



تشريح الشعاعي و الكورس الأول

RADIOLOGICAL FEATURES OF INTERVERTEBRAL DISCS

Sawa University

College of health and medical techniques

Department of Radiology Tech.

Third Stage

جامعة ساوة الاهلية

كلية التقنيات الصحية والطبية

قسم تقنيات الاشعة والسونار

المرحلة الثالثة

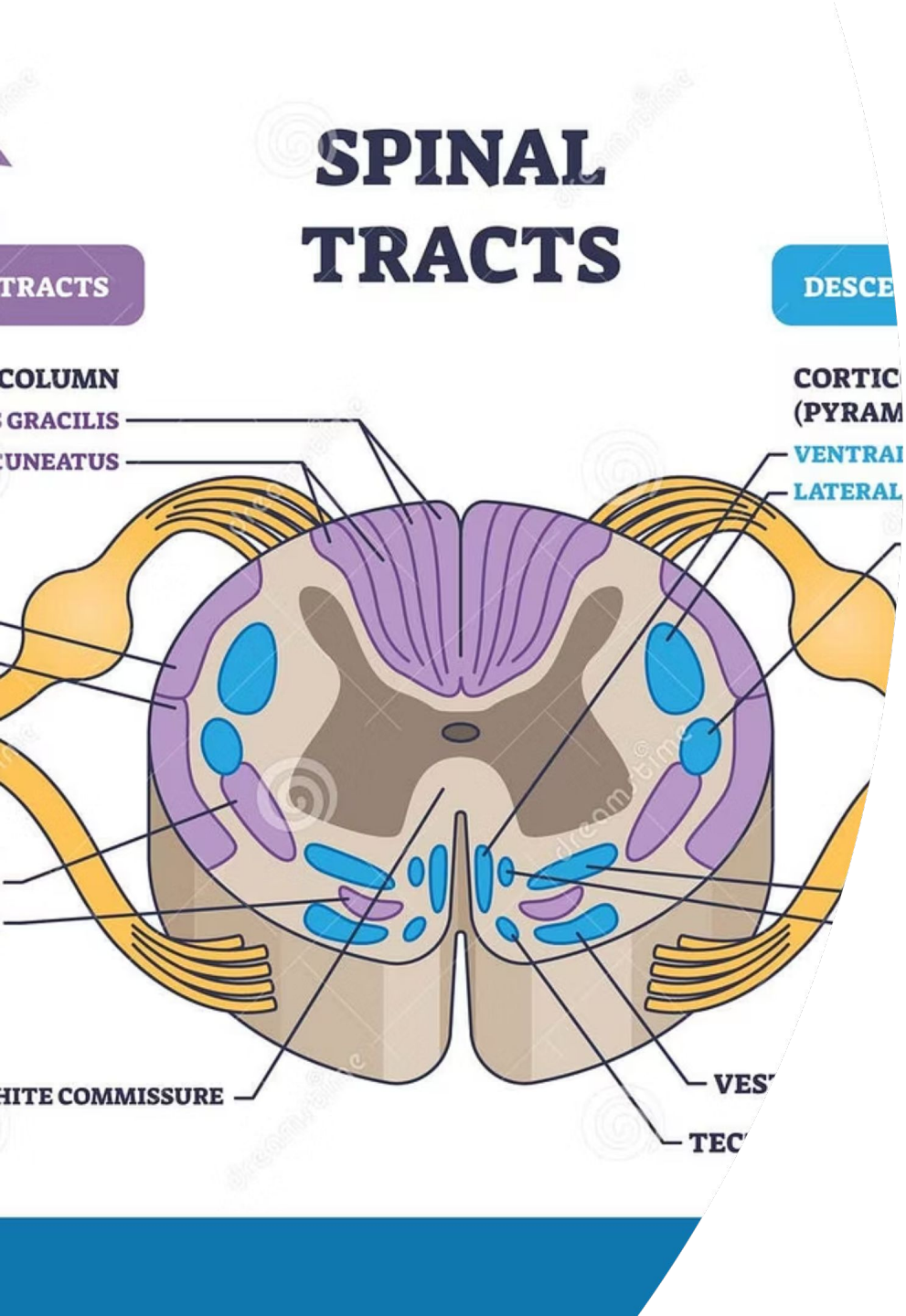
محاضرة رقم 6

Lecture No. ...6.

الجانب النظري

Theoretical

تدريسي المادة : م.م. ابراهيم فاضل



Chapter 1: Overview of the Spinal Cord Anatomy

The Spinal Cord: Vital Link Between Brain and

Body



Location & Length

Extends from the medulla oblongata at the foramen magnum to L1-L2 vertebrae.

Approximately 45 cm in adults with diameter varying 1–1.5 cm.



