

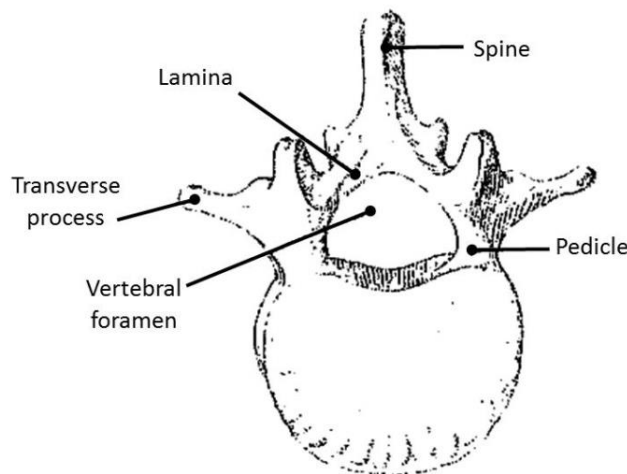
# Spinal cord

## Structure of the vertebra

The vertebra consists of the vertebral body, two pedicles that connect the vertebral body and two laminae. The hole in the center of the vertebra, through which the spinal cord passes, is the vertebral foramen.

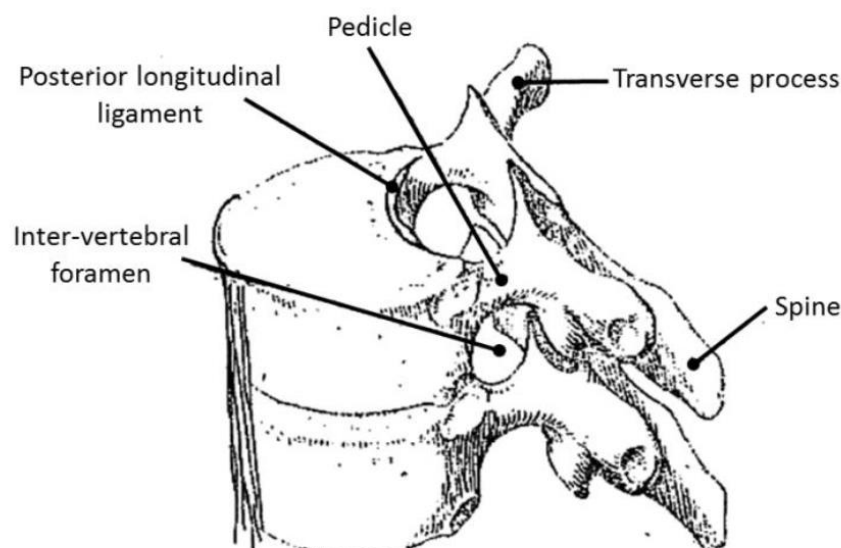
At the junction between the lamina and the pedicle, there is a transverse process, and between the two laminae there is a spinous process.

The **cervical vertebrae** are similar in structure to the other vertebrae. However, they also have holes in the transverse processes - **transverse foramina**. Through these holes the vertebral arteries pass.



