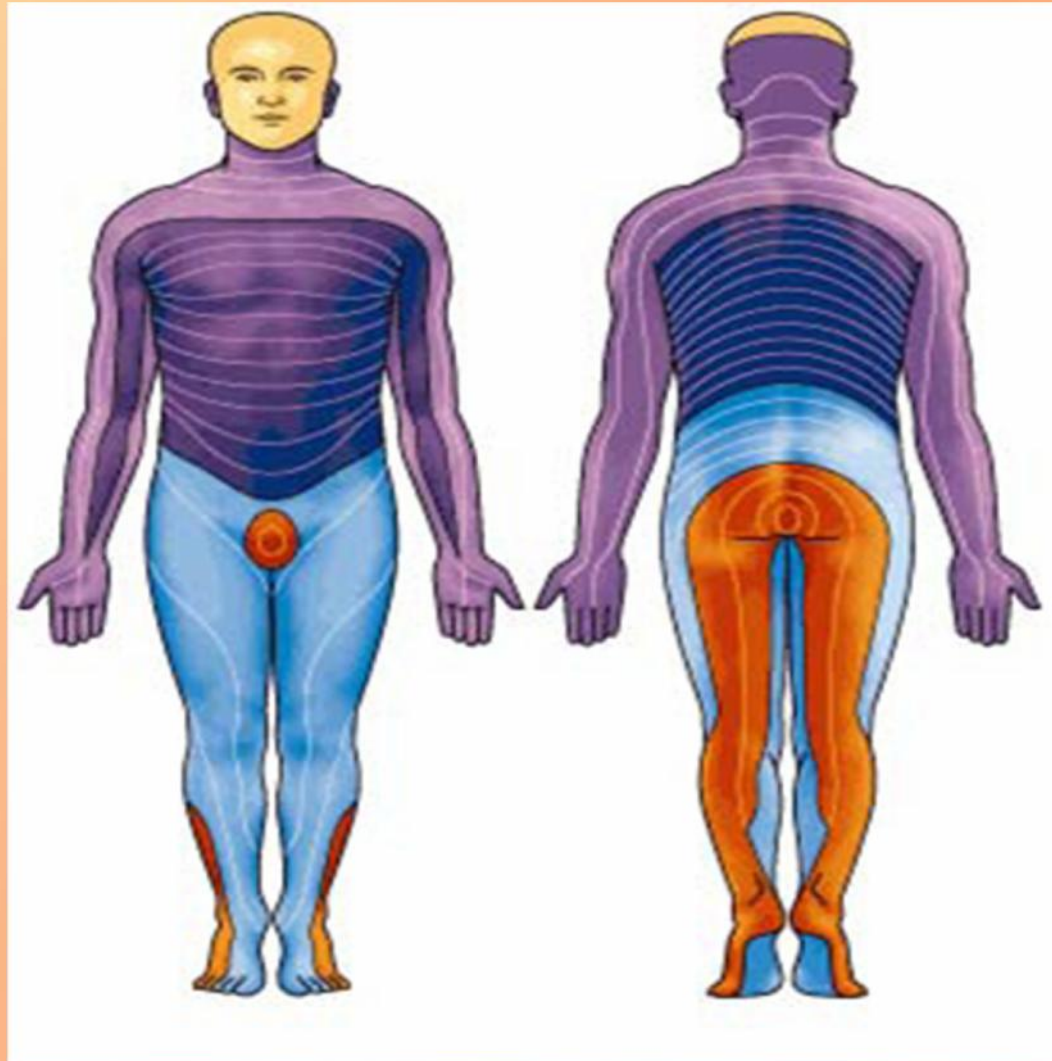


DERMATOMES & SEGMENTAL INNERVATION OF THE UPPER & LOWER LIMBS

By

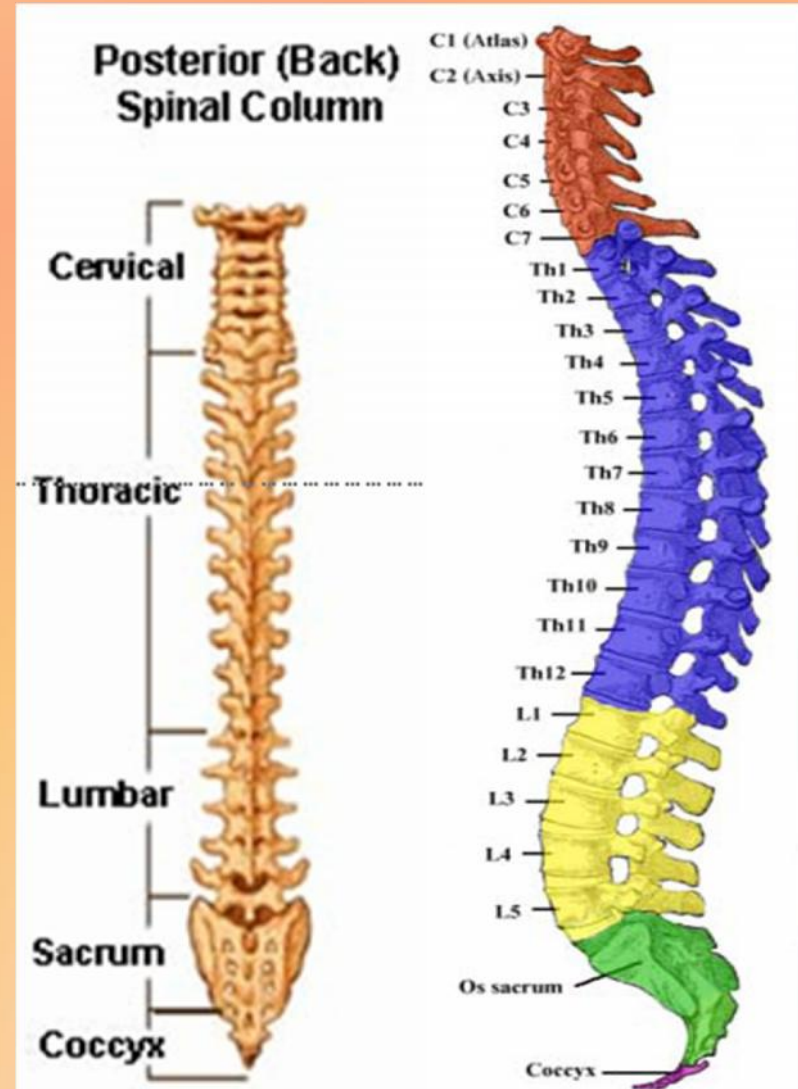
Dr. Riyadh Lafta

Segmental Innervation of the Skin



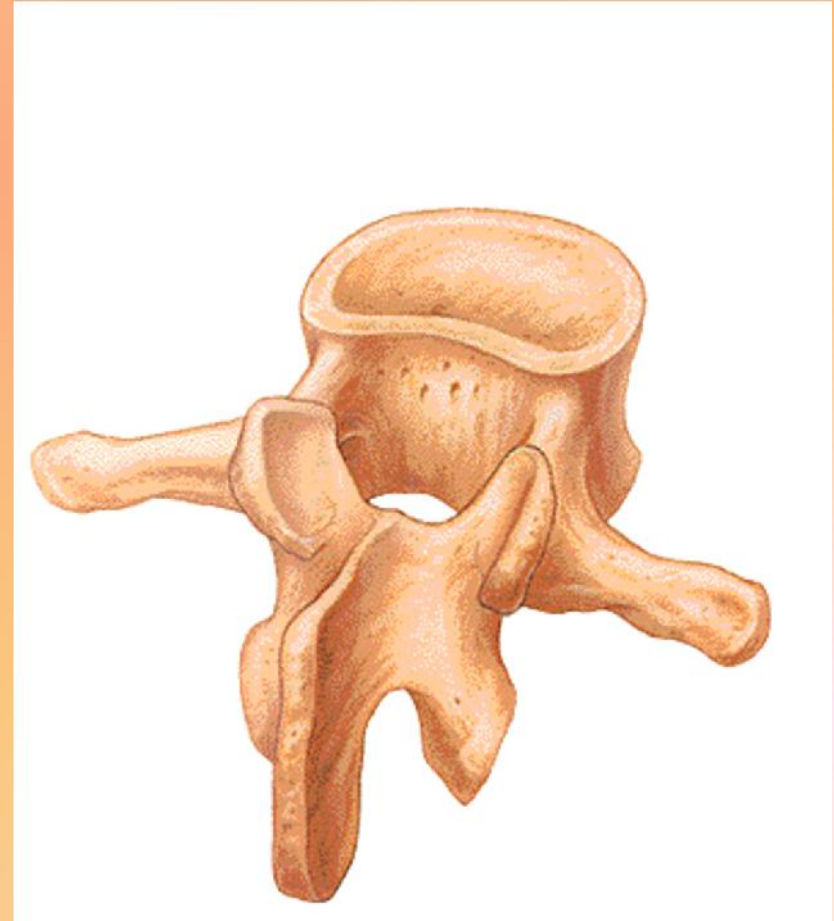
Segmental Nerve Supply to The Limbs

- Nerve Supply to the limbs comes from the Spinal Cord
- The Spinal Cord is protected by the Vertebral Column
- Vertebral Column consists 33 Spinal Vertebrae
- 24 are Discrete (typical) Spinal Vertebrae
- 9 are fused to form the Sacrum & Coccyx
- There are 5 Distinct Groups of Spinal Vertebrae
 1. Cervical (n=7)
 2. Thoracic (n=12)
 3. Lumbar (n=5)
 4. Sacrum (fused-n=5)
 5. Coccyx (fused n=4)