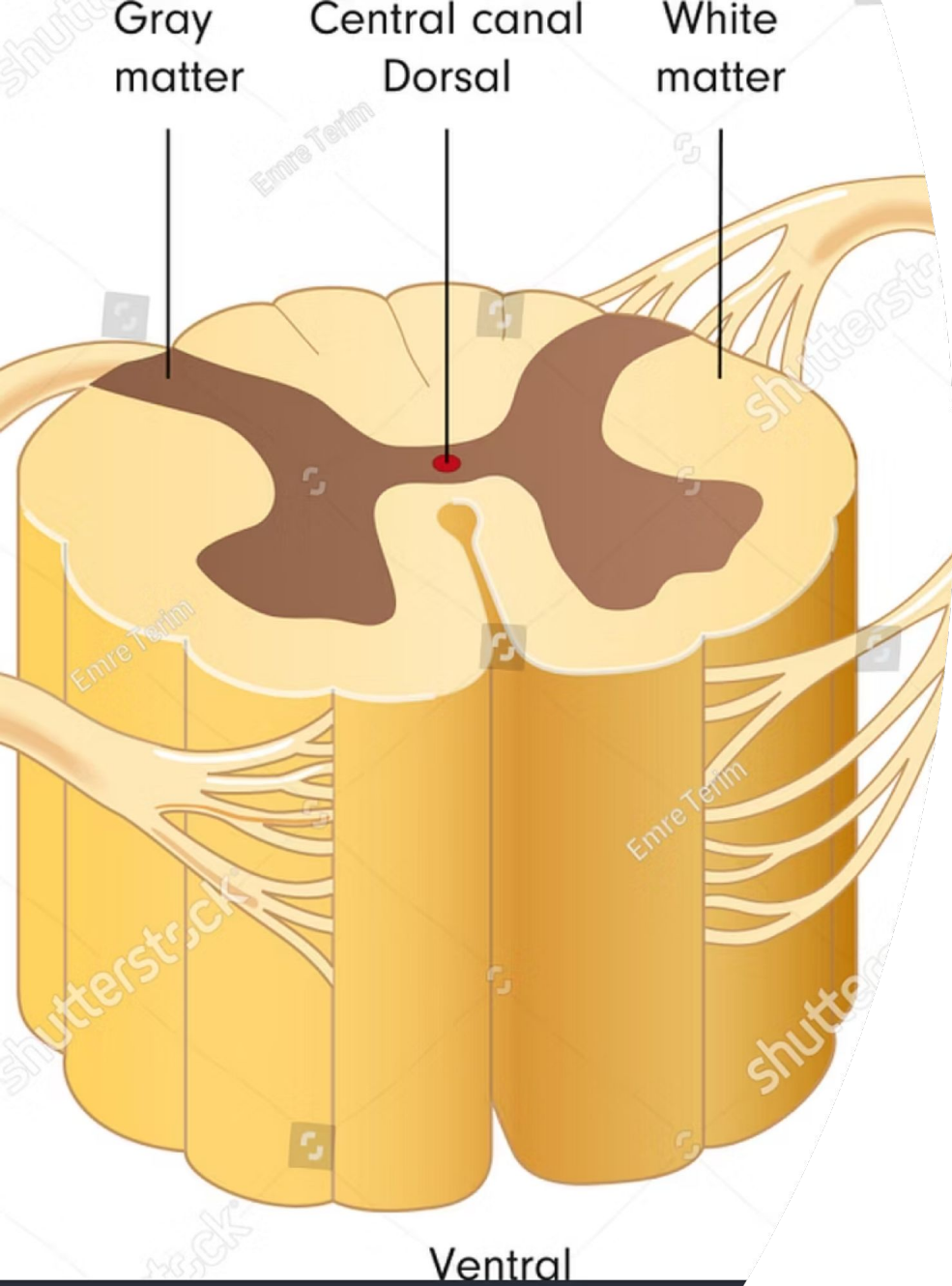
Segmental Organization

Divided into 31 segments: 8 cervical, 12 thoracic, 5 lumbar, 5 sacral, and 1 coccygeal segment.

