Lower Limb Nerves
Lectures Objectives

• Describe the structure and relationships of the plexuses of the lower limb.
• Describe the course, relationships and structures supplied for the major nerves of the lower limb.
• Give a general description of a peripheral nerve lesion.
Lumbar Plexus

- Ventral rami L1-L4
- Supplies:
  - Abdominal wall
  - External genitalia
  - Anteromedial thigh
- Major nerves .....
Lumbar Plexus

• Nerves relation to psoas m. :
  ➢ Obturator n. & lumbosacral trunk ----- medial border
  ➢ Genitofemoral n. ---- anterior surface
  ➢ Remaining nn. ----- lateral border
Lumbar Plexus

• Iliohypogastric nerve
  – Relations
    • Psoas m.
    • Quadratus lumborum m.
  – Distribution
    • Muscles of the lateral abdominal wall
    • Skin above the inguinal ligament
Lumbar Plexus

• Ilioinguinal nerve
  – Relations
    • Psoas m.
    • Quadratus lumborum m.
    • Inters the inguinal canal and exits from the superficial inguinal ring
  – Distribution
    • Muscles of the lateral abdominal wall
    • Skin above pubic symphysis and scrotum or labia majora
Lumbar Plexus

• Lateral cutaneous nerve of the thigh
  – Relations
    • Psoas m.
    • Iliacus
    • Inguinal ligament
  – Divisions
    • Anterior
    • Posterior
  – Supply the skin over the lateral side of the thigh & knee & lower part of the buttock
Lumbar Plexus

• Genitofemoral nerve
  – Relations
    • Psoas m.
  – Divisions
    • Genital branch
      – Enter spermatic cord
      – Supplies cremaster m.
    • Femoral branch
      – Supply small area of skin over the anterosuperior part of thigh
Femoral Nerve

• Largest branch of the lumbar plexus

• Relations
  – Psoas m.
  – Iliacus m.
  – Inguinal ligament
  – Femoral sheath
Femoral Nerve: Branches

- In the abdomen
  - Muscular branch to iliacus

- In the thigh
  - Muscular branches
    - Sartorius, pectineus & quadriceps femoris
  - Cutaneous branches
    - Medial cutaneous n. of the thigh
    - Intermediate cutaneous n. of the thigh
    - Saphenous n.
  - Articular branches (hip & knee)
Saphenous nerve

- Relations
  - In Femoral triangle
  - Within Adductor canal
  - Cross Femoral a.
  - Between Sartorius & gracilis tendons
  - Accompanies great saphenous v.
  - Anterior to Medial malleolus
Femoral Nerve Injury

• Results from
  – Stab or gunshot wound
  – Complete division is rare

• Paralysis of quadriceps femoris m.
  – Knee can not be extended against resistance
  – Patient usually press against the distal thigh during walking

• Loss of sensation along the medial part of the lower limb and the anterior part of the thigh
Obturator Nerve: Relations

- Emerge from the medial border of the psoas m.
- Cross the pelvic brim posterior to common iliac vessels
- Runs on the lateral wall of the pelvis between internal and external iliac vessels
- Accompanies the obturator vessels
- Exit through the obturator canal
Obturator Nerve: Divisions

• Anterior
  – Anterior to obturator externus & adductor brevis mm.

• Posterior
  – Traverse obturator externus m.
  – Posterior to adductor brevis m.
  – Anterior to adductor magnus m.
Obturator Nerve: Branches

• Sensory n. to parietal peritoneum in pelvis
• Anterior division
  – Muscular branches
    • Gracilis, adductor brevis, adductor longus mm.
  – Cutaneous branch (medial side of the thigh)
  – Articular branch (hip)
• Posterior division
  – Muscular branches
    • Obturator externus & adductor magnus mm.
  – Articular branch (knee)
Obturator Nerve Injury

- Rare
- Paralysis of the adductor muscles
- Loss of sensation of small area of the medial part of thigh
Sacral Plexus

- Ventral rami L4-S4
- Supplies buttocks, perineum & part of lower limb
- Sciatic nerve = L4 to S3 supplies post. thigh & all below knee
Sacral Plexus: Relations

- Anterior to the sacrum & posterior pelvic wall
- Form in front of piriformis m.
- Branches exit from the greater sciatic notch inferior to piriformis m. except the superior gluteal n.
Sacral Plexus: Branches

• Sciatic nerve
  – Largest nerve in the body
• Superior gluteal n.
  – Gluteus medius and minimus and tensor fascia latae mm.
• Inferior gluteal n.
  – Gluteus maximus m.
• Nerve to quadratus femoris m.
  – Inferior gemellus m.
Sacral Plexus: Branches

- Nerve to the obturator internus m.
  - Exit from greater sciatic notch and return from the lesser sciatic notch
    - Superior gemellus m.
- Posterior cutaneous n. of the thigh
  - Buttock & back of the thigh
- Perforating cutaneous n.
  - Medial side of buttock
- Nerve to the piriformis m.
- Pudendal n. (perineum)
Sciatic Nerve: Relations

- Greater sciatic foramen
- Piriformis m.
- In the posterior thigh:
  - Gluteus maximus m.
  - Biceps femoris m.
    - Supply the hamstring mm.
- At the superior part of the popliteal fossa divides into its terminal branches
  - Tibial n.
  - Common peroneal n.
Tibial Nerve: Relations

- Popliteal fossa
- Descend through the posterior compartment of the leg
  - Gastrocnemius and soleus mm.
  - Posterior tibial a.
- Deep to flexor retinaculum
- Divides into medial and lateral planter nn.
Tibial Nerve: Branches in Leg