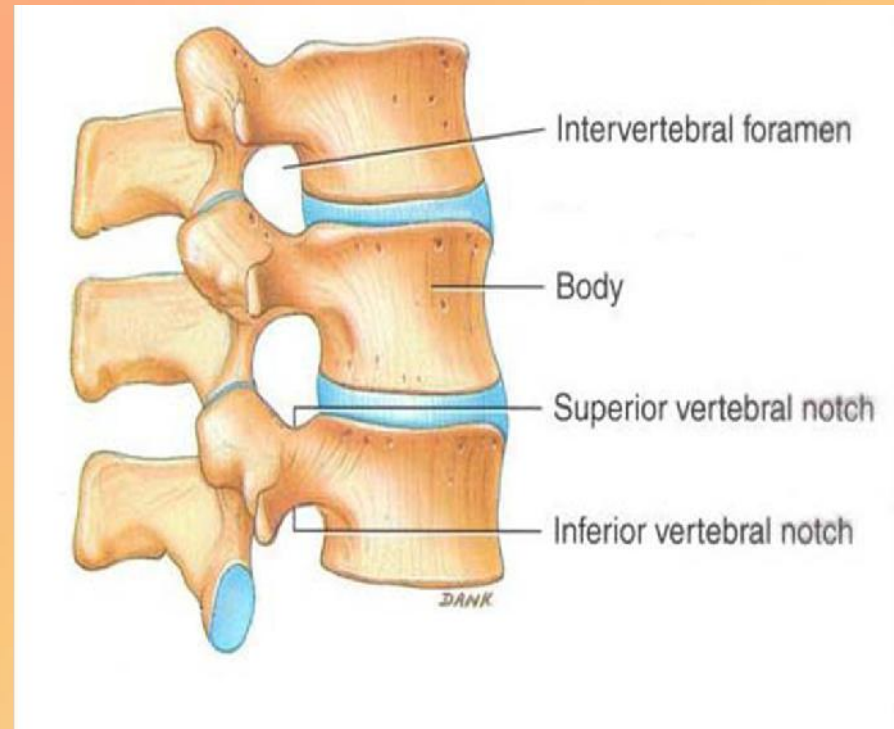
Typical Features of A Vertebral Segment

- Each Vertebra makes 1 vertebral segment
- It has the following:
 - A Body
 - A spine
 - 2 Transverse Processes
 - 2 Superior Vertebral Notches
 - 2 Inferior Vertebral Notches
 - A Vertebral Foramen



Features of 2 adjoining Vertebral Segments

- Each vertebra has an inferior & a superior vertebral notch on each side
- When any 2 consecutive vertebrae form a common joint, their corresponding inferior and superior vertebral notches form an intervertebral foramen
- The Spinal cord passes through Vertebral Foramina (most levels)
- Segmental nerves leave the spinal cord via intervertebral foramina



The Spinal Cord+ Vertebral Column



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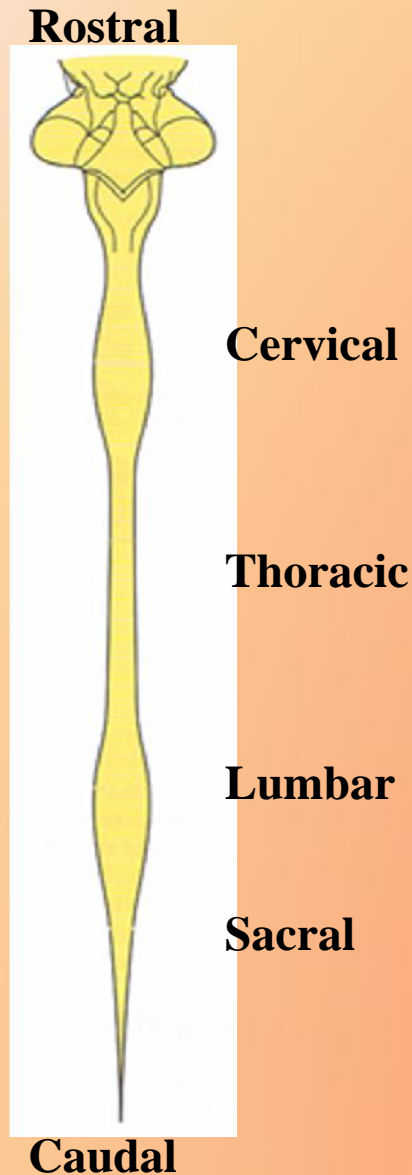


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- The spinal cord is a column of millions of nerve cell bodies and neuronal fibres (Ascending, Descending & Crossing)
- It extends from the Medulla to the Conus Medullaris (where it ends)
- It runs through vertebral foramina of the vertebral column
- Vertebral foramina form the spinal canal

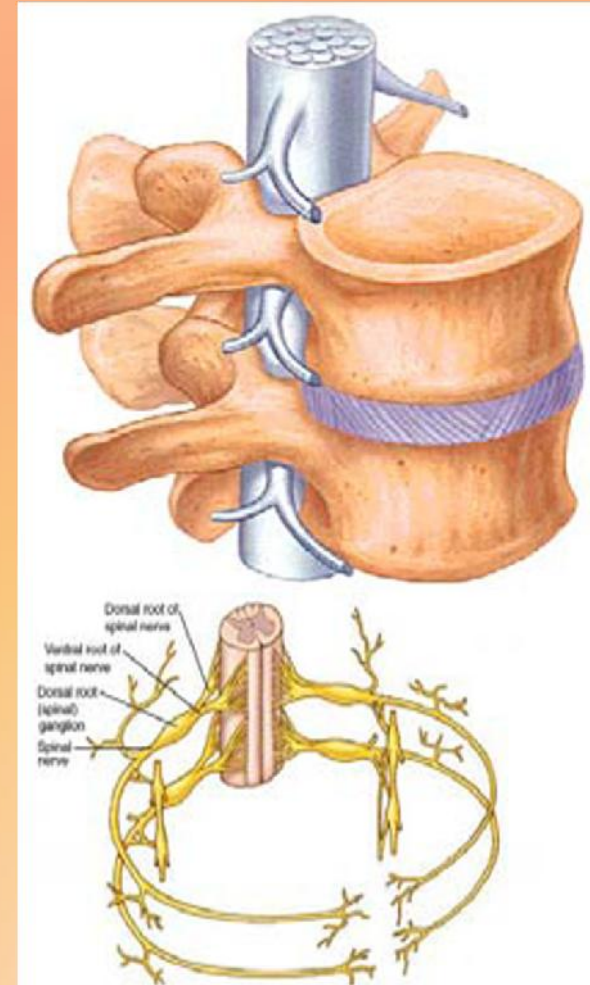
The Spinal Cord



- The Gross Shape of the spinal cord changes from rostral to caudal
- Shows two enlargements at the cervical and lumbar levels and ends in a taper (conus medullaris)
- The cross sectional appearance of the cord shows changes from rostral to caudal
- In X-section: the spinal cord shows regional specialisations that match the 4 Vertebral Regions
- Distribution of motoneurones varies along the rostro-caudal axis of cord

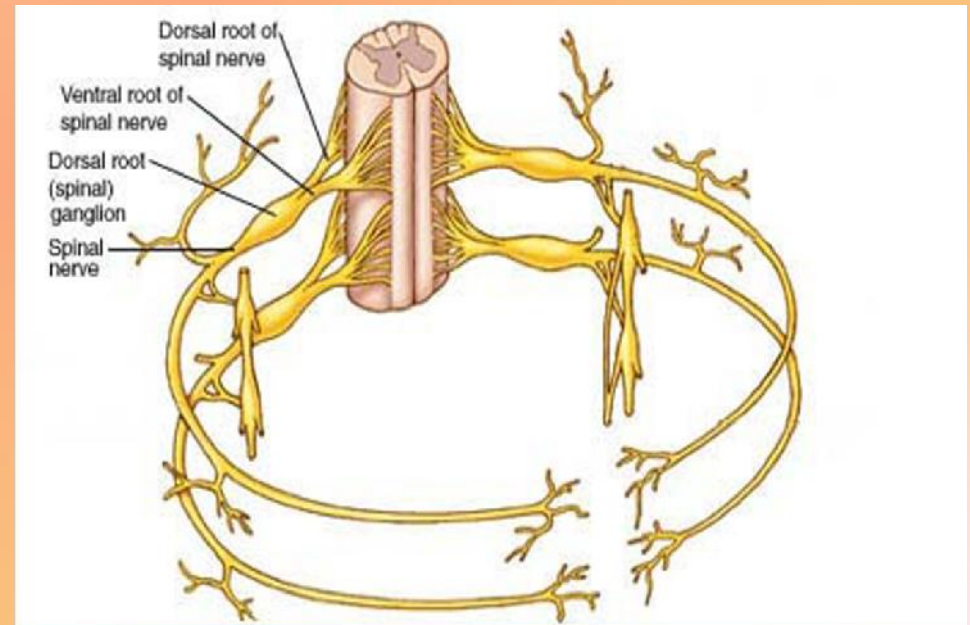
What is a Segmental Nerve?

- At Each Vertebral Level the spinal cord gives out a pair of nerves
- One to the Left
- One to the Right
- The nerves exit the vertebral column through intervertebral foramina
- Each of these nerves is known as a Spinal Segmental Nerve
- There is an established relationship between a vertebral level and a neuronal spinal level.