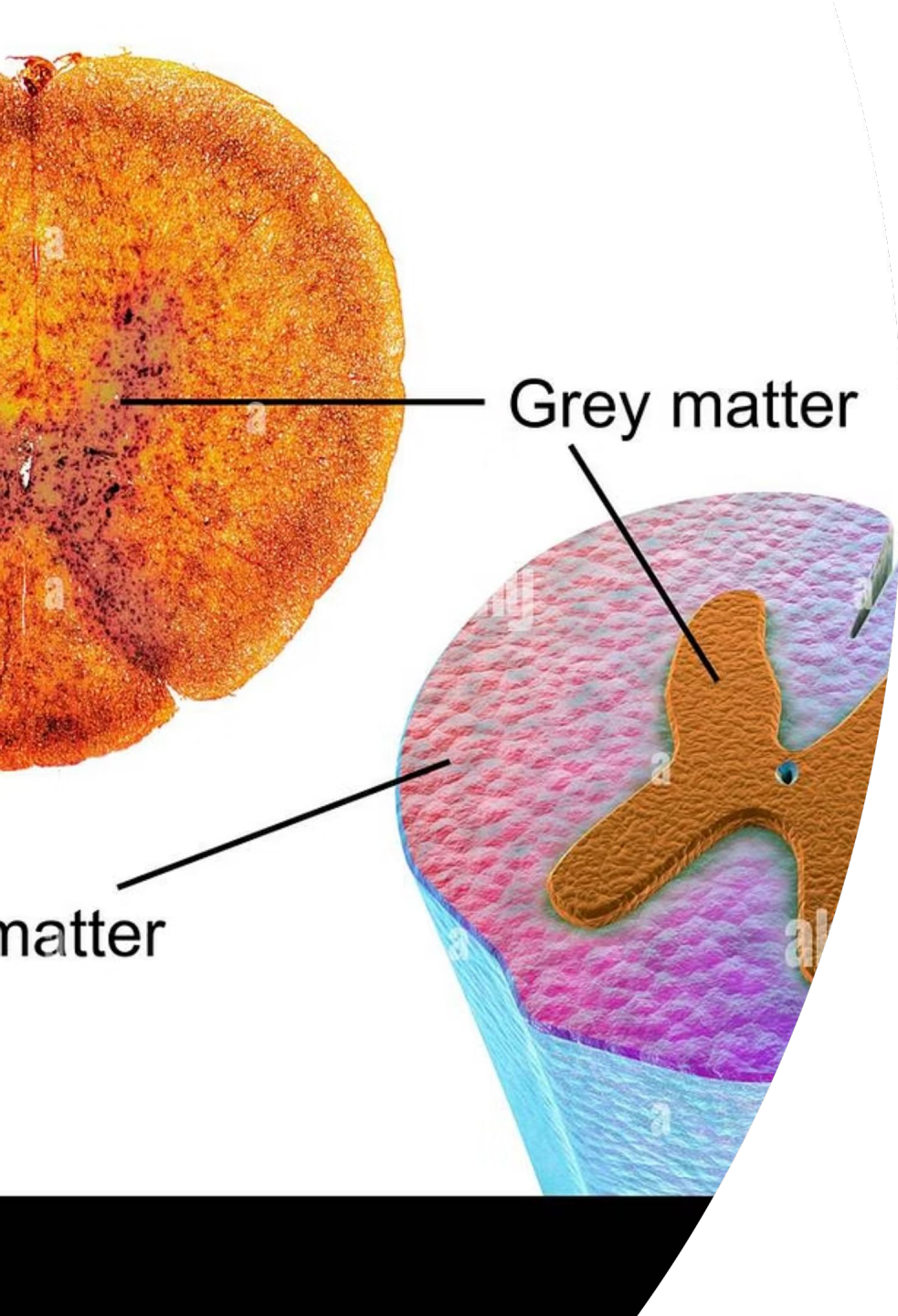


Two Key Enlargements

Cervical enlargement (C4-T1) innervates upper limbs. Lumbar enlargement (T11-L1) supplies lower limbs.



Lateral perspective reveals the spinal cord's relationship to the vertebral column, highlighting the cervical and lumbar enlargements where nerve plexuses emerge to innervate the extremities.



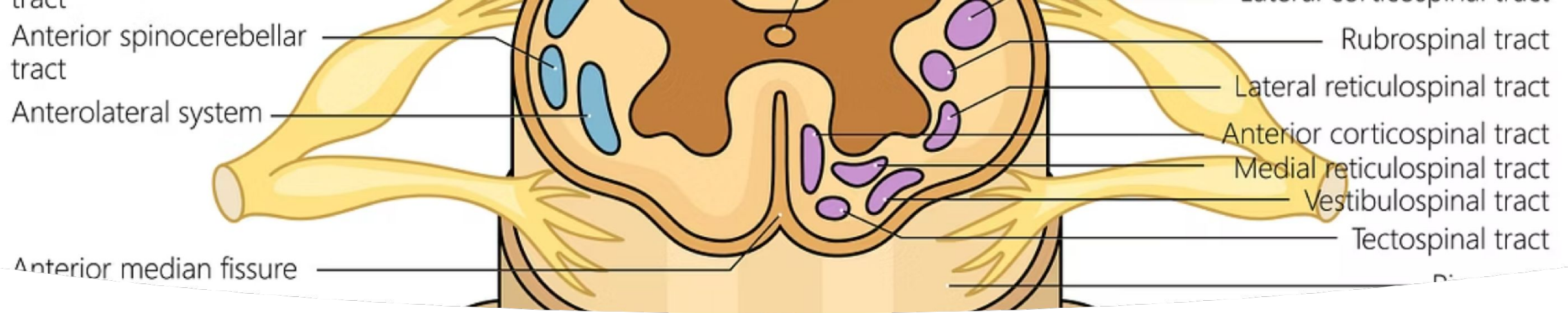
Spinal Cord Functions & Structure

Primary Functions

- Conveys sensory information from body to brain
- Transmits motor commands from brain to muscles
- Coordinates reflexes and autonomic control
- Integrates neural signals bidirectionally

Structural Components

- White matter contains myelinated axons forming tracts
- Gray matter houses neuronal cell bodies
- Central canal runs longitudinally, filled with CSF
- Organized in distinct functional regions



Chapter 2: Cross Section of the Spinal Cord

Cross Section Anatomy: Butterfly-Shaped Gray Matter

1

Gray Matter

Configuration Butterfly-shaped region containing neuron cell bodies, dendrites, and unmyelinated axons. This distinctive pattern is visible in all spinal cord levels.

2

White Matter Arrangement

Surrounds the gray matter completely, organized into columns containing ascending sensory and descending motor tracts that communicate with the brain.