- **Cutaneous branches**
  - Sural n.
    - Back of the leg & lateral side of the foot
  - Medial calcaneal n.
    - Skin over medial side of heel
- **Muscular branches**
  - Muscles of the posterior compartment of the leg
- **Articular branches (knee & ankle)**
Tibial Nerve: Branches in sole

- Medial planter n.
  - Accompanies medial planter a.
  - Deep to abductor hallucis m.
- Cutaneous branch
  - Medial side of sole & 3½ toes
- Muscular branch
  - Abductor hallucis, flexor digitorum brevis, flexor hallucis brevis, & 1st lumbrical mm.
Tibial Nerve: Branches in sole

- Lateral planter n.
  - Accompanies lateral planter a.
  - Deep to abductor hallucis & flexor digitorum brevis mm.
- Cutaneous branch
  - Lateral side of sole & 1½ toes
- Muscular branch
  - Abductor digiti minimi, flexor digiti minimi brevis, adductor hallucis, 2-4 lumbricals, & interosseous mm.
Tibial Nerve Injury

• Rare
• Paralysis of the muscles in the posterior compartment of the leg and the muscles of the sole
  – Calcaneovalgus (Dorsiflexion & eversion of foot)
• Loss of sensation on the sole of the foot
  – Trophic ulcers
Common Peroneal Nerve: Relations

• Traverse the popliteal fossa
• Around head of fibula
• Traverse the peroneus longus m.
• Divide into terminal branches
  – Superficial peroneal n.
  – Deep peroneal n.
Common Peroneal Nerve: Branches

- Cutaneous branches
  - Sural communicating branch
  - Lateral cutaneous n. of the calf
- Muscular branch
  - Short head of biceps femoris m.
- Articular branch (knee)
- Superficial peroneal n.
- Deep peroneal n.
Superficial Peroneal Nerve: Relations

- Descends in the lateral compartment between peroneus longus & previs mm.
Superficial Peroneal Nerve: Branches

• Cutaneous branch
  – Skin over the lower anterior leg and dorsum of foot

• Muscular branch
  – Lateral compartment
Deep Peroneal Nerve: Relations

- Descends in the anterior compartment deep to the extensor digitorum longus m.
- Anterior to the interosseous membrane
- Accompanies the anterior tibial vessels
Deep Peroneal Nerve: Branches

- Cutaneous branch
  - Between 1\textsuperscript{st} & 2\textsuperscript{nd} toes
- Muscular branch
  - Anterior compartment & extensor digitorum brevis m.
- Articular branch (ankle & tarsal)
Common Peroneal Nerve Injury

• Results from
  – Fractures of the neck of the fibula
• Paralysis of the muscles of the anterior and lateral compartments of the leg
  – Equinovarus (Planter flexion (foot drop) and inversion)
• Loss of sensation on the anterior and lateral sides of leg & dorsum of foot
Pudendal Nerve: Relations

- Exit from greater sciatic notch and return from the lesser sciatic notch
- Traverse the pudendal canal with the internal pudendal vessels in the ischiorectal fossa
Pudendal Nerve: Branches

• Inferior rectal n.
  – Sensory
    • Mucus membrane of lower half of anal canal & perianal skin
  – Muscular
    • External anal sphincter
Pudendal Nerve: Branches

• Perineal n.
  – Cutaneous (posterior scrotal (labial) n.)
    • Posterior surface of scrotum or labia majora
  – Muscular
    • Superficial and deep transverse perineal mm., bulbospongiosus, ischiocavernosus mm., external urethral sphincter, and levetor ani mm.
Pudendal Nerve: Branches

• Dorsal n. of the penis (clitoris)
  – Skin and deeper structures of the penis (clitoris)
Cutaneous Innervation of the Lower Limb

- Posterior rami
- 12th thoracic
- Lumber plexus
- Femoral
- Sacral plexus
- Tibial
- Common peroneal

- femoral branch of genitofemoral nerve
- lateral cutaneous nerve of thigh
- ilioinguinal nerve
- obturator nerve
- medial cutaneous nerve of thigh
- patellar plexus of nerves
- infrapatellar branch of saphenous nerve
- lateral sural cutaneous nerve
- saphenous nerve
- superficial peroneal nerve
- deep peroneal nerve
- posterior rami of upper three lumbar nerves
- lateral branch of twelfth thoracic nerve
- lateral branches of iliohypogastric (L1) nerve
- branches of lateral cutaneous nerve of thigh
- branches of posterior cutaneous nerve of thigh
- posterior cutaneous nerve of thigh
- lateral cutaneous nerve of calf
- sural communicating branch of common peroneal nerve
- sural nerve
- medial calcaneal nerve
- medial plantar nerve
- lateral plantar nerve
Sciatic Nerve Injury

- Results from
  - Penetrating wounds, fractures of the pelvis, or dislocation of the hip bone
  - Faulty IM injections in the gluteal region
- Complete injury is rare
  - 90% of the cases affect the common peroneal part (more superficial)
- Paralysis of the hamstring muscles and all muscles below knee
  - Foot droop (planter flexed position)
- Loss of sensation below knee except for the medial part (femoral n.)
  - Trophic ulcers of the sole
Sciatica

• Pain along the sensory distribution of the sciatic nerve
  – Posterior of thigh
  – Posterior & lateral sides of leg
  – Lateral part of foot

• Results from
  – Prolapse of an IVD (pressing on the roots of the spinal nerves)
  – Pressure on the sacral plexus or sciatic n. by tumor