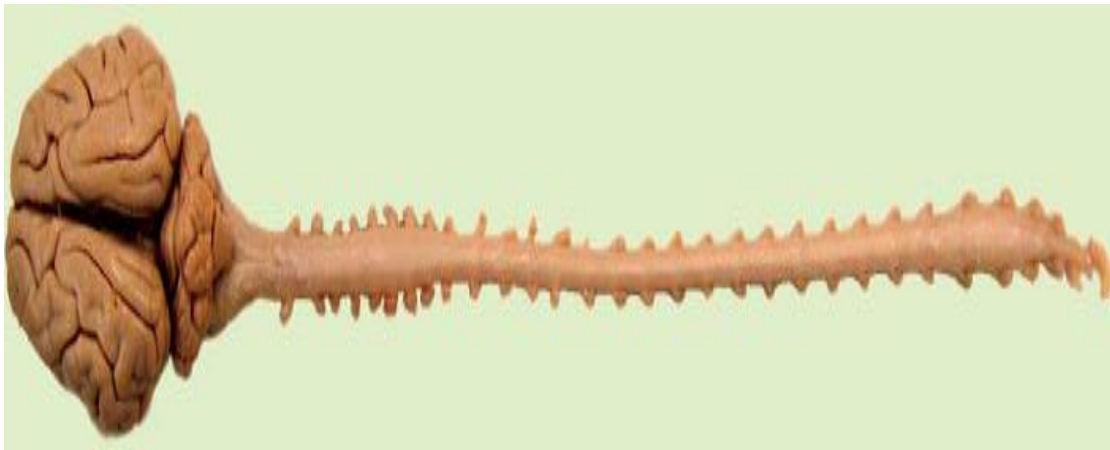


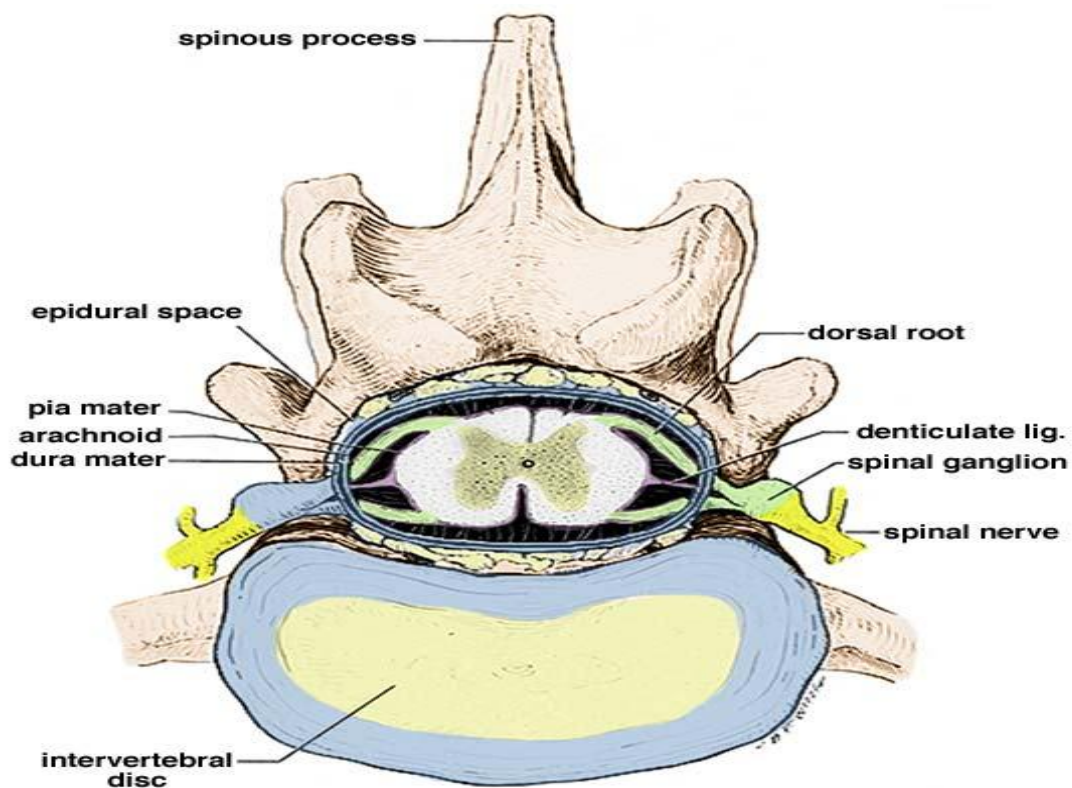
Spinal cord surgery

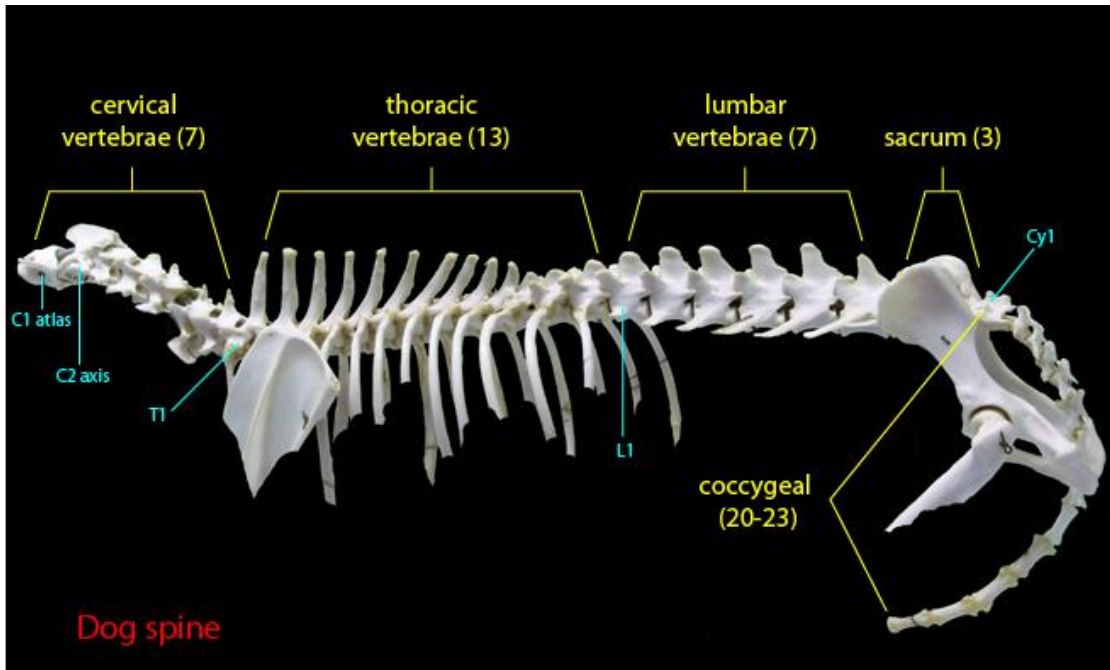
Spinal cord is the caudal part of the central nervous system of vertebrates. It is covered and protected by the vertebral bones, and localizes in a long cavity known as medullary canal. In transverse view, spinal cord is rounded in most vertebrates, although it is dorso-ventrally flattened in some fish like cyclostomes. The shape is quite constant along the rostro-caudal extension, excepting the most caudal part where the diameter progressively decreases. In tetrapods animals, there are two thickenings located at the spinal cord segments that innervate the fore and hind limbs, respectively. Spinal nerves are numbered according to the vertebrae where their nerve roots are leaving the spinal cord. They also have a first capital letter in the name (C: cervical, T: thoracic, L: lumbar, S: sacral), followed by the number. Spinal cord contains an internal duct, known as central canal or ependymary canal, which runs along the spinal cord extension, has a small diameter, and is filled with cerebrospinal fluid.