3

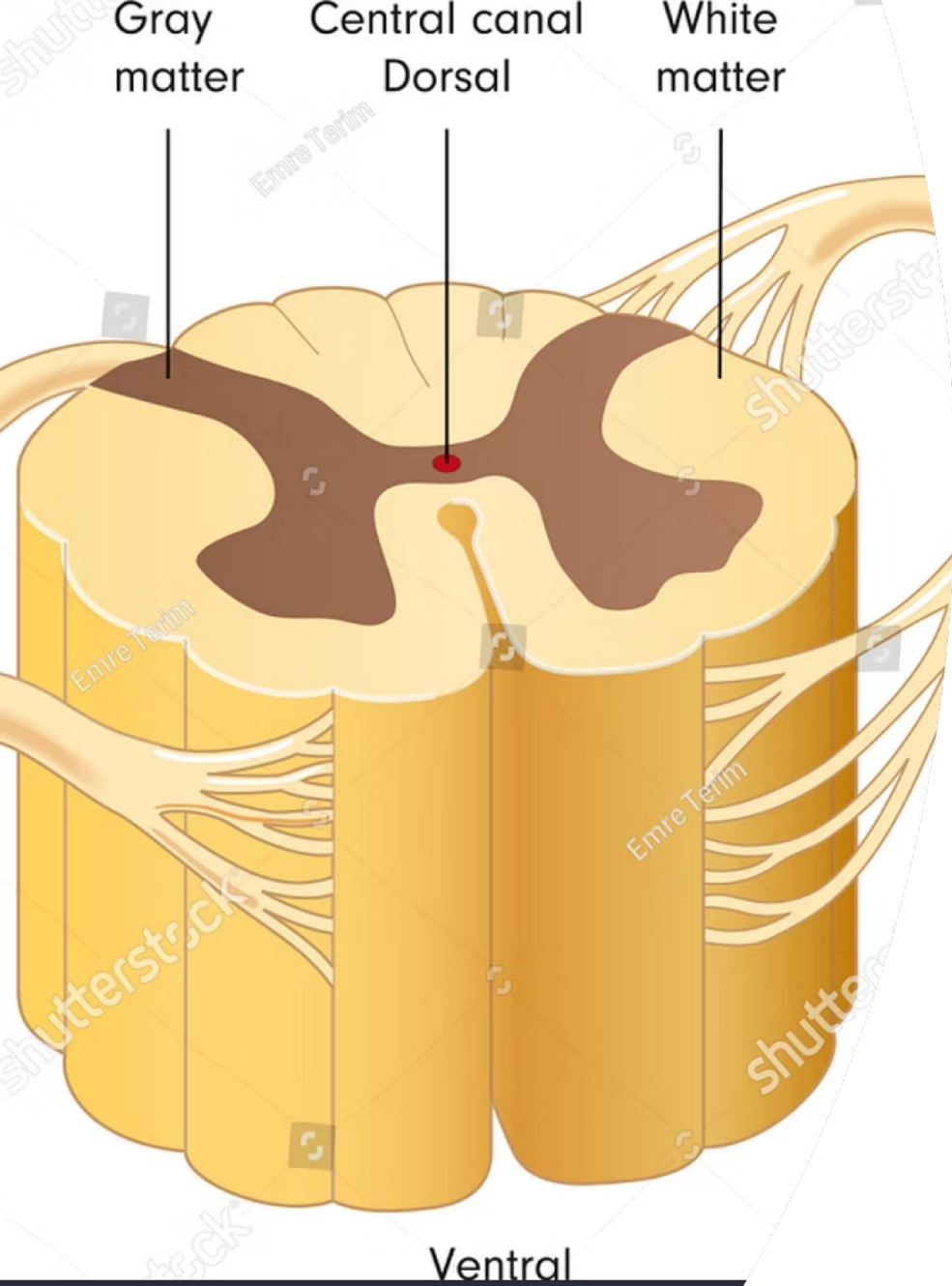
Surface Landmarks

Anterior median fissure creates a deep groove ventrally. Posterior median sulcus forms a shallow groove dorsally, providing anatomical orientation points.

4

Functional Horns

Dorsal (posterior) horns process and receive sensory input. Ventral (anterior) horns contain motor neurons that control skeletal muscle contraction.



Cross-sectional view illustrating the distinctive anatomy: the butterfly-shaped gray matter surrounded by white matter tracts, with clearly defined anterior fissure, posterior sulcus, and emerging dorsal and ventral roots.

Spinal Nerve Roots & Segmental Organization



Root Formation

Each spinal segment produces paired dorsal roots (sensory afferent) and ventral roots (motor efferent) that emerge bilaterally.