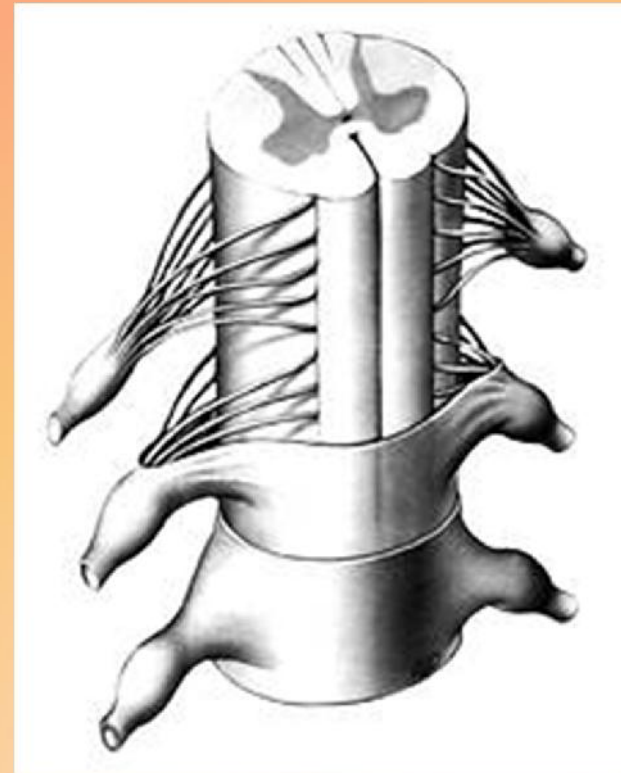
Composition of a Segmental Nerve

- Segmental Nerves are known as Mixed Spinal Nerves
- We need to know what this mixture consists of



Functional Modalities of A Segmental Nerve

- Each Spinal Segmental Nerve comprises of:
 - 1) Dorsal Roots (Sensory)
 - 2) Ventral Roots (Motor)
 - 3) Ventral Roots (Autonomic)



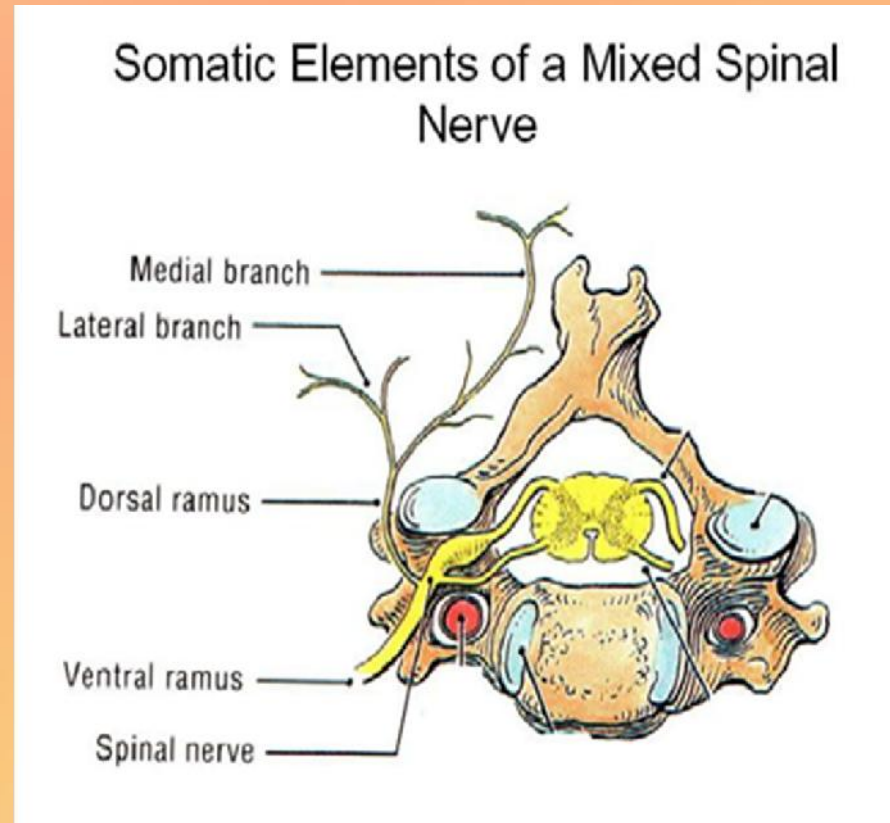
Branching Order of a Segmental Nerve

- As the mixed spinal nerve emerges through the intervertebral foramen it divides into 2 branches
- Posterior or Dorsal Ramus (small)

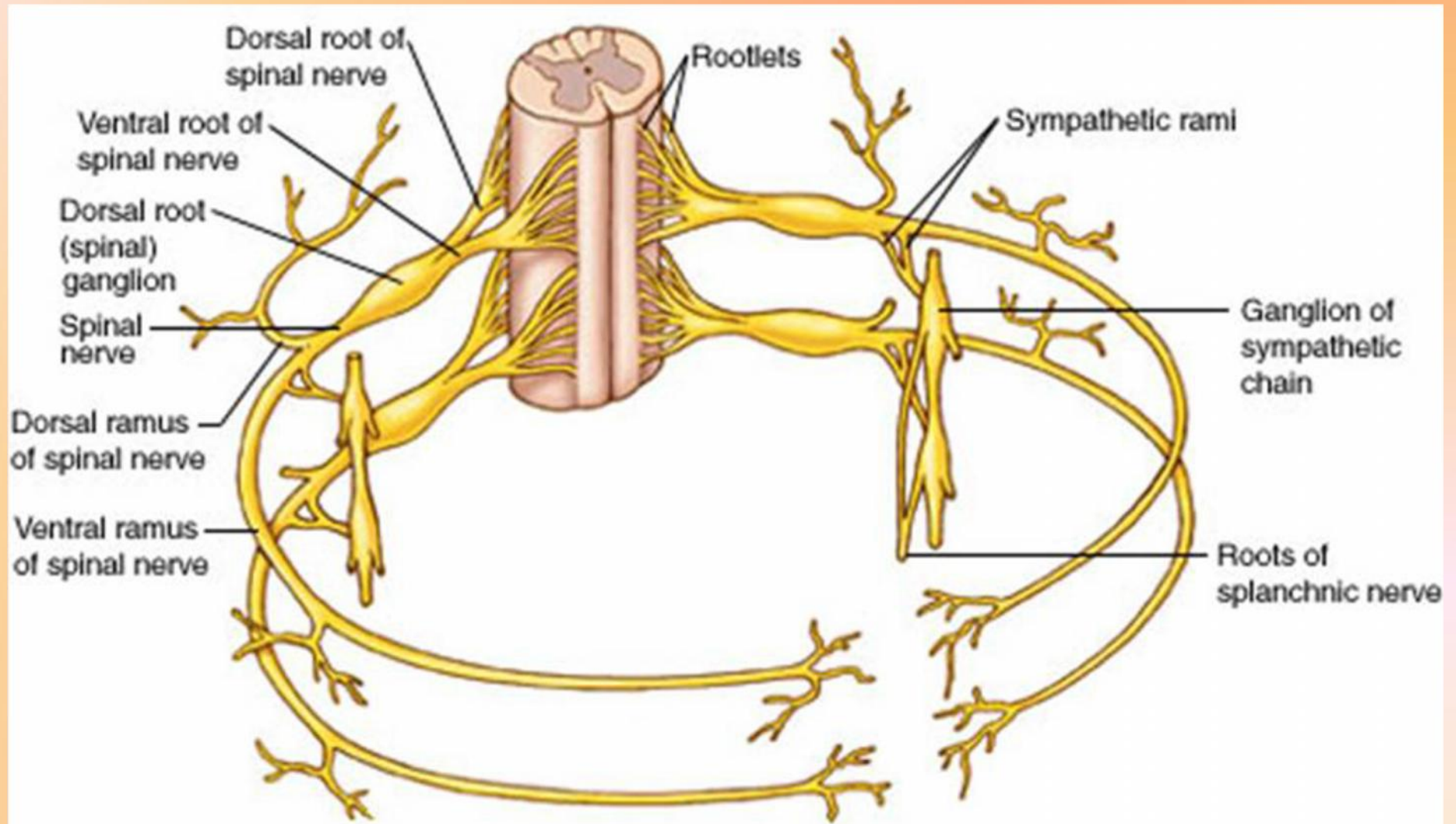
The Posterior Ramus Divides further into Medial & Lateral Branches

- Anterior or Ventral Ramus (Large)

All Rami contain all functional modalities for that segmental level

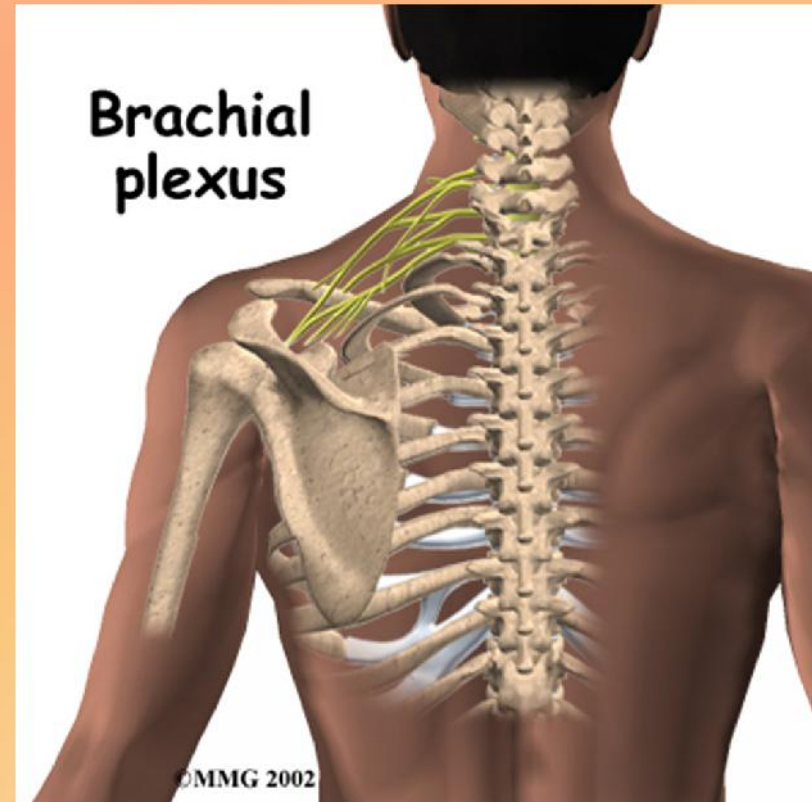


Anterior & Posterior Rami of Spinal Nerves



Nerve Supply to The Upper Limb

- It Receives all its Nerve Supply from The Spinal Cord
- Most of Its Supply is derived from the Cervical Spinal Segments (C5-T1)
- The rest comes from T2 Roots
- Spinal Nerves (except T2) to the Upper Limb form a Network of nerves
- The Brachial Plexus