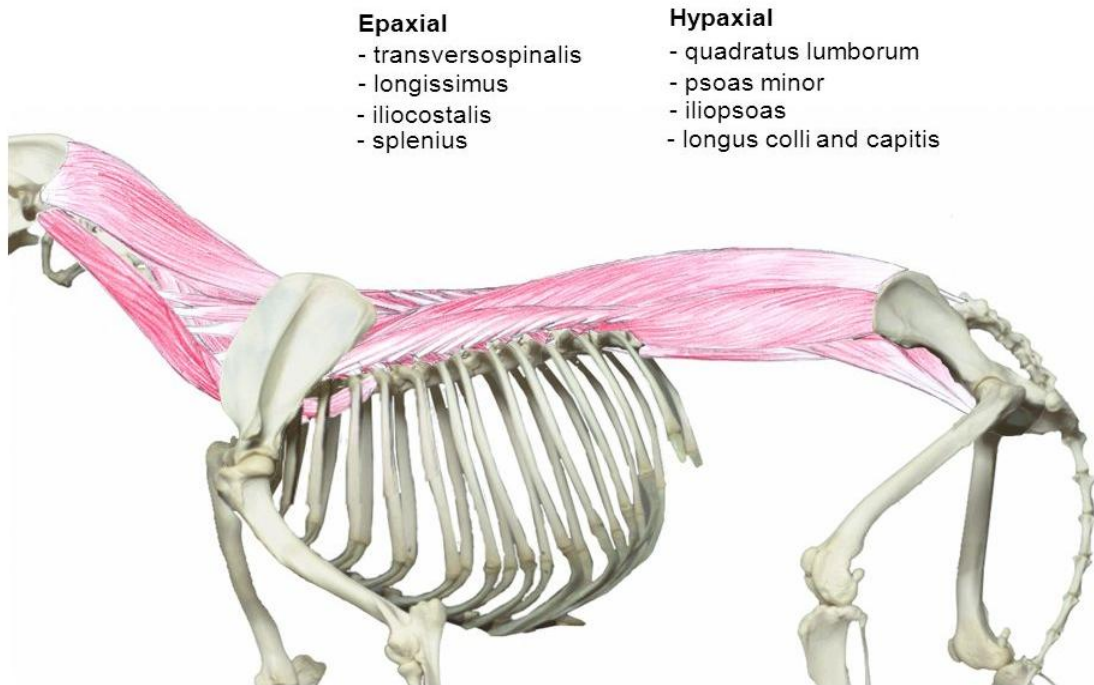
spinal cord vertebrae

The following drawing depicts a **spinal cord segment** within a lumbar vertebra, at the level of an intervertebral disc (nucleus pulposus surrounded by annulus fibrosus). Spinal nerves are present bilaterally at intervertebral foramina, dorsal to the disc. An **epidural space**, containing fat, is evident external to spinal **dura mater** (blue). The latter is shown surrounding roots on the left; it is removed on the right side. Bilaterally, dorsal and ventral **spinal roots** (green) unite to form a spinal nerve (yellow) which soon branches. Bilateral thickenings of pia mater (purple), called **denticulate ligaments**, suspend the spinal cord within the dura mater.