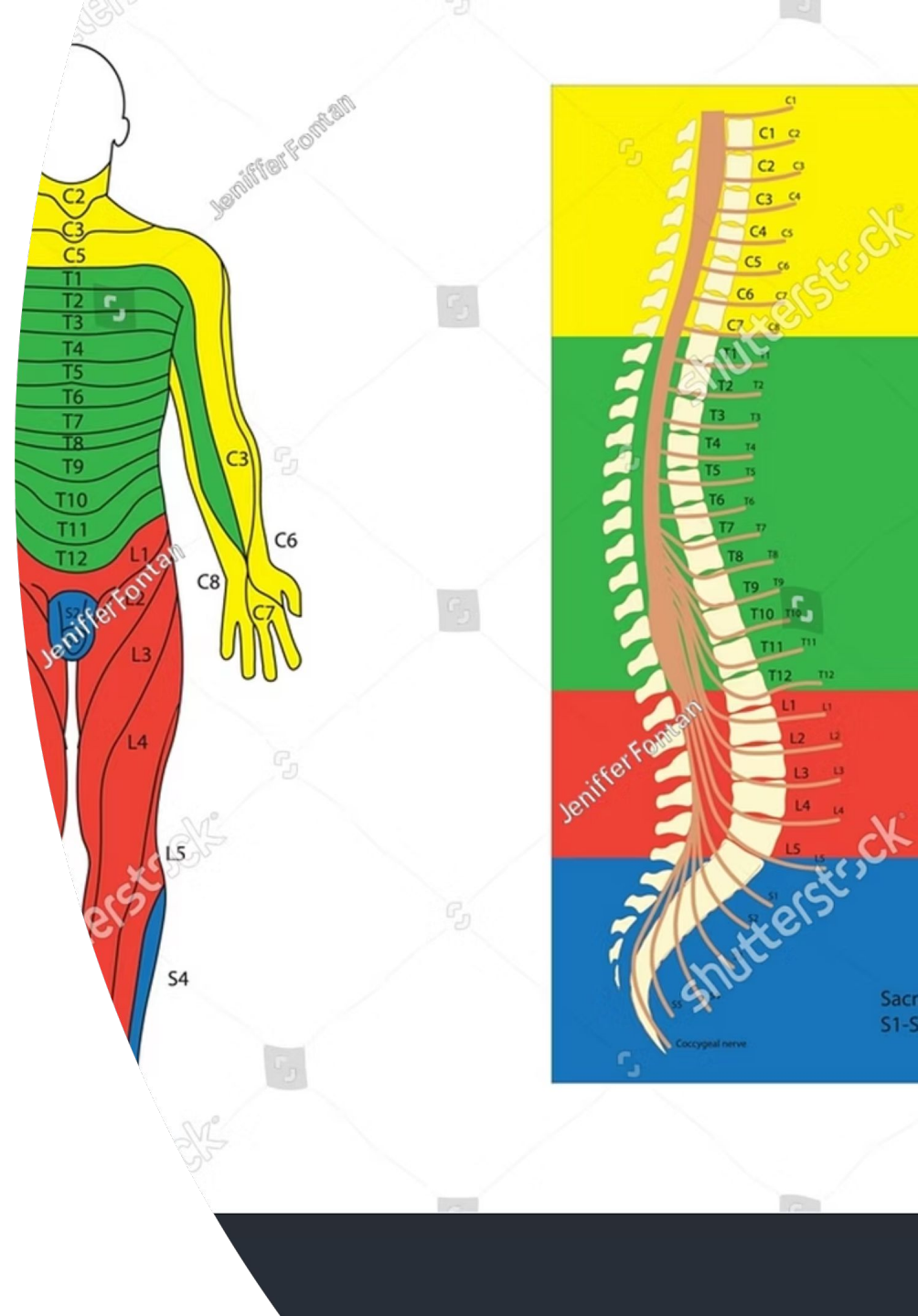
Nerve Assembly

Dorsal and ventral roots converge and merge to form 31 pairs of mixed spinal nerves that exit through intervertebral foramina.