## Structure of the vertebral column

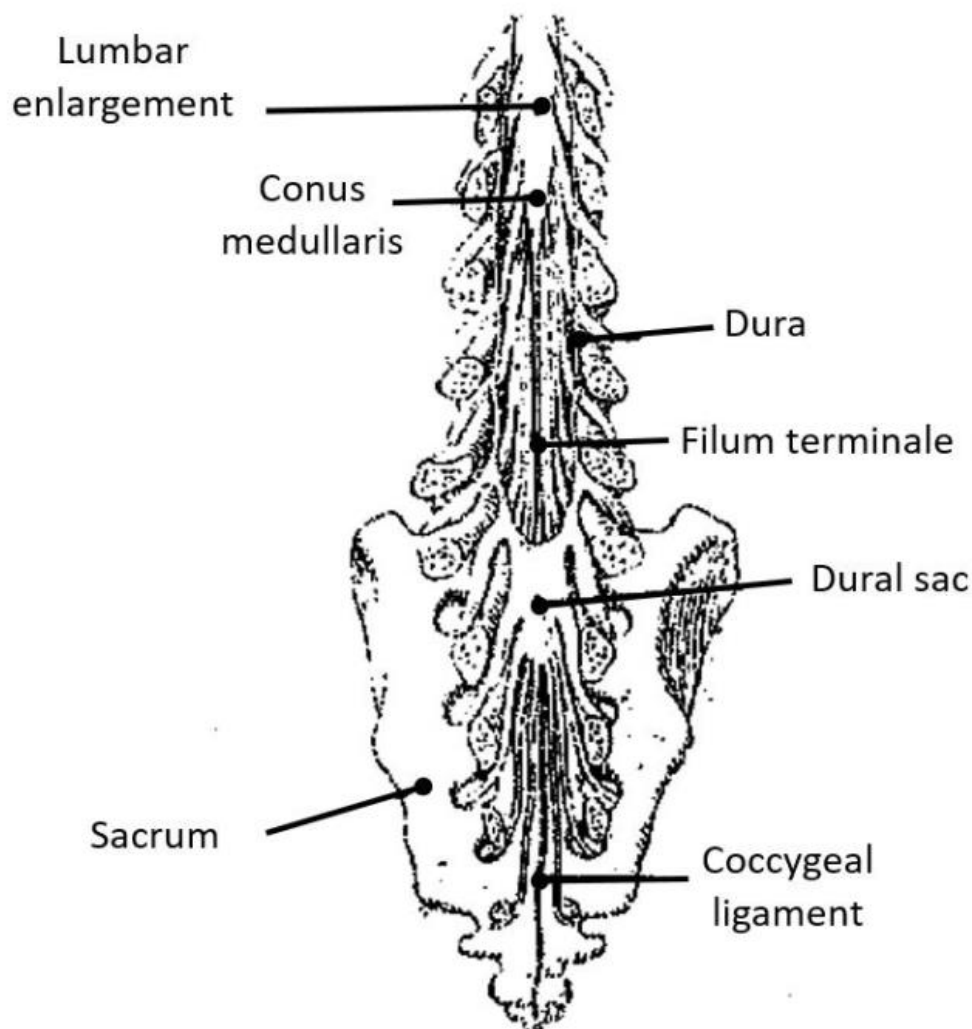
When the vertebrae are placed on top of each other, the vertebral foramina form the **spinal canal**. In addition, lateral holes form between each of the two vertebrae - the **intervertebral foramina** through which the **spinal nerves** pass. Note that in the living person there are **intervertebral discs** that separate the vertebrae so that they do not touch each other.



## Spinal cord meninges

The spinal cord is enclosed within the **dural sac** that is continuous with the dura mater that surrounds the brain. Unlike the skull where the dura is adjacent to it, the **epidural space** (between the dura and the vertebra) is filled with blood vessels and fat. The dural sac terminates at vertebrae-S2 and its tip - **coccygeal ligament**, is attached to the coccyx bone.

