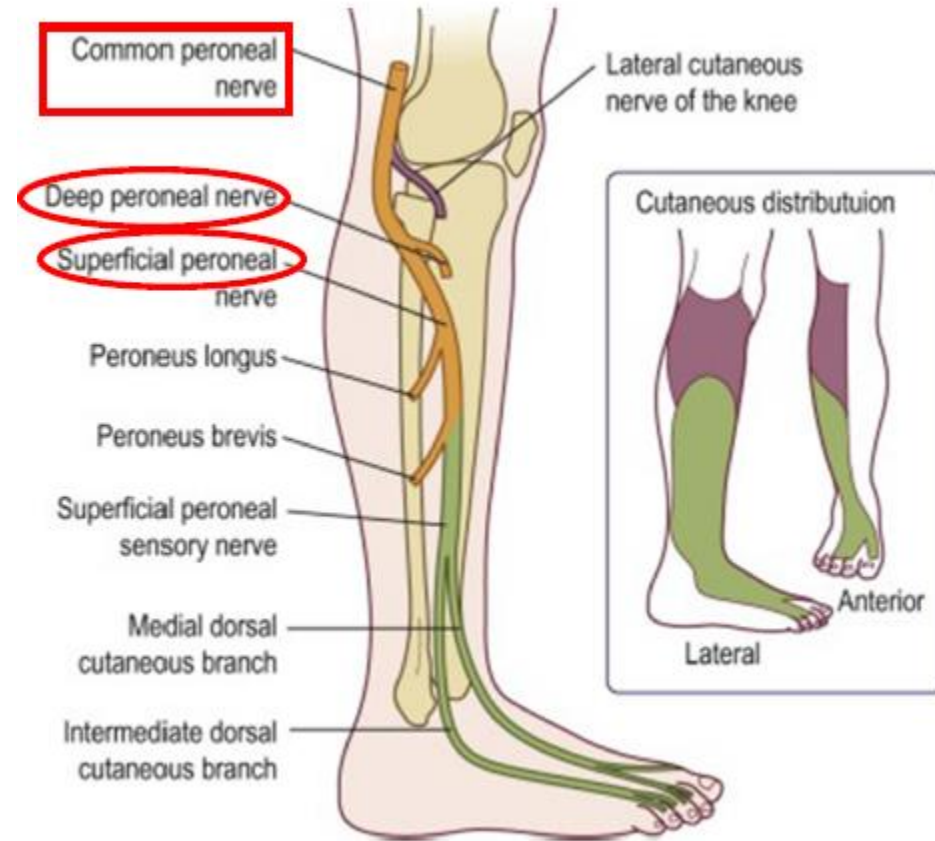
Femoral neuropathy

- Either in the Retroperitoneum (between the psoas and iliacus muscles) or near the Inguinal ligament
- weakness of knee extension and/or hip flexion.
Numbness can also be present in the anteromedial thigh and/or medial leg.
- Weakness of hip flexion is a key examination finding for localization



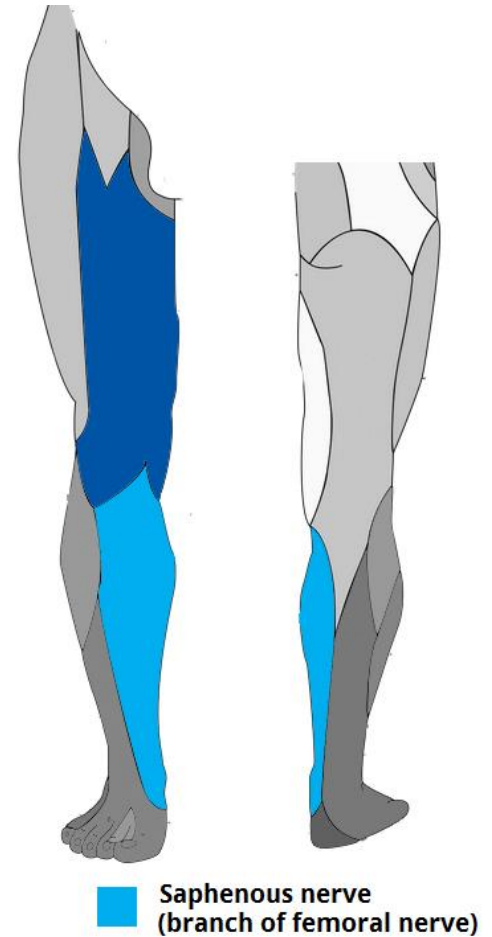
Peroneal Neuropathy

- The most common lower extremity mononeuropathy
- Most commonly occurs at the fibular head
- Weakness of ankle dorsiflexion and toe extension are expected, with or without ankle eversion weakness
- Numbness on the dorsum of the foot and anterolateral lower leg
- **Risk factor:** prolonged immobilization, habitual leg crossing, prolonged squatting, leg cast
- A steppage gait.
- Tinel sign is an excellent adjunct to diagnosis