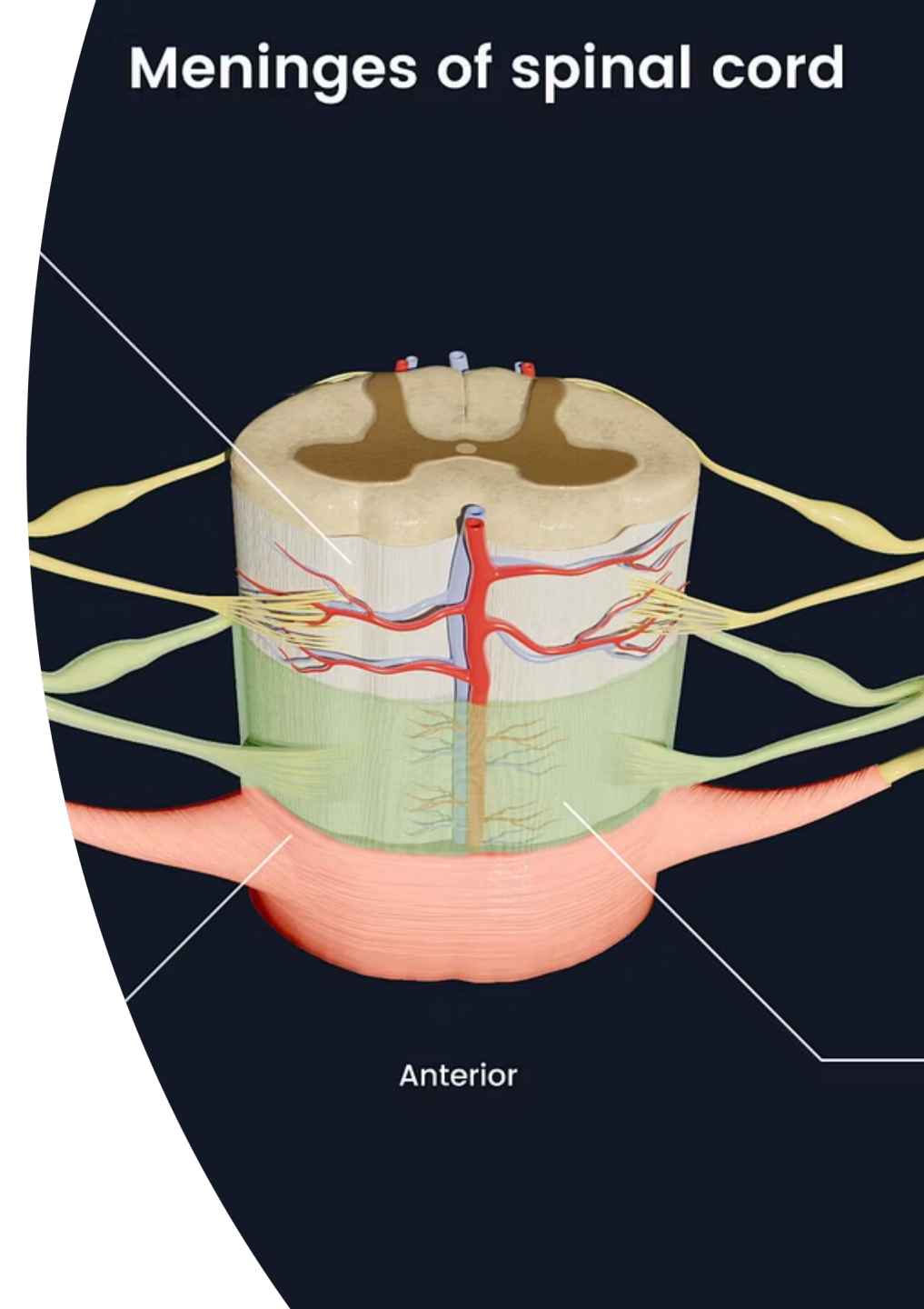


Dermatome Distribution

Each spinal nerve innervates a specific dermatome—a distinct area of skin—creating an organized sensory map across the body surface.



Chapter 3: The Spinal Meninges – Protective Layers



The Three Spinal Meninges Layers



Dura Mater

Tough, fibrous outermost layer providing primary protection. Extends from foramen magnum at the skull base to the filum terminale at S2 level. Most durable meningeal covering.



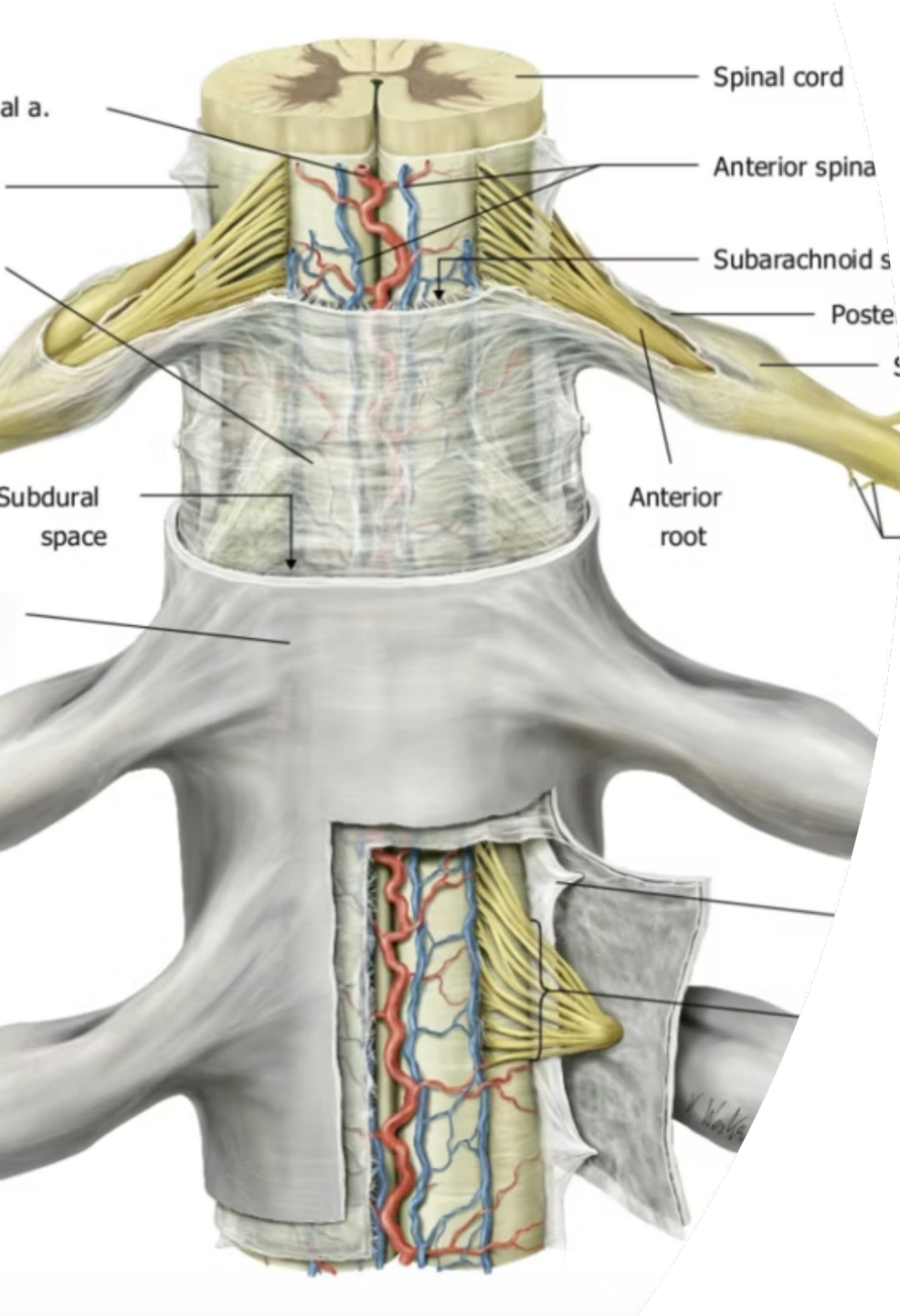
Arachnoid Mater

Delicate, avascular middle layer resembling a spider's web. Fine trabeculae span the subarachnoid space below, creating a cushioning network without blood vessels.

