**PERIPHERAL NERVE LESIONS**

**LOWER LIMB**

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**GENERAL PRINCIPLES**

**ETIOLOGY**
- Direct trauma
  - Fractures, stab wounds, gunshot, injection of drugs
- Stretching
  - Dislocation, falls, traction during birth
- Entrapment/Compression
  - Constriction by fascial bands, tight casts, tumors
- Neuritis
  - Chemical toxins, viruses, inflammations

**Distribution**
- Each nerve in a plexus contributes to several peripheral nerves.
- Each peripheral nerve of a plexus contains fibers from several spinal nerves.
- Skin areas supplied by spinal nerves (dermatomes) are different from the skin areas supplied by the peripheral nerves.
- Motor fibers in a spinal nerve (ventral root) generally supply more than one muscle.
- Each muscle usually receives fibers from more than one spinal nerve.
Typical Spinal Nerves

Motor Deficit

- Section of a spinal nerve is followed by weakness in several muscles it supplies, while section of a peripheral nerve results in paralysis.
- If a peripheral nerve is completely severed, all muscles supplied by that nerve will be paralyzed and flaccid, and will slowly decrease in size (atrophy).
- If the lesion is partial, muscles supplied by that nerve will be weakened (paresis). Some fibers die out, but others remaining will hypertrophy and try to compensate.
- Position of limb after injury will depend on antagonistic action of intact muscles.

Sensory Deficit

- There will be partial or complete loss of sensation (anesthesia) in areas supplied by the injured nerve depending upon the amount of damage.
- Sensation can be manifested as: pain, paresthesia (abnormal sensation) or anesthesia.

Cutaneous N. vs Dermatomes
Keegan vs Head

Dermatomes

Autonomic Deficit

- Loss of vasomotor supply to blood vessels leads to flushing of skin.
- Loss of innervation to sweat glands produces a dry skin (anhydrosis).

SPINAL CORD INJURY

- **Complete – Above L2**
  - **Causes** – Accident with vertebral crushing or dislocation, tumors, penetrating wounds
  - **Motor** – Paralysis of entire limb (also bladder and bowel dysfunction)
  - **Sensory** – Complete loss of sensation of lower limb and external genitalia

- **Complete – At L4**
  - **Causes** – Same as above
  - **Motor** – Quadriceps and adductors will be spared. Patients walk with characteristic awkward gait. (bladder and bowel)
  - **Sensory** – Sensation will be preserved over lateral side and front of thigh, medial side of thigh, leg and foot

SPINAL CORD INJURY

- **Complete – At S2**
  - **Causes** – Same as above
  - **Motor** – Only intrinsic muscle of foot will be affected and little disability will result. Bladder, bowel and sexual functions severely affected.
  - **Sensory** – Loss of sensation down the back of the limb, external genitalia and area around anus

- **Sacral Plexus**
  - **Causes** – Childbirth, pelvic operations, tumors, penetrating wounds
  - **Motor** – Varying amounts of motor function loss depending on extent of the lesion. Walking is possible using quadriceps and psoas. Loss of bladder, sexual and rectal
  - **Sensory** – Pain down back of thigh continuing into leg & foot
**Lateral Femoral Cutaneous Nerve**

- **Causes** – Entrapment behind lat. End of inguinal lig. 1st sign of lumbar cord tumor
- **Motor** - None
- **Sensory** – Pain, numbness or tingling down lateral side of thigh over “pocket area.”

**Femoral Nerve**

- **Causes** - Vascular dx, retroperitoneal hemorrhage, trauma
- **Motor** – With partial injury an increasing weakness of quadriceps resulting in an unstable knee which buckles unexpectedly. Complete injury there is weakness of thigh flexion, loss of ext. (patellar reflexes), and leg flexed.
- **Sensory** - Ant. thigh and medial leg

**Obturator Nerve**

- **Causes** – Trauma, pelvic fractures, childbirth, ovarian cancer
- **Motor** – Weakness of adductors giving wide stance gait with exaggerated swing outward
- **Sensory** – Pain down medial side of thigh to knee

**Gluteal Nerves**

- **Superior Gluteal Nerve**
  - **Causes** – Intramuscular injections, penetrating wounds
  - **Motor** - Loss of abductors and medial rotators, difficulty in walking
  - **Sensory** - none
- **Inferior Gluteal Nerve**
  - **Causes** – Penetrating wounds, injections
  - **Motor** - Loss of extension of hip, difficulty in running and climbing
  - **Sensory** - none
**Sciatic Nerve**