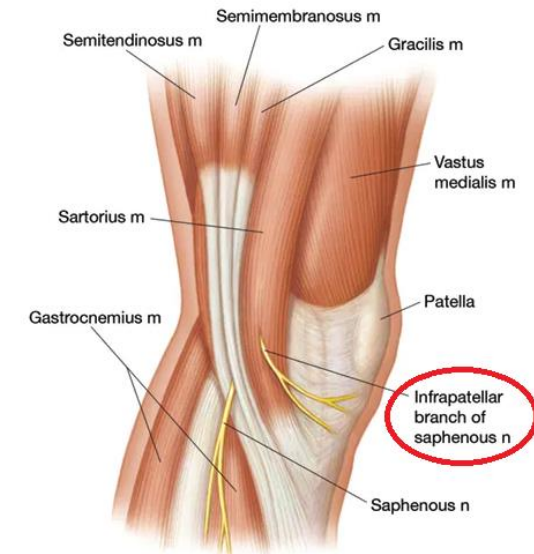
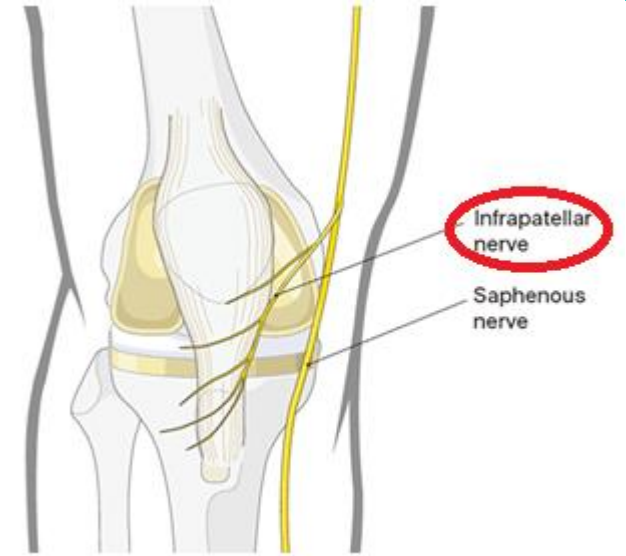
Saphenous neuropathy

- may occur within the adductor canal
- Pure-sensory branch of the femoral nerve
- Symptom:
 - ✓ Pain around the knee and less commonly in the thigh or lower leg
 - ✓ Numbness or paresthesia on the medial leg, medial ankle, and/or hallux
- The differential diagnosis includes partial femoral neuropathy and L4 radiculopathy
- Risk factors: genu varum, prolonged knee hyperflexion, obese thighs



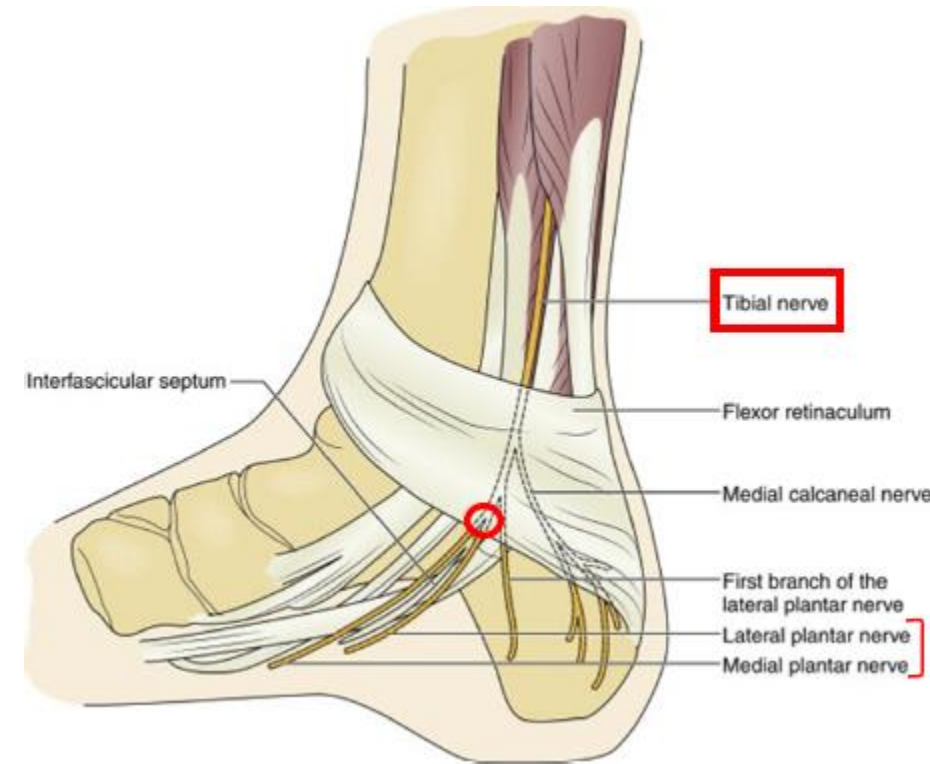
Saphenous nerve (infrapatellar branch)