Brachial Plexus

- **Roots**

From Anterior Rami C5-T1 Unite & Divide to give

- **Upper Trunks** (C5,C6)
- **Middle Trunks** (C7)
- **Lower Trunks** (C8,T1)

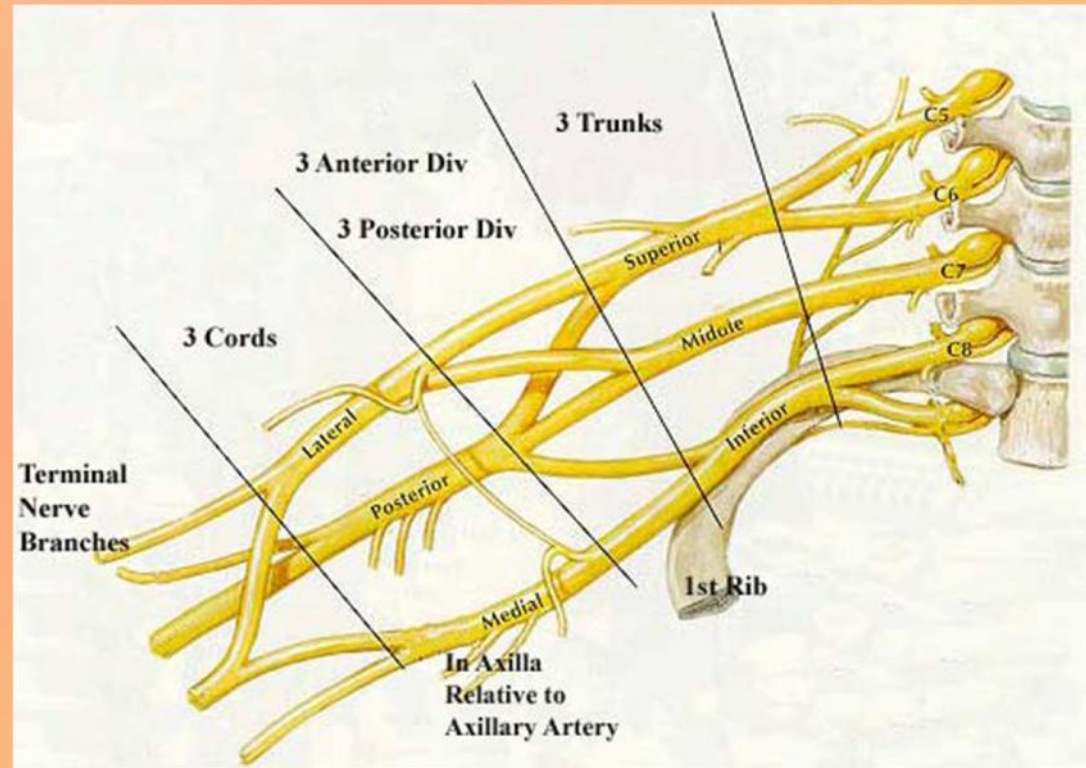
All Trunks Divide into

- **Divisions:**

- Anterior
- Posterior

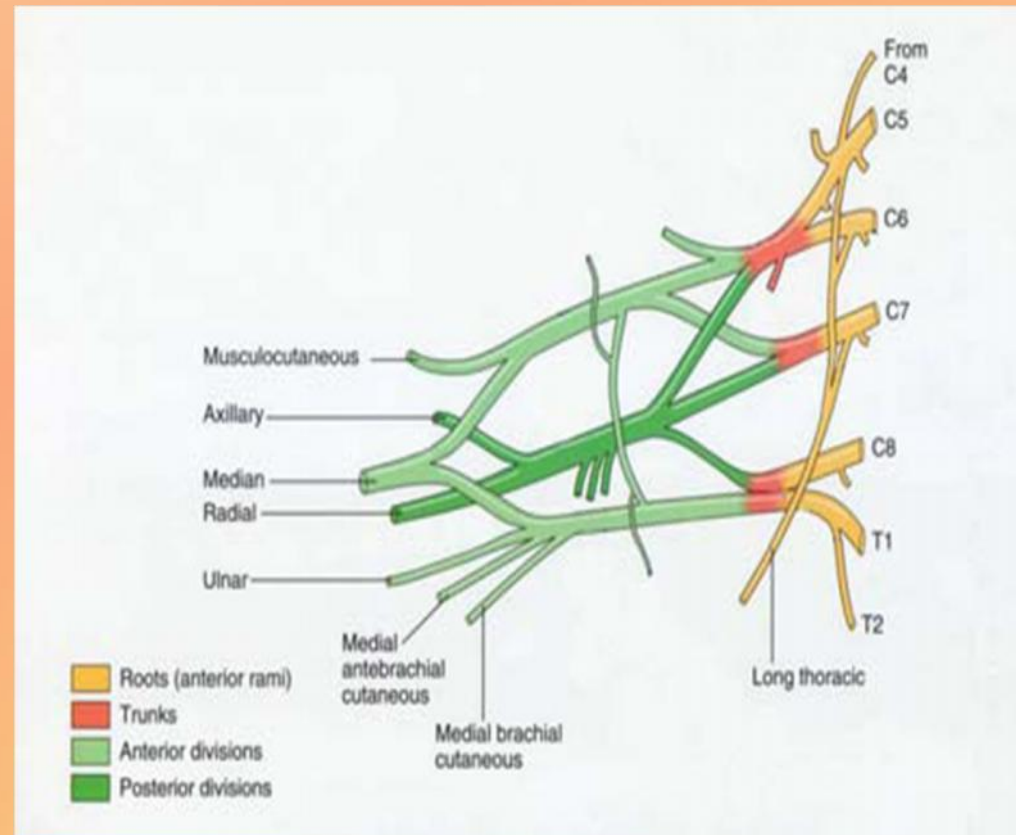
Divisions give rise to Cords (Axillary Artery):

- Medial Cord
- Lateral Cord
- Posterior Cord



Nerves of The Upper Limb

- Radial Nerve –
C5,6,7,8,T1
- Musculocutaneous Nerve
– C5,6,7
- Ulnar Nerve – C7,8,T1
- Median Nerve –
C6,7,8,T1

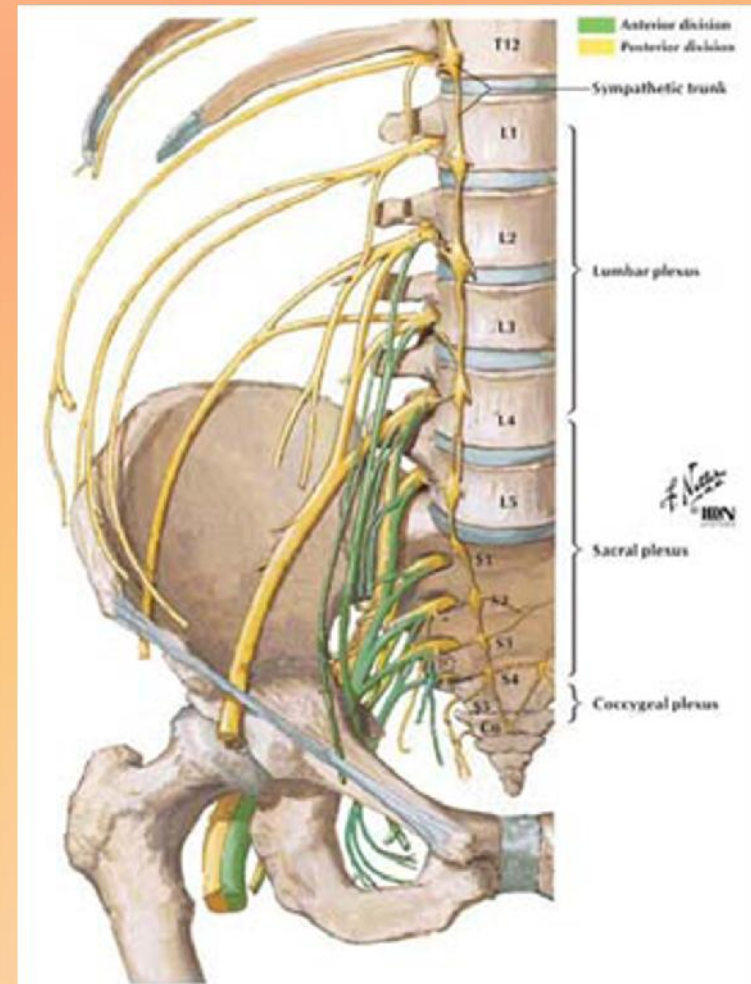


Other Nerves of the Upper Limb

- Lateral Pectoral
- Upper Subscapular
- Lower Subscapular
- Dorsal Scapular
- Long thoracic
- Axillary

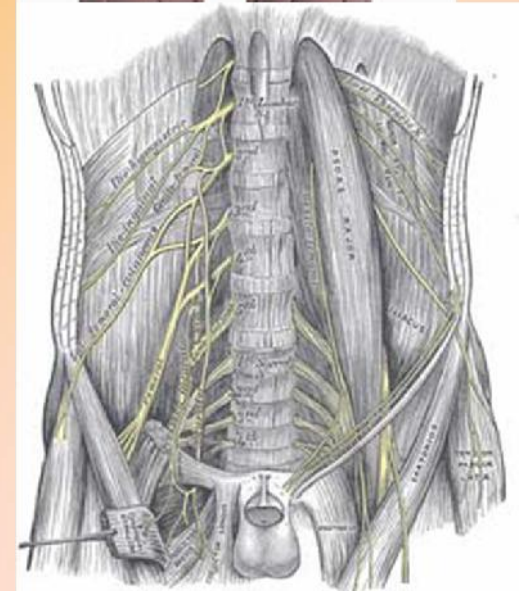
Nerve Supply to The Lower Limb

- The Lower Limb Also Receives all its Nerve Supply from The Spinal Cord
- It is supplied from the Lumbar and Sacral Spinal Segments (L1-S4)
- Spinal Nerves to the Lower Limb originate from two separate Networks of nerves
- The Lumbar Plexus (L1-L4)
- Sacral Plexus (L4-S4)

