

Nerve Structure

Nerves are cordlike organs that are part of the PNS

Nerves vary in size and are made up of parallel bundles of axons wrapped in connective tissue

The wrappings are

- Endoneurium
- Perineurium
- Epineurium

Endoneurium

Made up of loose CT

Surrounds the axon and its myelin sheath

Perineurium

Surrounds the fascicles

Bundle of fibers are called fascicles

Epineurium

Surrounds all fascicles to form a nerve

Spinal Nerves – General Features

- There are 31 pairs of spinal nerves
- Contain thousands of nerve fibers that arise from the spinal cord and supply all parts of the body except the head and some areas of the neck
- All are mixed nerves

Spinal Nerves

- Spinal nerves are very short
- They divide immediately they leave the foramen into:
 - Small dorsal ramus
 - Contain visceral motor, somatic motor and sensory fibers to and from the skin and muscles in the back
 - Larger ventral ramus
 - Contain visceral motor, somatic motor and sensory fibers to and from the ventrolateral body surface, structures in the body wall and the limbs

- At the base of the ventral rami of the thoracic spinal nerves are special rami called rami communicantes that contain autonomic visceral nerve fibers
 - Tiny meningeal branch
 - Re-enters the vertebral foramen to innervate the meninges and the surrounding vasculature

Innervation of Specific Body Regions

- Dorsal rami
 - Remain distinct from each other
 - Innervate a narrow strip of skin and muscle along the back at the level where the ramus leaves the spinal nerve
- Ventral rami
 - Those in the thoracic region are called intercostal nerves
 - Innervate a narrow strip of muscle and skin on the sides, chest, ribs and abdominal wall
 - In other regions, the ventral rami converge and form networks of nerves called plexuses
 - Various fibers within each plexus are rearranged such that any nerve that leaves has contributions from different spinal nerves
 - The advantage of this is that damage to one spinal segment or root cannot completely paralyze any limb muscle
- **Cervical Plexus (C₁ to C₄)**
 - Located in the neck area.
 - Consist mainly of cutaneous nerves that transmit sensory signals from the skin of the neck, ear area, back of head and shoulder
 - The most important branch is the phrenic nerve that supplies both motor and sensory fibers to the diaphragm (Fig 13.8)
- **Brachial Plexus (C₅ to C₈ and most of T₁)**
 - Located partly in the neck and partly in the axilla
 - Arises medially as roots, form trunks (upper, middle, and lower), divides into divisions (anterior and posterior), and terminates as cords (lateral, medial, and posterior) (Fig 13.9)
- **Branches of the posterior cord**
 - Axillary nerve: Innervates the shoulder area
 - Radial nerve: Largest branch and innervates all extensor muscles of the upper limb

- **Branches of the lateral cord**

- Musculocutaneous nerve: Innervates muscles of the anterior arm and provides cutaneous sensation to the lateral forearm
- Median nerve: Has contributions from the lateral and medial cords. Supplies most of skin and flexor muscles of the anterolateral forearm and hand

- **Branches of the medial cord**

- Ulnar nerve: Supplies the rest of the forearm muscles and hand (anteromedial aspect) that are not supplied by the median nerve.

- **Lumbar plexus (L₁ to L₄)**

- Lies within the psoas muscle innervating parts of the abdominal wall muscles
- Major branches descend to the lower limb.
 - Femoral nerve: Largest branch that innervates muscles and skin of the anteromedial thigh
 - Obturator nerve: Innervates the muscles of the medial thigh (Fig 13.10)

- **Sacral plexus (L₄ to S₄)**

- Lies immediately caudal to the lumbar plexus from which it has some contributions
- Innervates the buttocks, pelvis and perineum, and the rest of the lower limbs (Fig 13.11)
 - **Sciatic nerve:**
 - Longest and thickest nerve in the body
 - Actually consists of two nerves (tibial and common peroneal or common fibular nerve)
 - Supplies the entire lower limb except the anteromedial thigh
 - **Tibial nerve**
 - Supplies posterior aspect of the leg and sole of the foot
 - **Common fibular nerve**
 - Supplies the anterolateral aspect of the leg and the dorsum of the foot.

- **Inferior and superior gluteal nerves**
 - Innervate the buttocks
- **Pudendal nerve (pudendal means shameful)**
 - Innervates the muscle and skin of the perineum