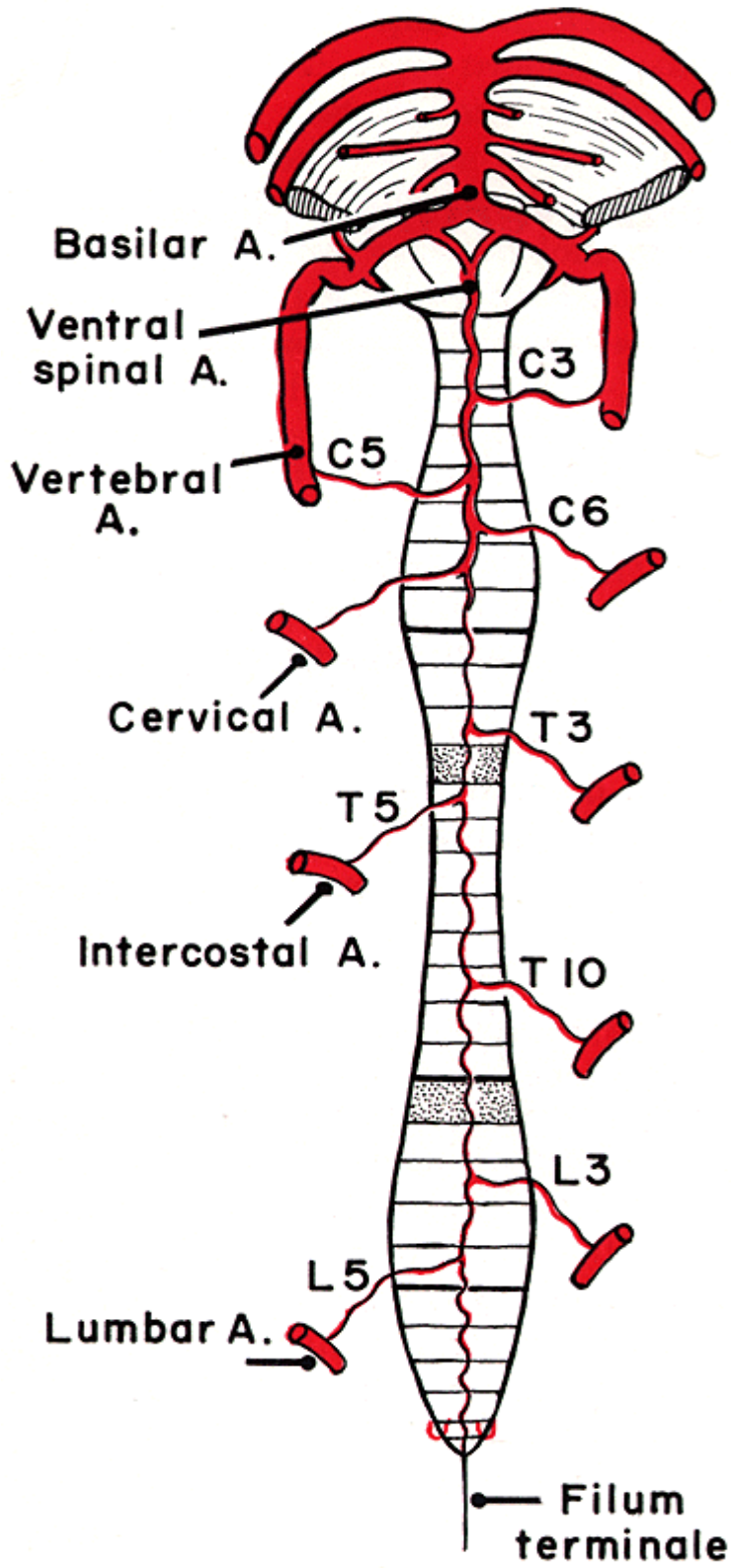


Anatomy of vertebrae muscle



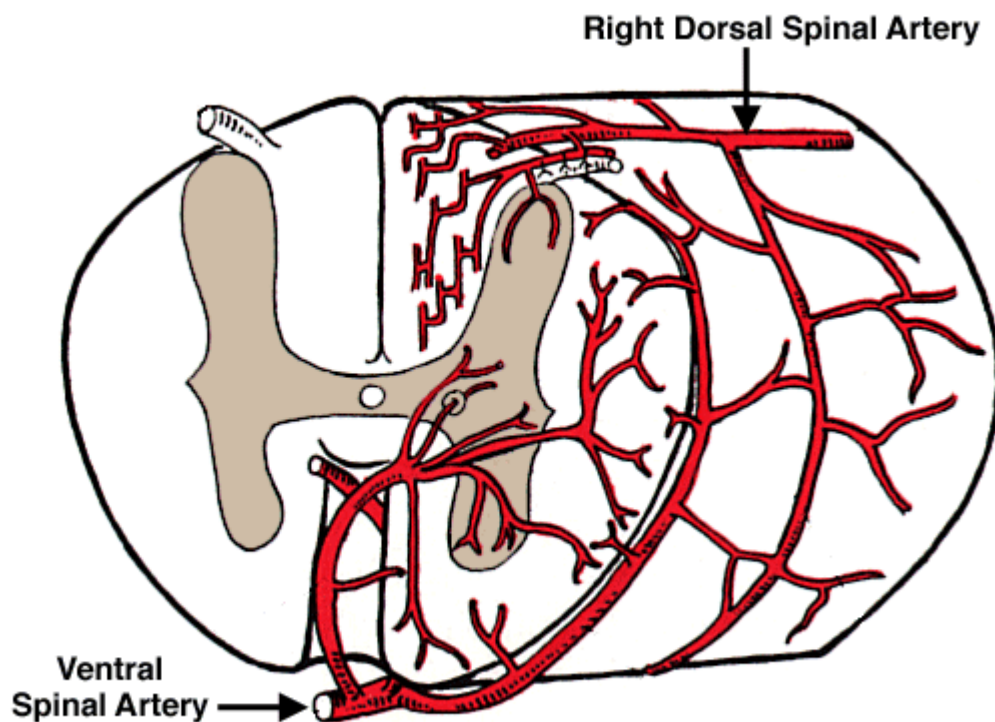
Spinal Cord Blood Supply - Longitudinal View