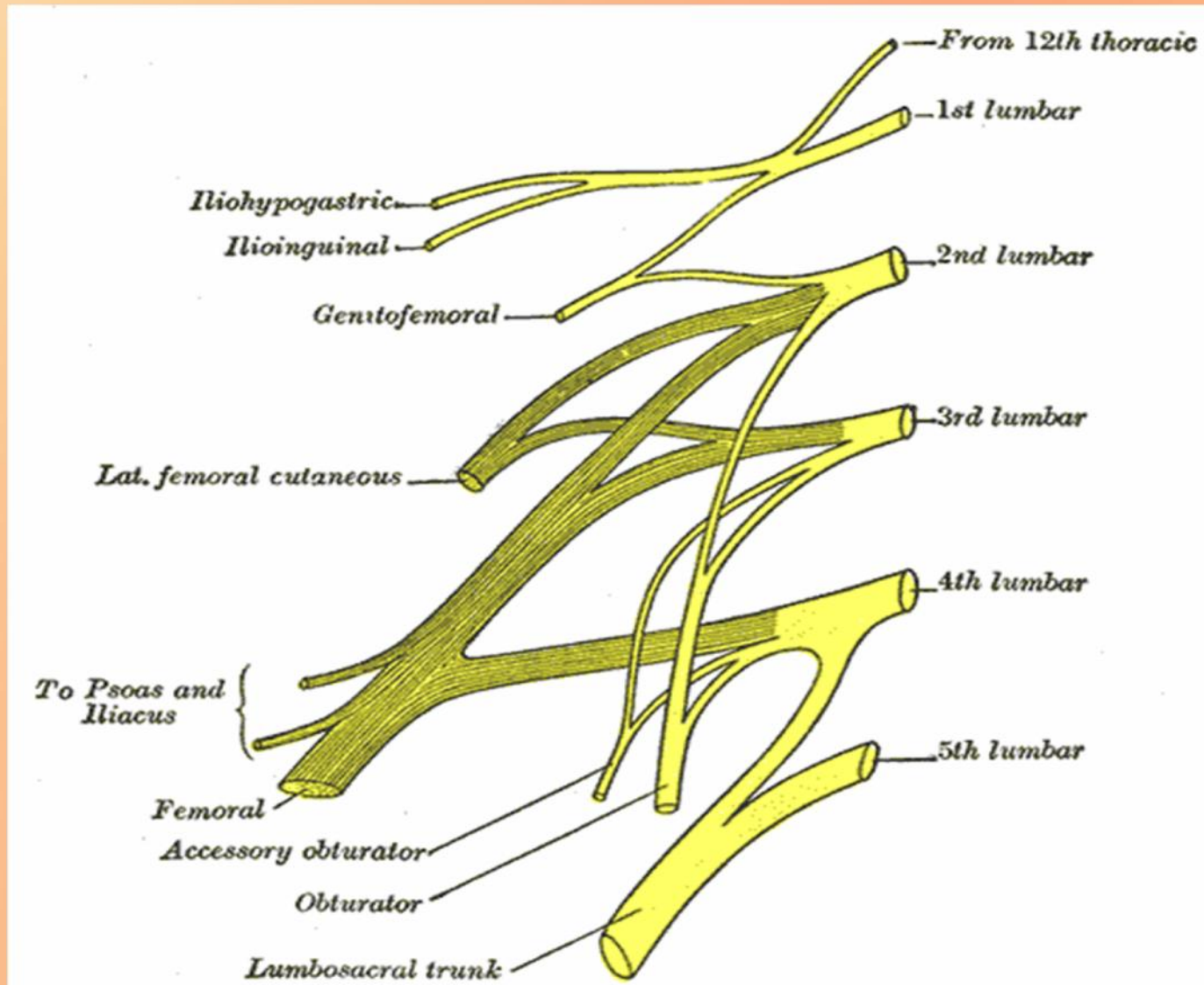


The Lumbar Plexus

- It forms behind within the psoas major muscle
- Nerves emerge either medial or lateral to the borders of the psoas
- Nerves emerging lateral to psoas
 1. The femoral (L2-L4)
 2. Iliohypogastric
 3. Ilioinguinal
 4. Lateral cutaneous nerve of the thigh
- 5. Nerves emerging medial to psoas
- 6. The obturator nerve
- 7. The lumbosacral trunk



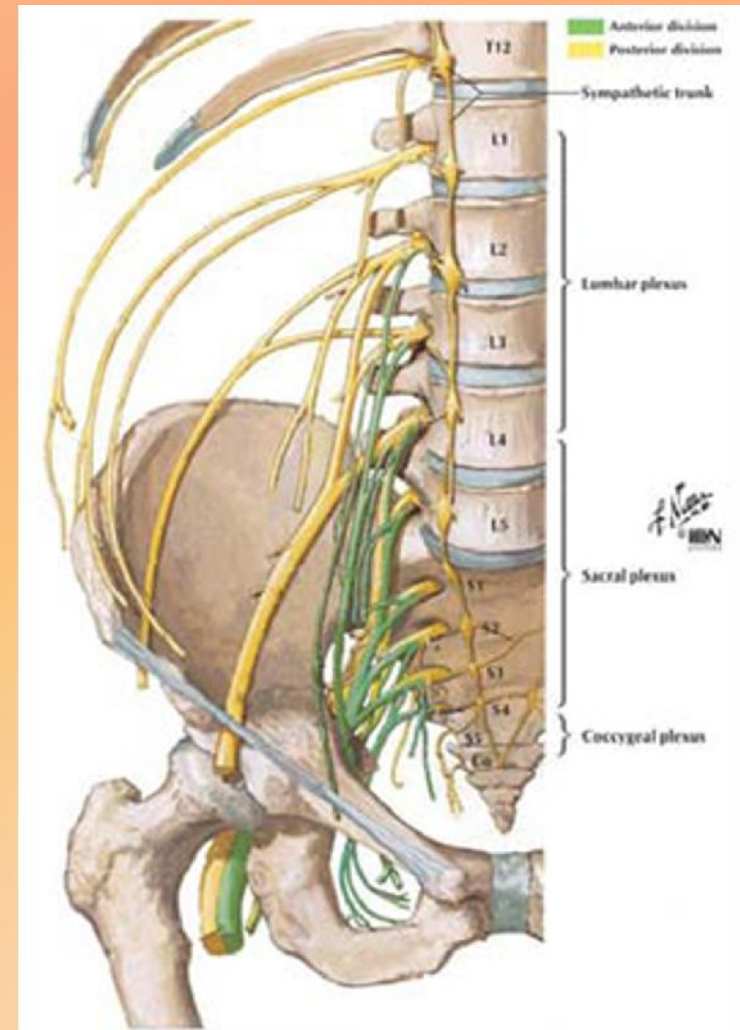
Lumbar Plexus



The Sacral Plexus

Composed of:

- Lumbosacral trunk (half of L4 & all L5) Sacral spinal segmental outflow
- Plexus forms within the pelvic cavity
- Plexus lies in relation to piriformis
- Sacral plexus supplies:
 - Pelvic region
 - Gluteal region
 - Perineal region
 - The lower limb (via the sciatic nerve)



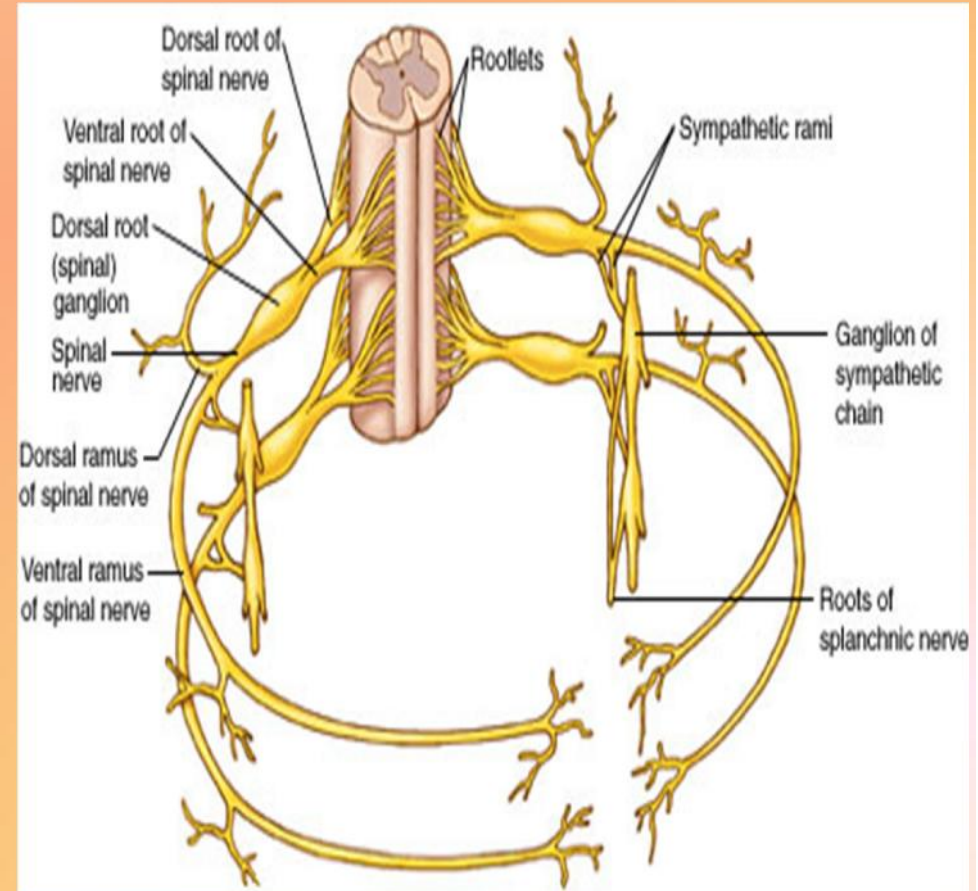
Dermatomes of the Upper Limb

Why Study Dermatomes?