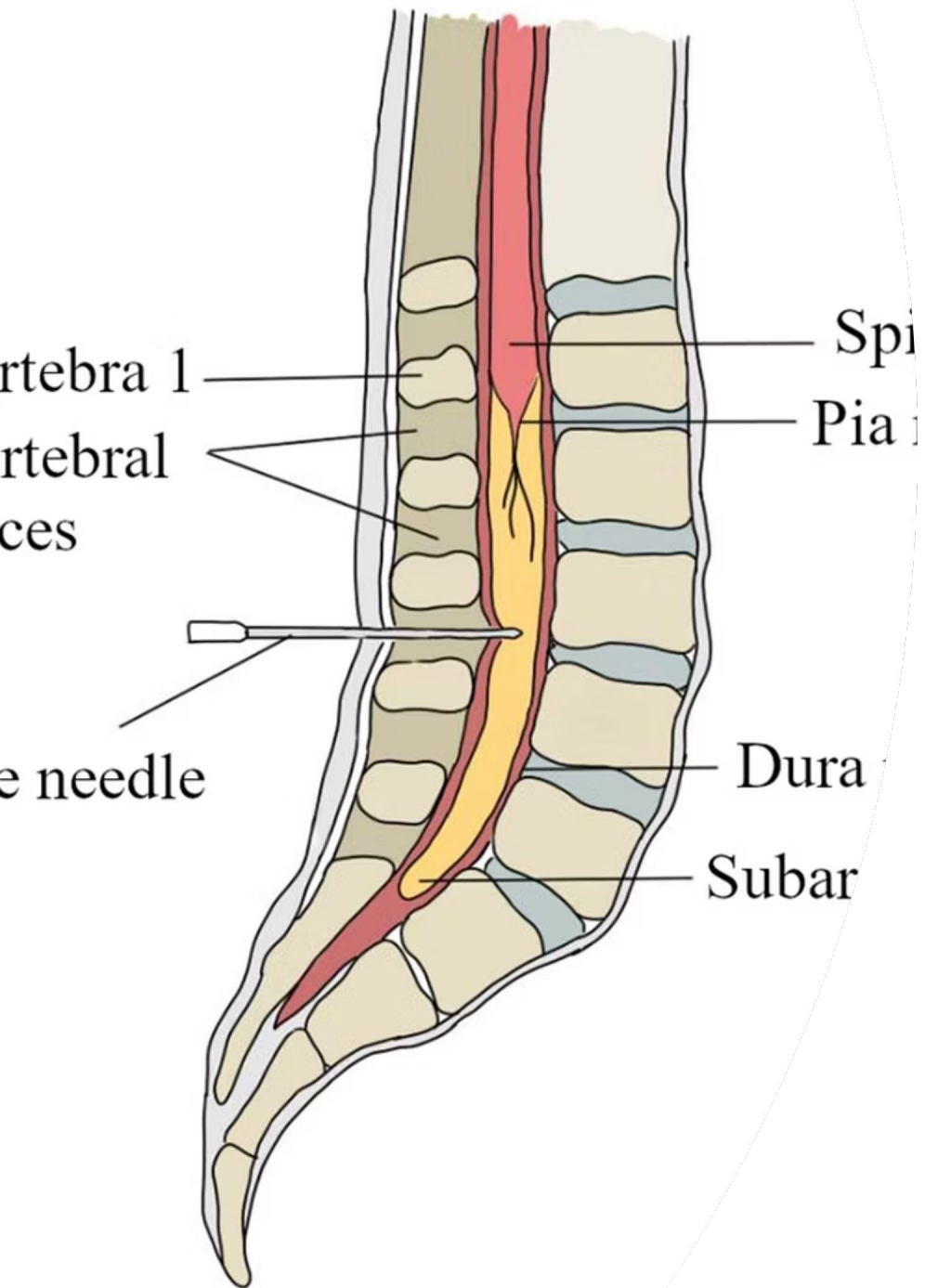


Pia Mater

Thin, highly vascularized innermost layer that intimately adheres to the spinal cord surface. Follows every contour, providing direct vascular support to neural tissue.



Comprehensive cross-sectional view demonstrating the three protective meningeal layers and the critical spaces between them, essential for understanding spinal anatomy and clinical procedures.



Spaces Between Meninges & Clinical Significance

1

Epidural Space

Located between the vertebral canal periosteum and dura mater. Contains adipose tissue, loose connective tissue, and internal vertebral venous plexus. **Clinical site for epidural anesthesia** during labor and surgical procedures.

2

Subdural Space

A potential space between dura and arachnoid mater, typically minimal or absent. Can become pathologically expanded in subdural hematomas following trauma or vascular rupture.

3

Subarachnoid Space

Filled with cerebrospinal fluid (CSF) that bathes and cushions the spinal cord. The lumbar cistern within this space (below L2) is the **safe access point for lumbar puncture** procedures.

Pia Mater Special Features

Denticulate Ligaments

Lateral extensions of pia mater form 21 pairs of tooth-like ligaments that anchor the spinal cord to the dura mater, providing lateral stabilization and preventing excessive movement.