The major arterial blood supply to the spinal cord is the ventral spinal artery. The artery is actually created by the sequence of cranial and caudal branches of radicular arteries that enter along ventral roots. As illustrated, only several of the radicular arteries contribute significantly to the spinal cord, a number radicular vessels are barely sufficient to supply their spinal roots. Radicular arteries are branches of spinal arteries which, in turn, are branches of regional arteries (vertebral, costocervical, intercostal, and lumbar). Cranially, the ventral spinal artery is continued as the basilar artery of the brainstem. Both are fed by termination of the vertebral artery.



Spinal Cord Blood Supply - Transverse View

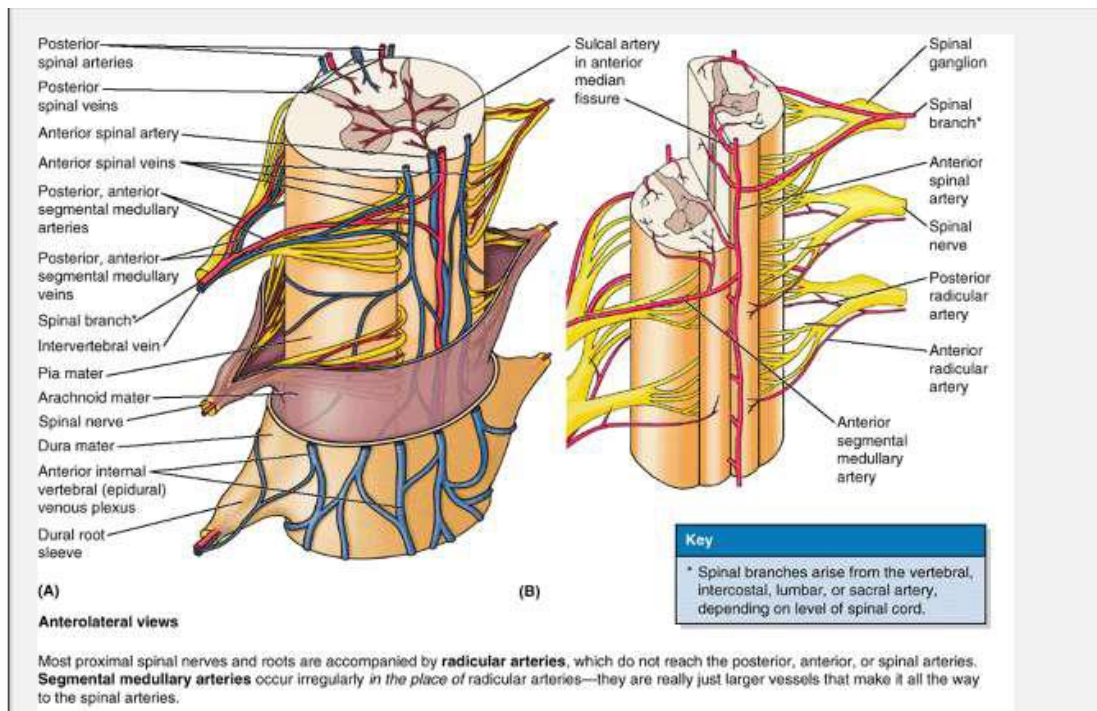
The arterial blood supply to the spinal cord comes from a ventral spinal artery and paired dorsal spinal arteries. The ventral spinal artery supplies most of the spinal cord and damage to the artery can be quite debilitating. *longitudinal view* of the ventral spinal artery.