- To enable examination of integrity of sensory function of the skin of the body (as a major organ of the body)
- To accurately pinpoint areas of skin with disturbed function (e.g. anaesthesia; Allodonia)
- To predict what nerves & spinal segments may be affected (Disturbed Sensory Function above)
- To anaesthetise segments of nerves and associated skin with accuracy

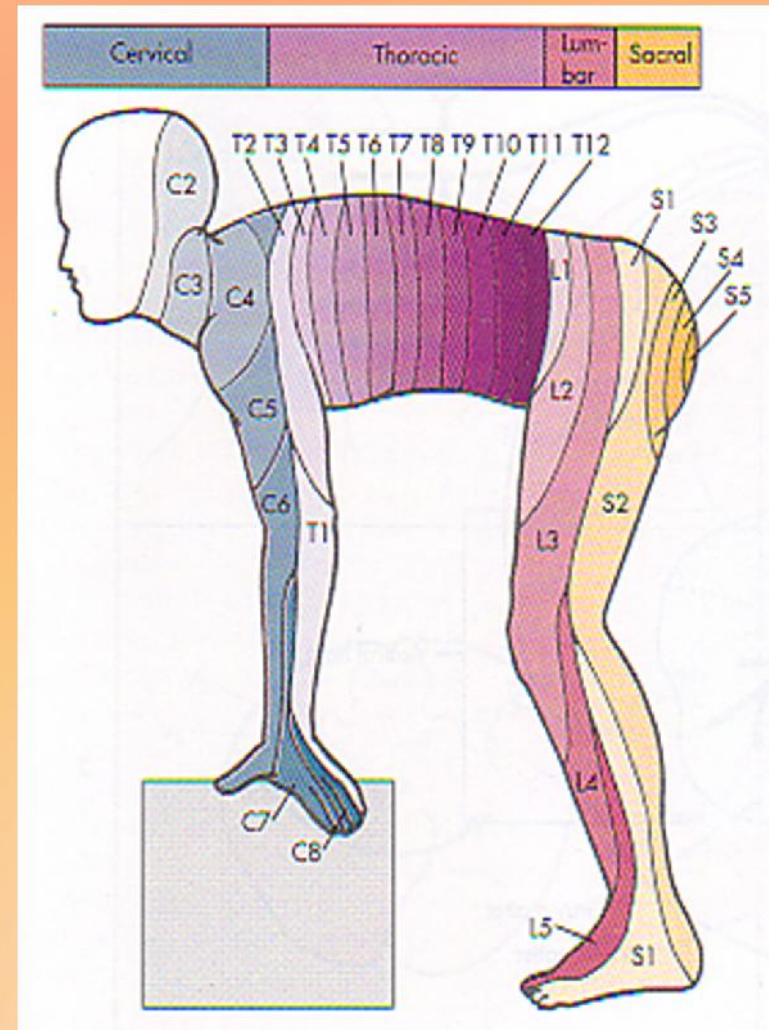
Dermatomes

- **Remember that:**
- The spinal cord handles both General Categories of Nervous System Function:
- (Somatic & Autonomic)
- **Somatic**
- Sensory (Inflow)
- Motor (Outflow to Muscles)
- **Autonomic:** Outflow to:
 - glands and
 - smooth muscles



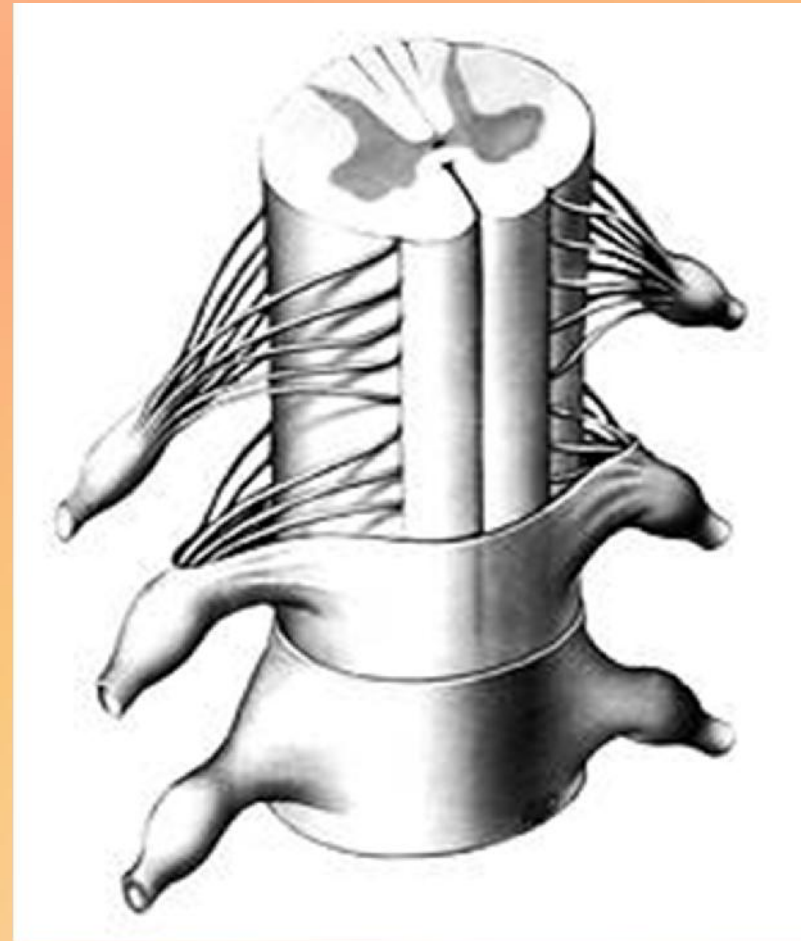
What is a Dermatome?

- Literally- it translates to skin (derma-) segment (-tome)
- It is an area of skin supplied by sensory fibers from a single spinal nerve
- Dermatomes are arranged as highly ordered slices of the skin
- A spinal nerve root supplies 1 slice of skin (or dermatome)
- 1 Dermatome receives sensory supply from 1 spinal nerve root



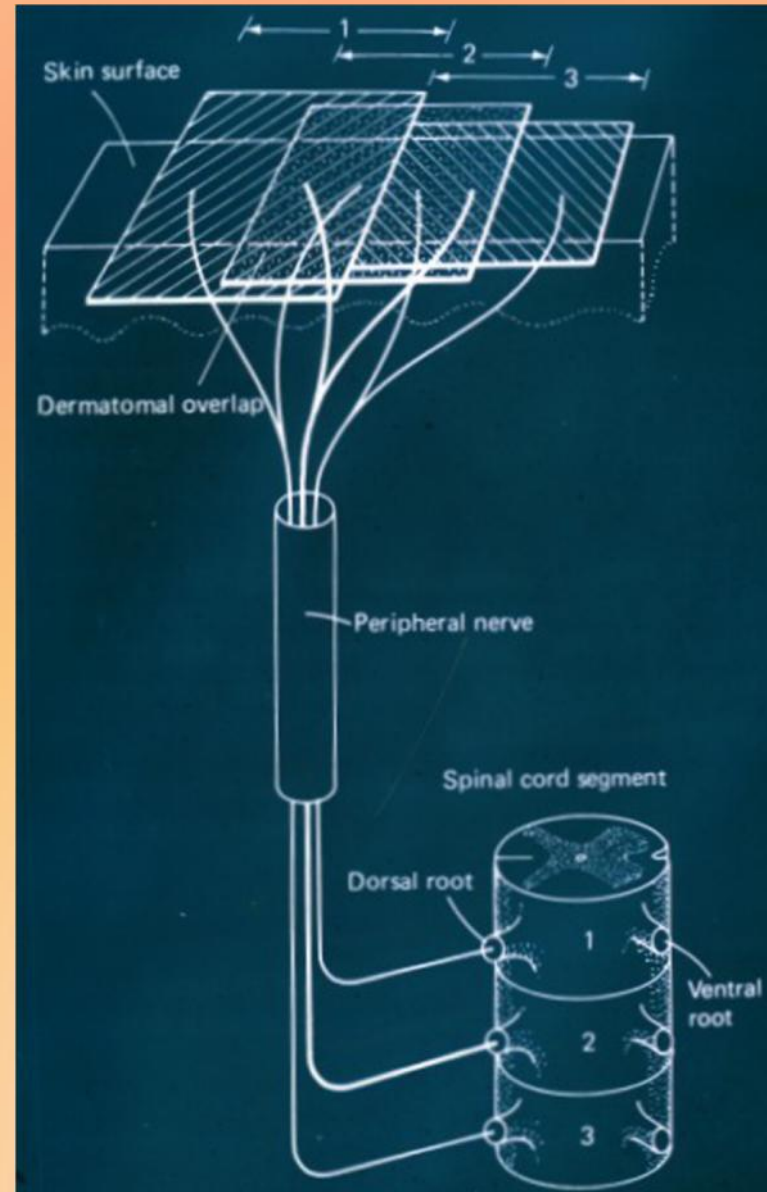
Spinal Nerves

- As a general rule:
 - An area of skin is supplied by sensory fibers from a single spinal nerve root (no overlap with others)
 - A spinal nerve is made from nerve fibers coming from a single spinal segment (that corresponds to its vertebral level)