- Isolated compression of the infrapatellar branch of the nerve is not uncommon
- should be considered in cases of atypical or **refractory knee pain** and following trauma to the medial side of the knee.
- These patients will also notice a worsening of the pain with knee flexion or with use of braces
- reproducible Tinel sign at the site of entrapment



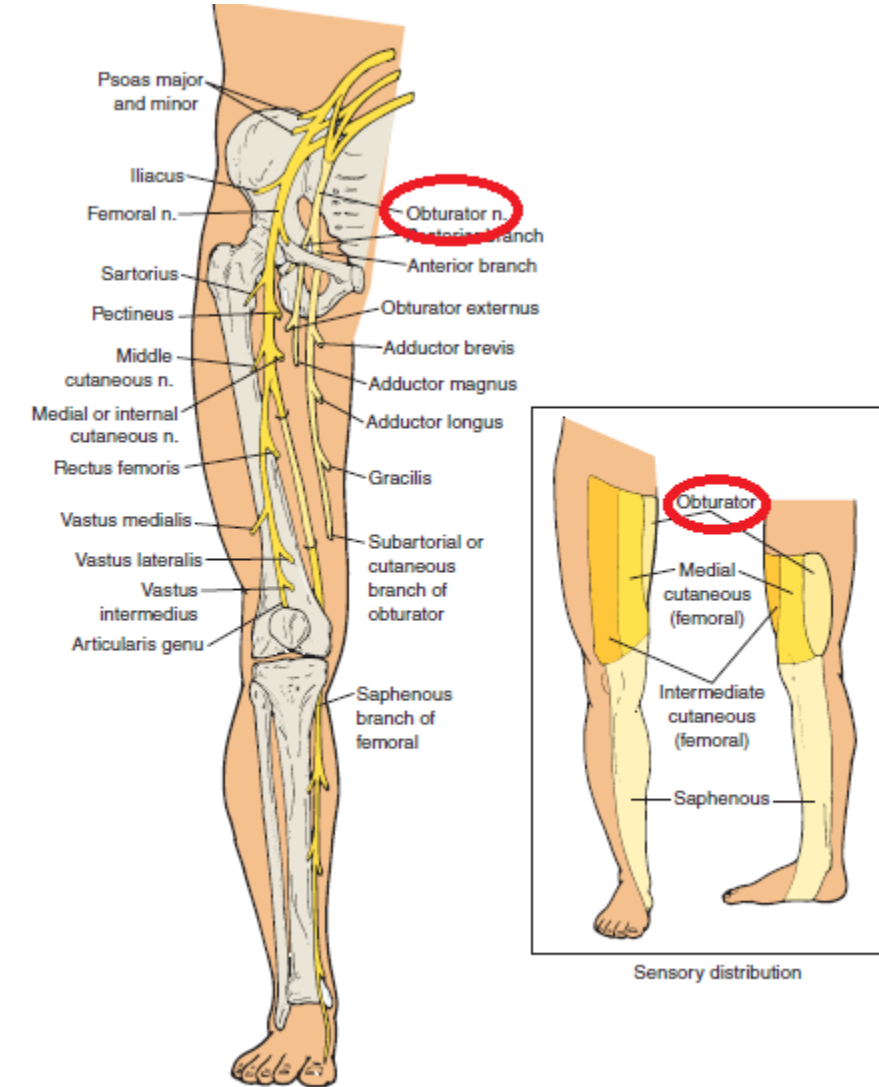
Tarsal tunnel syndrome (Posterior Tibial neuropathy)