- **Causes** – Herniation of intervertebral disc, IM injections
- **Motor** – Severe muscle loss (only gluteal, adductors and quadriceps left), weakness of thigh extension, flexion of knee and instability of ankle (loss of foot)
- **Sensory** – Pain and abnormal sensation down back of thigh and into leg and foot

**Tibial Nerve**

- **Causes** – Penetrating wounds, popliteal aneurysm
- **Motor**
  - High – hamstrings affected with difficulty in flexing knee, weakness of hip extension.
  - Low – popliteal fossa with flexors of ankle and toes
- **Sensory** – Pain/loss over posterolateral leg, lateral and plantar surface of foot

**Peroneal Nerve**

- **Causes** – Trauma as winds around head of fibula
- **Superficial Peroneal**
  - **Motor** – Loss of eversion of foot
  - **Sensory** – Pain over front of leg and dorsum of foot
- **Deep Peroneal**
  - **Motor** – Foot drop with flexed toes
  - **Sensory** – Pain between 1st and 2nd toes

**SUMMARY**
### Cutaneous Nerves

- **Saphenous Nerve**
  - Pain over medial side of leg and foot

- **Sural Nerve**
  - Pain over the lateral border of the ankle and foot

### SELF-TEST OF NERVE INJURIES

1. Complete loss of all movements of the ankle and toes, weakness of flexion of the leg and extension of the hip.
   - **A.** Superior gluteal nerve @ origin
   - **B.** Inferior gluteal nerve @ origin
   - **C.** Femoral nerve @ femoral triangle
   - **D.** Sciatic nerve @ gluteal region
   - **E.** Sciatic nerve @ lower 1/3 of thigh
   - **F.** Common peroneal nerve @ popliteal
   - **G.** Superficial peroneal nerve @ origin
   - **H.** Deep peroneal nerve @ origin
   - **I.** Deep peroneal nerve @ lower 1/3 of leg
   - **J.** Tibial nerve @ popliteal
   - **K.** Tibial nerve @ lower 1/3 of leg
   - **L.** Not possible with single nerve damage

2. Loss of extension of the leg (at the knee)
   - **A.** Superior gluteal nerve @ origin
   - **B.** Inferior gluteal nerve @ origin
   - **C.** Femoral nerve @ femoral triangle
   - **D.** Sciatic nerve @ gluteal region
   - **E.** Sciatic nerve @ lower 1/3 of thigh
   - **F.** Common peroneal nerve @ popliteal
   - **G.** Superficial peroneal nerve @ origin
   - **H.** Deep peroneal nerve @ origin
   - **I.** Deep peroneal nerve @ lower 1/3 of leg
   - **J.** Tibial nerve @ popliteal
   - **K.** Tibial nerve @ lower 1/3 of leg
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3. Loss of cutaneous sensation-plantar surface of the foot, unimpaired plantar flexion of the ankle.
   - **A.** Superior gluteal nerve @ origin
   - **B.** Inferior gluteal nerve @ origin
   - **C.** Femoral nerve @ femoral triangle
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### Self-Test of Nerve Injuries

| A. Superior gluteal nerve @ origin | G. Superficial peroneal nerve @ origin |
| B. Inferior gluteal nerve @ origin | H. Deep peroneal nerve @ origin |
| C. Femoral nerve @ femoral triangle | I. Deep peroneal nerve @ lower 1/3 of leg |
| D. Sciatic nerve @ gluteal region | J. Tibial nerve @ popliteal |
| E. Sciatic nerve @ lower 1/3 of thigh | K. Tibial nerve @ lower 1/3 of leg |
| F. Common peroneal nerve @ popliteal | L. Not possible with single nerve damage |

**4. Weakness of flexion of the thigh.** C

**5. Loss of flexion of the leg.** L

**6. Loss of extension of the thigh.** L

**7. Foot drop, sensory deficit between great and second toes only.** H
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9. Loss of plantar flexion of the ankle and toes, unimpaired dorsiflexion of the foot.

11. Inability to evert the foot, unimpaired dorsiflexion of the foot.

12. Loss of all sensation below the knee.

13. Complete loss of all movements of the ankle and toes, little or no loss of flexion of the leg.
## SELF-TEST OF NERVE INJURIES

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15. Sensory deficit between 2nd and great toe only, unimpaired dorsiflexion of the ankle.