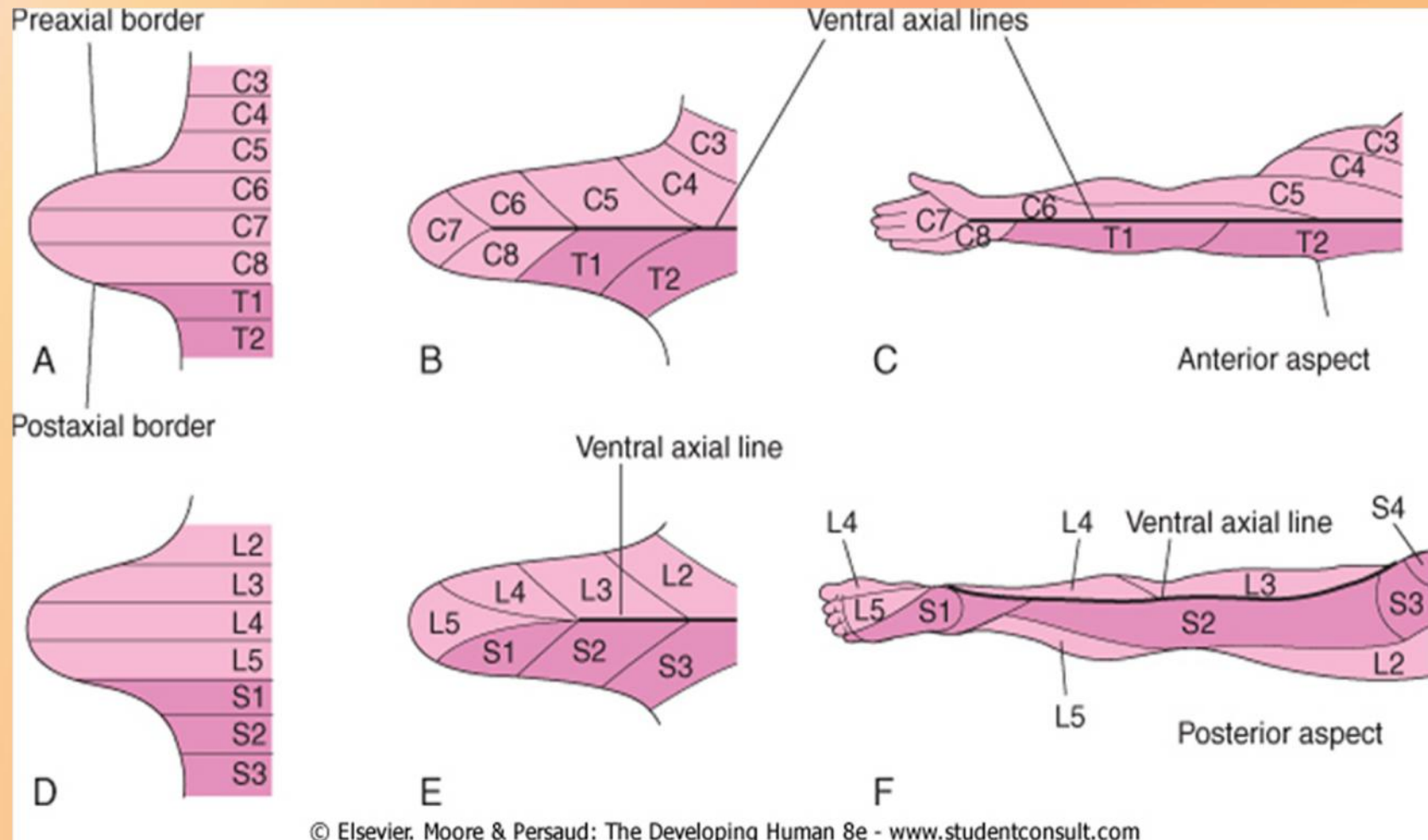


Spinal Nerves

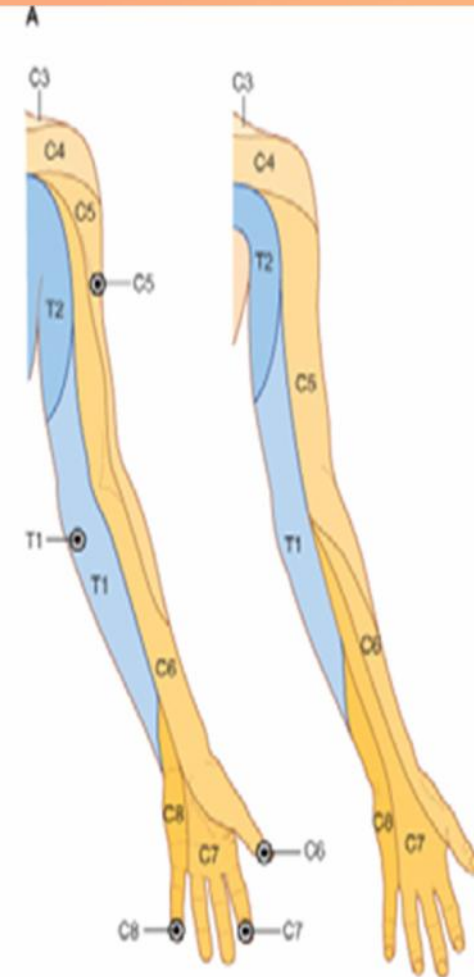
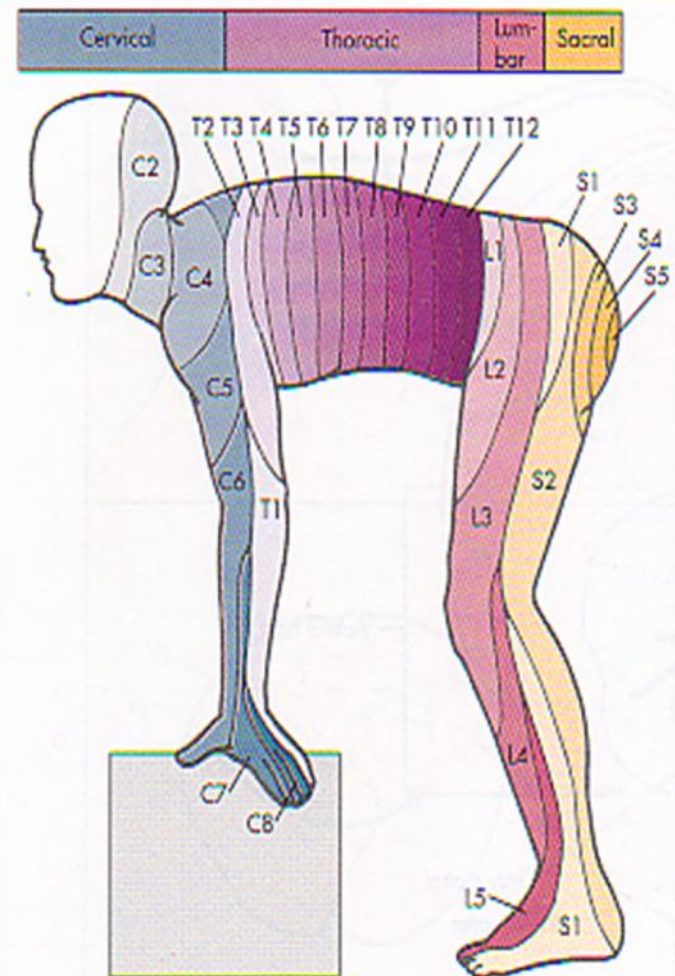
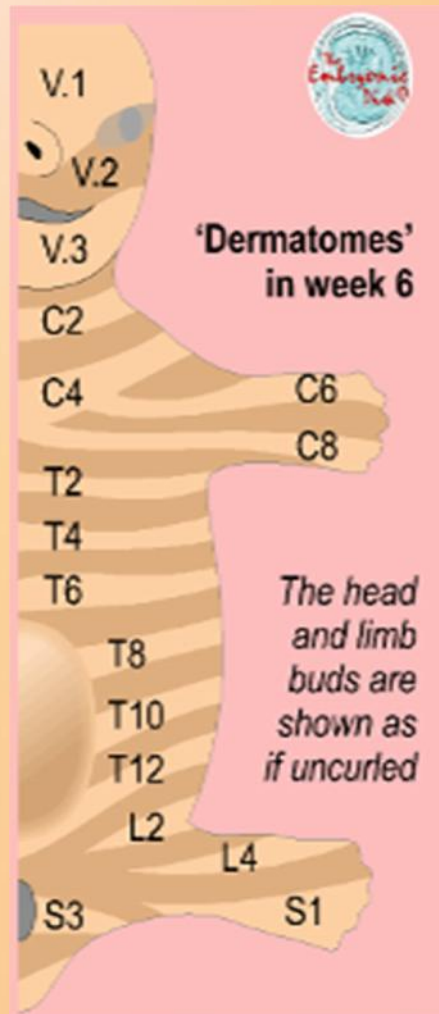
- What is the reality?:
- There is functional overlap between adjacent dermatomes
- Some sections of a dermatome are served by 2 successive spinal nerves
- Thus, a typical dermatome sandwiched between 2 others will be served by 3 successive sensory nerves
- Anaesthesia as a result of nerve damage will result for any dermatome only if all its 3 sensory nerves are all damaged together