- Tarsal tunnel syndrome is rare
- Pain in the medial aspect of the ankle, with radiation to the plantar aspect of the foot.
- Paresthesia, numbness, tingling, and burning pain of the sole of the foot commonly occur.
- Symptoms are exacerbated by weight-bearing activities
- **Risk factors:** osteoarthritis, rheumatoid arthritis, diabetes, tight footwear, and both varus and valgus deformity of the foot



Obturator Neuropathy

- Within the obturator foramen where the obturator nerve exits the pelvis
- The motor innervation to the adductor muscles
- Sensory innervation to the hip joint, knee joint and medial thigh.
- Clinical manifestations include groin or medial thigh pain associated with weakness of the adductor musculature



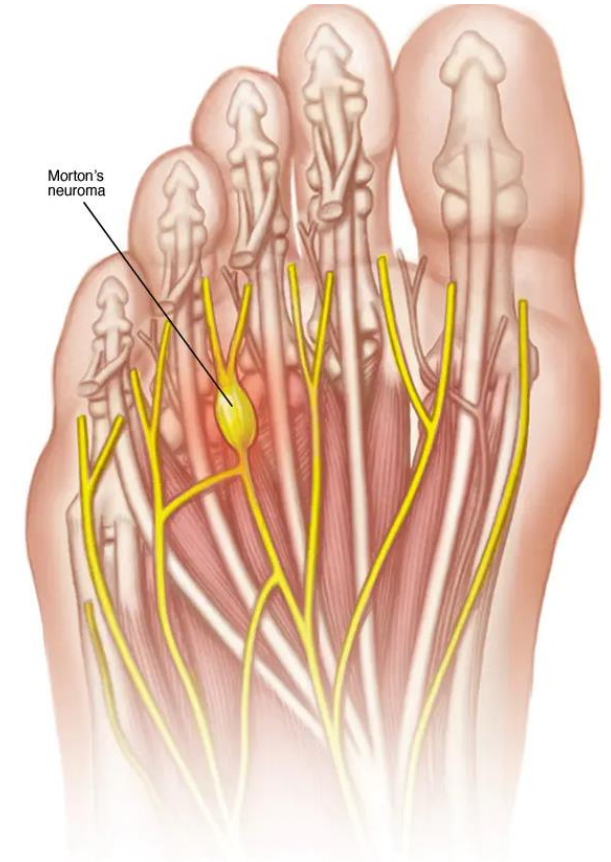
Sural Neuropathy

- Entrapment at the level of the fifth metatarsal base
- Clinical manifestations:
- Paresthesia and or pain along the lateral ankle and foot, which is exacerbated by inversion and plantar flexion of the foot, and chronic calf pain exacerbated by physical activity
- frequent or recurrent “ankle sprains, chronic Achilles tendonitis, associated with sural nerve entrapments.



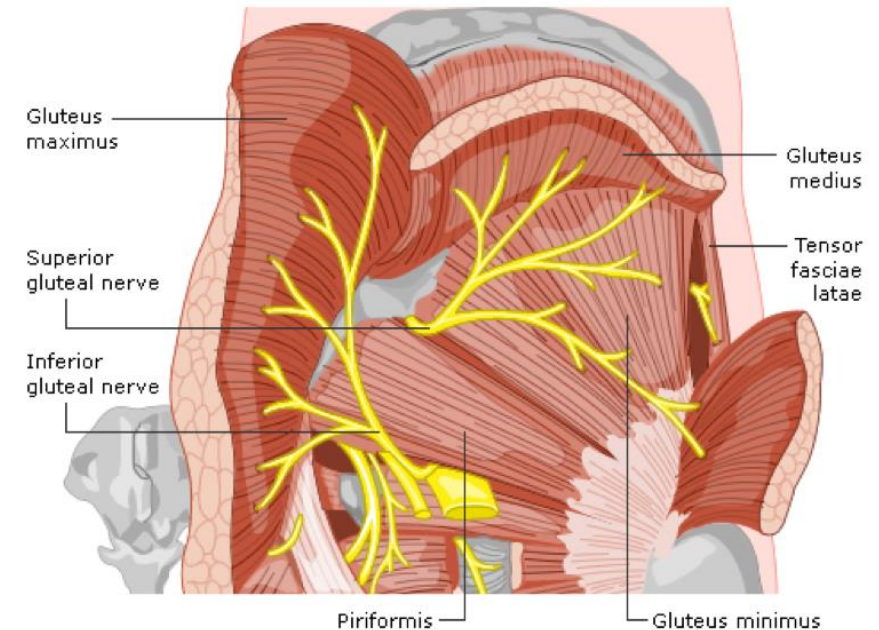
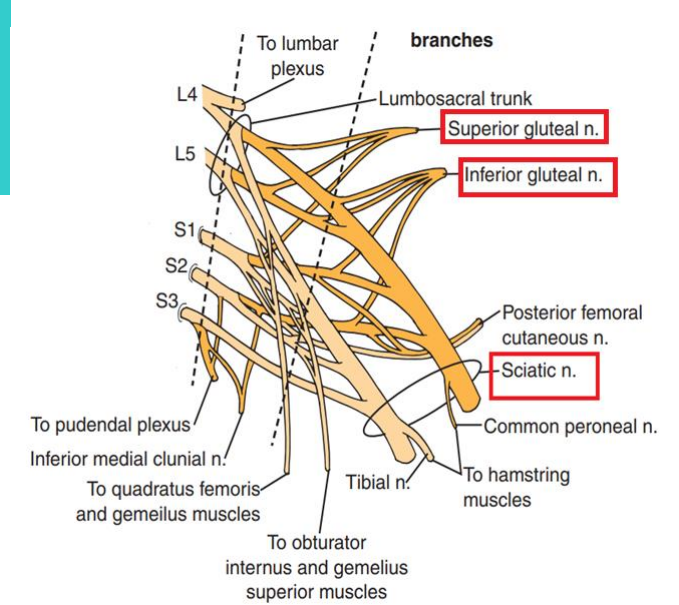
Morton's syndrome