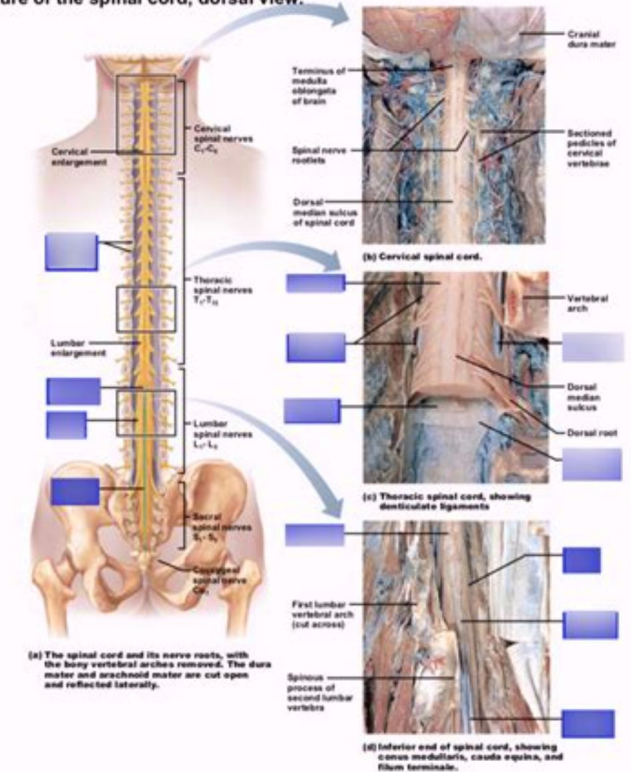
Elastic Protection

Provides elasticity and resilience, allowing the spinal cord to maintain its shape and position after compression or stretching during normal body movements.

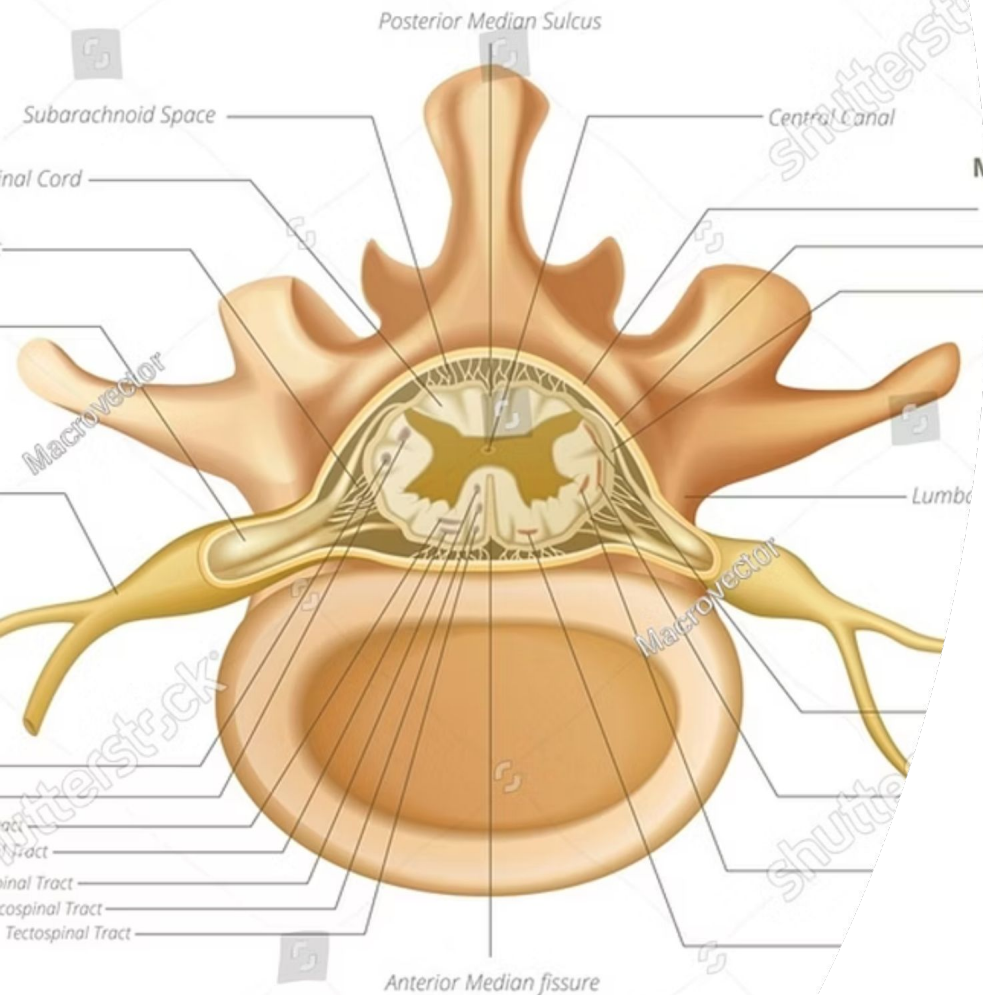
Filum Terminale

The pia mater continues inferiorly as a thin fibrous strand called the filum terminale, which anchors the spinal cord to the coccyx, maintaining proper positioning.

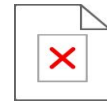
Figure 19.1 Gross structure of the spinal cord, dorsal view.



Spinal Cord Anatomy

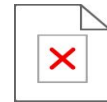


Conclusion: The Spinal Cord & Meninges – A Complex Protective System



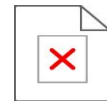
Segmented Architecture

The spinal cord's 31-segment organization and meningeal layers ensure vital bidirectional communication between brain and body while providing comprehensive protection against mechanical injury.



Clinical Applications

Understanding detailed anatomy is essential for accurate diagnosis of spinal injuries, neurological disorders, and safely performing clinical procedures like lumbar puncture and epidural anesthesia.



Essential Protection

Safeguarding this delicate neural system through its meningeal coverings and CSF cushioning is critical for maintaining body function, coordinating reflexes, and preserving quality of life.

QUIZ



Any questions?

*Thank
You*