Sensory Supply of Upper & Lower Limbs

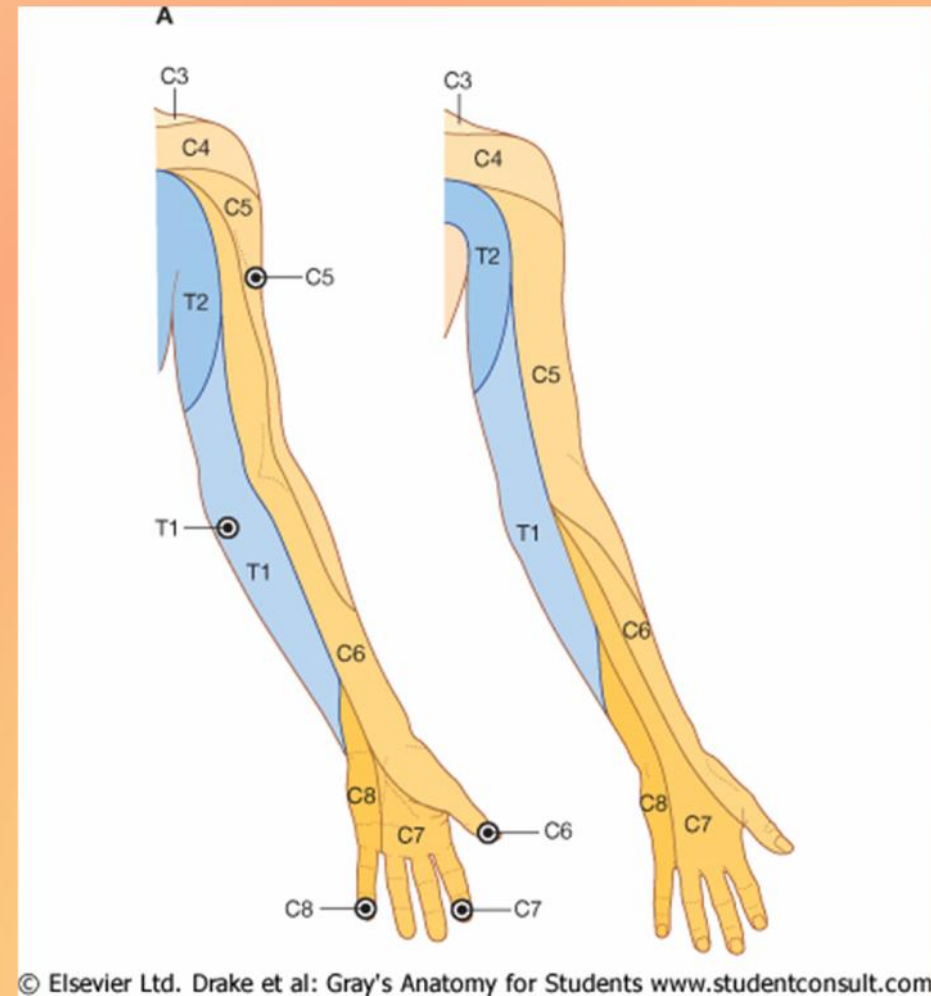


Sensory Supply of Upper Limb

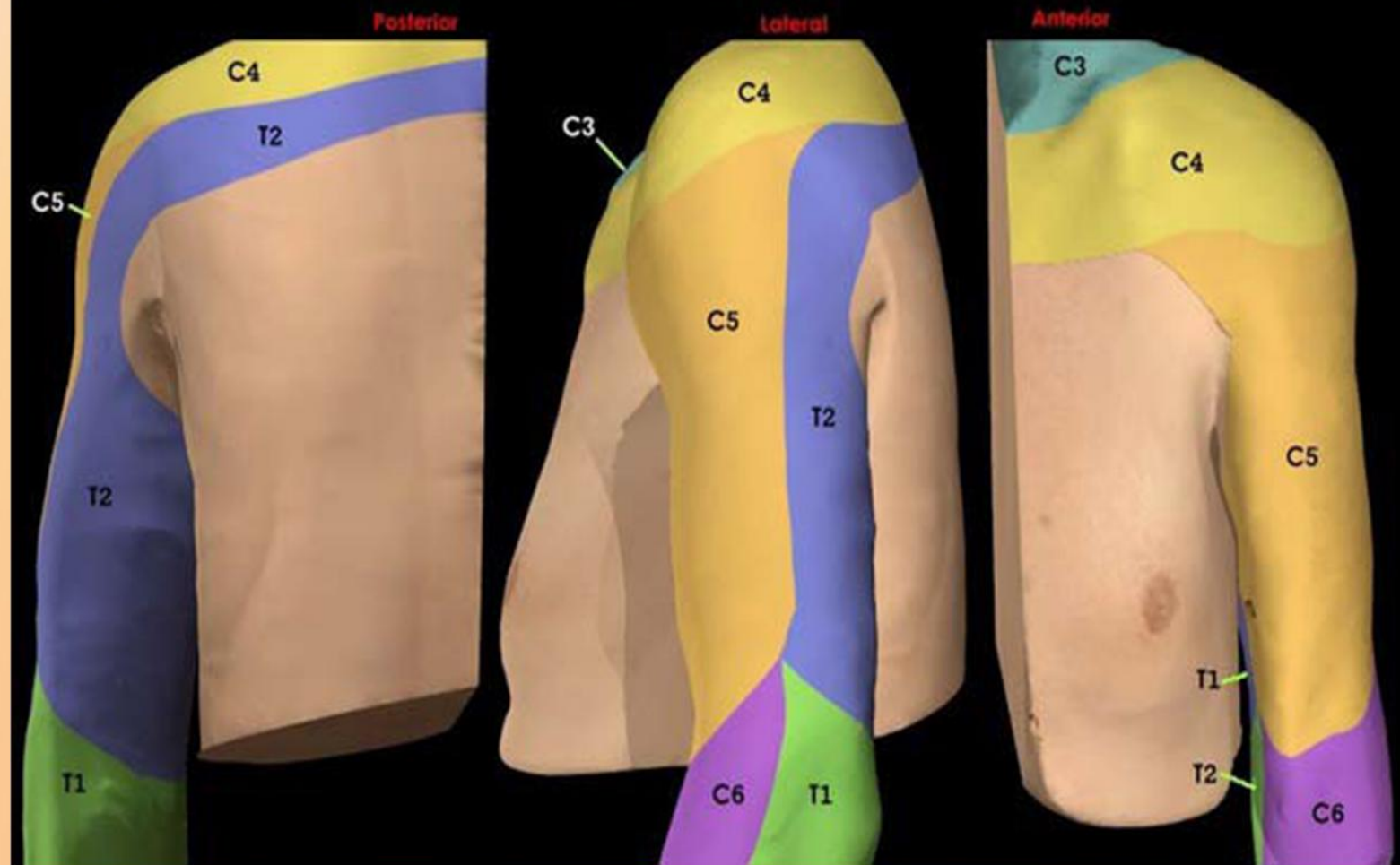


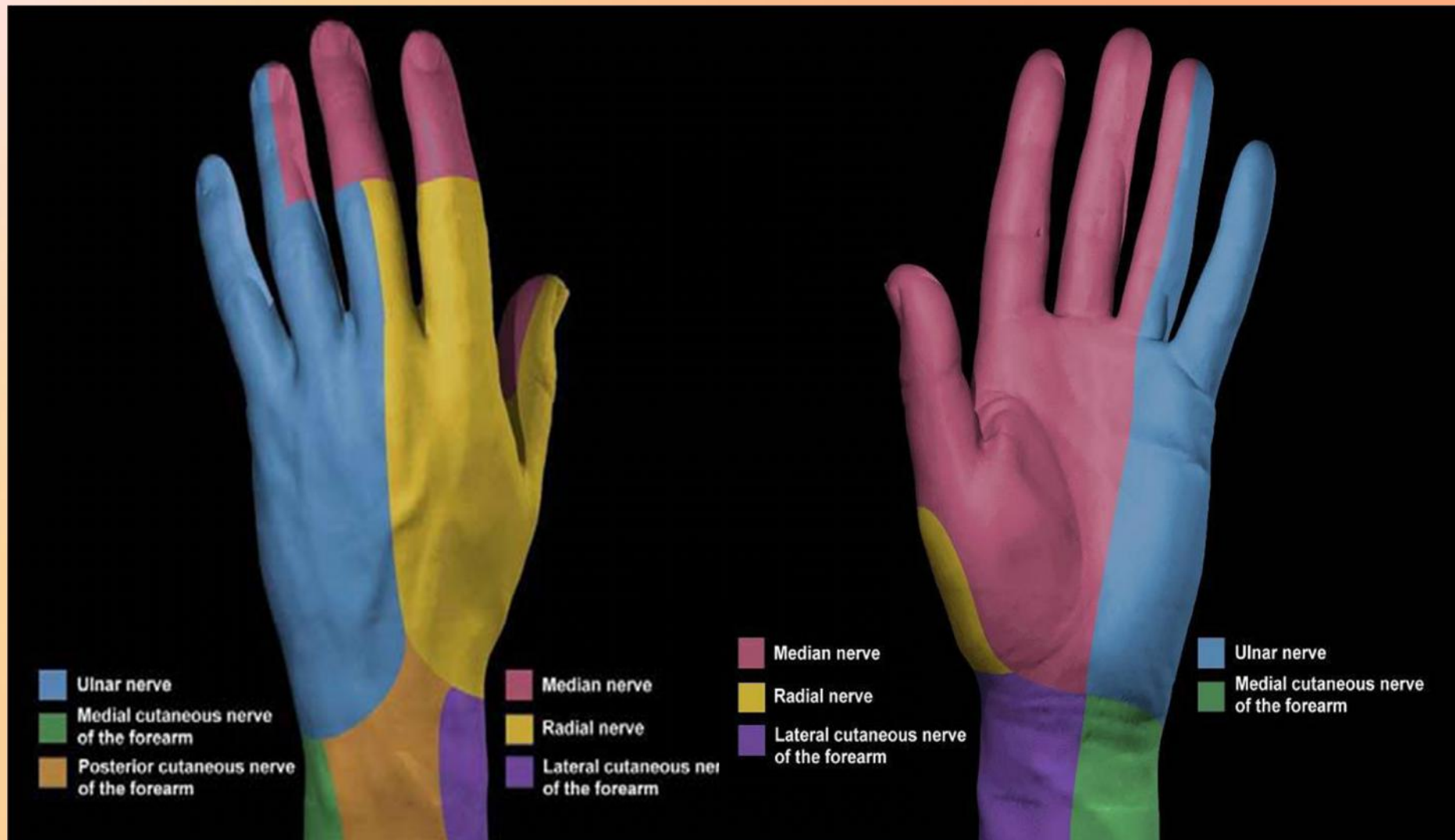
Sensory Supply of Upper Limb

- C4- Skin Over The Shoulder Tip
- C5- Radial side of Upper Arm
- C6 Radial Side of Forearm
- C7 skin of the hand
- C8- Ulnar side of the Forearm
- T1-Ulnar side of the Upper Arm
- T2- Skin of the Axilla



Dermatomal supply of arm and chest





Dermatomes of the Lower Limb

Sensory Supply of Lower Limb

- The Front of limb is supplied largely by lumbar segments
- The Back of limb is supplied largely by Sacral Segments
- The Saddle Area is supplied by Sacral Segments
- The Perineal Area is supplied by Sacral Segments
- To Note The Discontinuity of Dermatomes at the back of the limb (Axial Line)