- Caused by chronic entrapment of the planter interdigital nerve under the intermetatarsal ligament
- Is more often found at the second and third intermetatarsal spaces.
- Intermetatarsal pain and numbness exacerbated by walking/standing and relieved by rest and shoe removal.



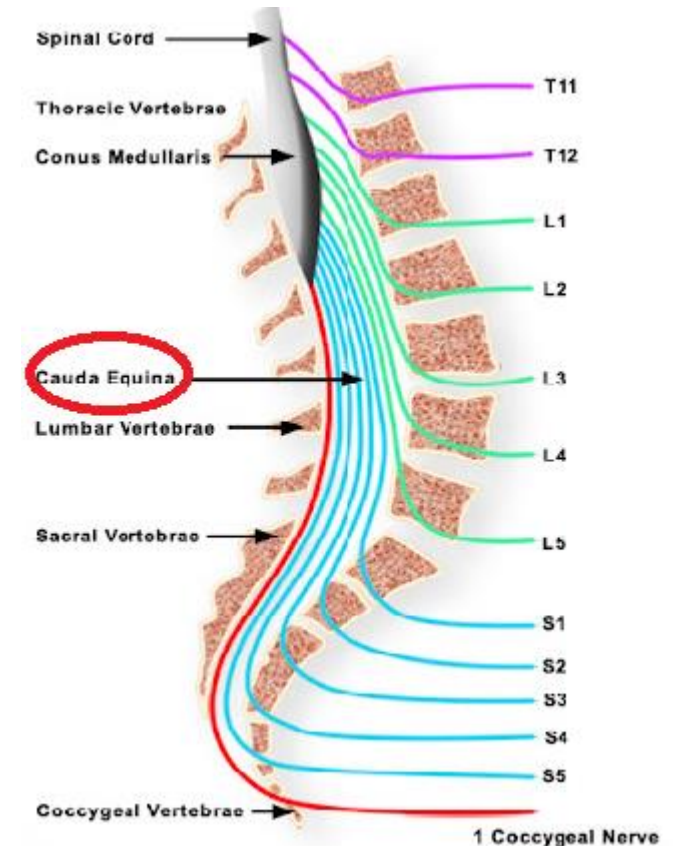
Superior and Inferior Gluteal Nerves

- Injured after hip replacement surgery
- Superior gluteal: gluteus medius, minimus, tensor fascia lata
 - weakness of hip abduction and external rotation.
 - Trendelenburg gait
- Inferior gluteal injury will result in atrophy of the gluteus maximus and weakness of leg extension.
- There should be no sensory changes



Cauda Equina Syndrome

- CES affects a bundle of nerve roots called cauda equina (Latin for horse's tail).
- Symptom:
 - Severe low back pain
 - Pain, numbness, or weakness in one or both legs
 - Saddle anesthesia
 - Bladder or bowel incontinence
- usually is a surgical emergency.



از توجه شما سپاسگزارم