Spinal cord meninges

is invested by the dura, arachnoid, and the pia mater.

1. The dura mater is comprised of an inner meningeal and an outer endosteal layer.
2. The outer endosteal layer forms the periosteum of the vertebral canal and the epineurium of the spinal nerves at or slightly beyond the intervertebral foramina.



Internal organization

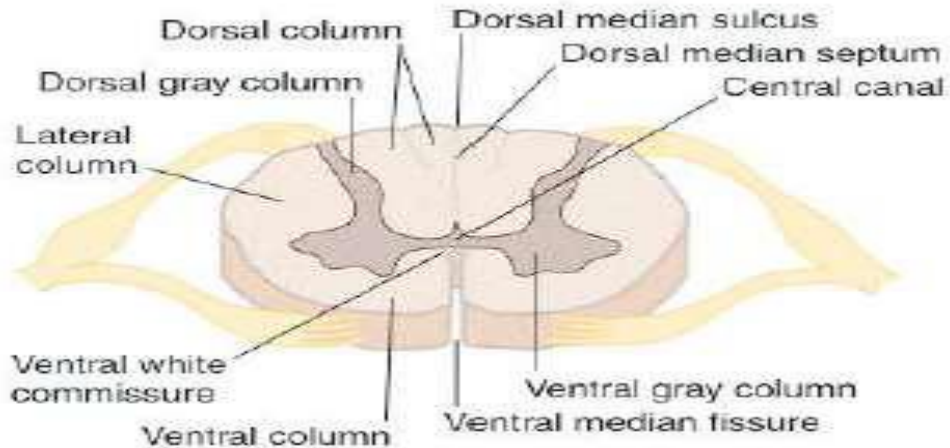
- 1- Each spinal segment consists of central gray and peripheral white matters that are connected by the corresponding gray and white commissures.
- 2- The central canal is a tube that pierces the gray commissure of the spinal cord

A- Gray matter

consist of nerve cells & unmyelinated nerve fibers

H-shaped formed of:

1. anterior horns: containing motor nuclei.
2. poster horns: containing sensory nuclei
3. lateral horns containing autonomic cells



B. White Matter

It is divided into 3 large columns on each side

- 1- **Posterior column:** lies b/n the post median septum & the attachment of the dorsal nerve root it contains ascending tracts only
- 2- **Lateral column:** lies b/n the attachments of the dorsal & ventral nerve roots. It contains both ascending & descending tracts.
- 3- **Anterior column:** lies b/n the ant. median fissure & the attachment of the ventral nerve roots. It contains descending tracts mainly.

PATHWAYS IN WHITE MATTER

The white matter contains 3 types of nerve fibres

- 1- **Ascending (sensory) tracts:** carrying sensory impulses from the spinal cord to higher centers
- 2- **Descending or efferent tracts:** carrying motor or autonomic impulses from higher centres to the spinal cord.
- 3- **Associative tracts:** containing short ascending & descending fibres which coordinate the function of the different regions of spinal cord

Cerebrospinal Fluid

The cerebrospinal fluid is found in the ventricles of the brain and in the subarachnoid space around the brain and spinal cord.

Functions of CSF

- serves as a cushion between the central nervous system and the surrounding bones, thus protecting it against mechanical trauma.
- it provides mechanical buoyancy and support for the brain.
- assist in the regulation of the contents of the skull.

Circulation of CSF

- 1- The circulation begins with its secretion from the choroid plexuses in the ventricles.
- 2- aided by the arterial pulsations of the choroid plexuses and by the cilia on the ependymal cells lining the ventricles.

TYPES OF SPINAL CORD INJURY

- 1- Complete Spinal Cord Injuries: Complete paraplegia is described as permanent loss of motor and nerve function at T1 level or below, resulting in loss of sensation and movement in the legs, bowel, bladder, and sexual region. Arms and hands retain normal function.
- 2- INCOMPLETE SPINAL CORD INJURIES
 - a- Anterior cord syndrome
 - b- CENTRAL CORD SYNDROME
 - c- POSTERIOR CORD SYNDROME
 - d- CAUDA EQUINA SYNDROME