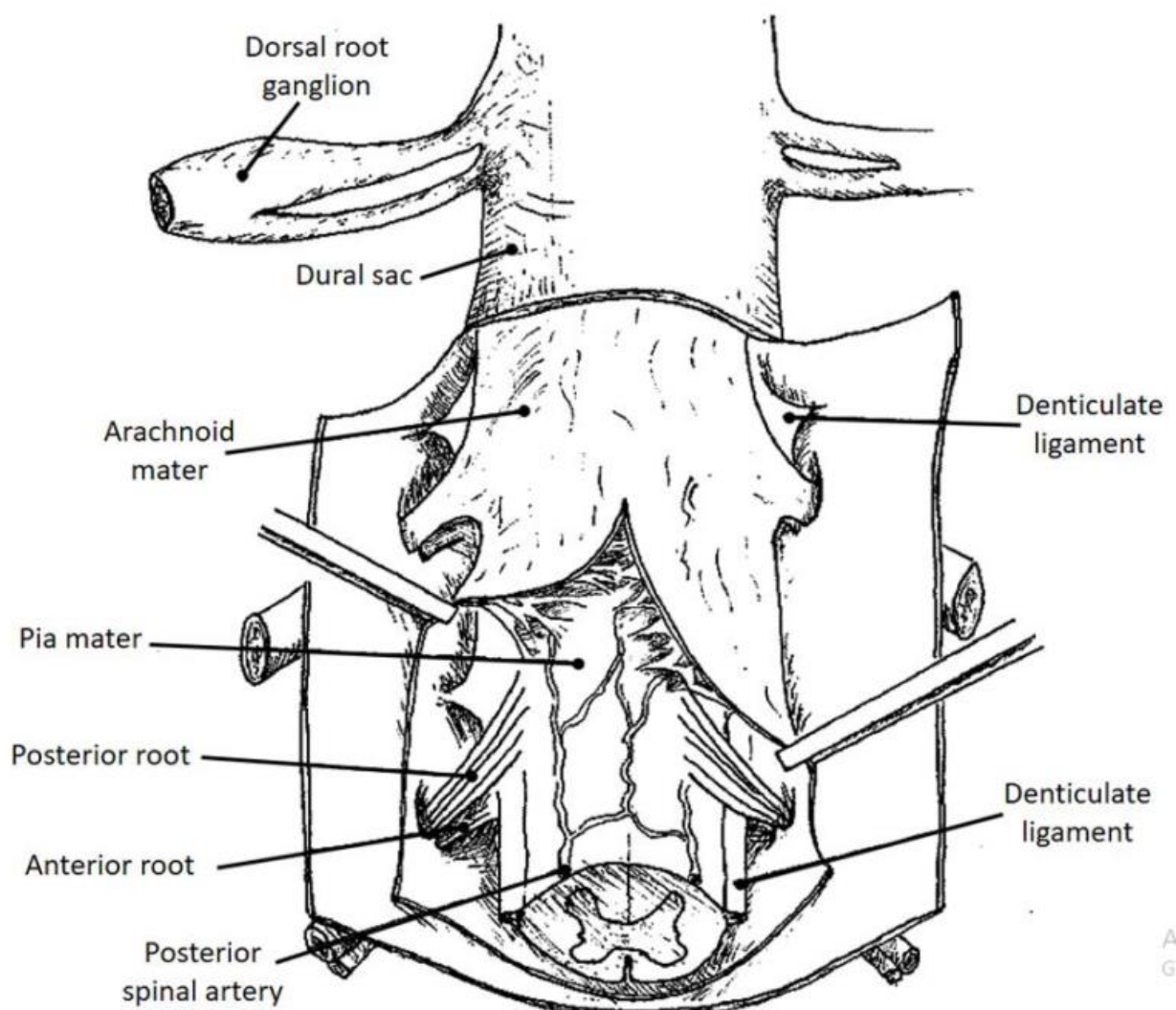
Make a longitudinal incision to open the dural sac, the **arachnoid mater** is attached to the inner part of the dura (in the skull it is more distinct and resembles a spider web). The membrane that covers the spinal cord is the **pia mater**, the space between it and the arachnoid is called the **subarachnoid space** and is filled with cerebrospinal fluid (CSF). Notice the serrated extensions of the pia that penetrate the arachnoid and fix the spinal cord to the dura, these are the **denticulate ligaments**. There are 21 such pairs between segments c1 and L1. The spinal cord ends at the level of vertebra L2, its narrowing end is the **conus medullaris**. The pia mater that covers the spinal cord continues down beyond the conus medullaris in a silvery structure called **filum terminale** that continues into the coccygeal ligament.



### Structure of the spinal cord

Notice that the spinal cord width is larger in two areas, the **cervical enlargement** and the **lumbar enlargement**. These areas include neural matter of the upper and lower limbs respectively. locate the end of the spinal cord at the level of vertebra L2 in the **conus medullaris**. Along the length of the spinal cord, notice ventral and dorsal rootlets that unite into the spinal roots. Immediately after exiting the dural sac, we notice a bulge containing the **dorsal root ganglion (DRG)** and the **ventral root** that form the **spinal nerve**. The dura mater covers then and it is continuous with the **epineurium** of the peripheral nervous system.

Notice that the roots of the superior spinal nerves are shorter and horizontal, while the roots of the more inferior spinal nerves are longer and diagonal. The lumbosacral and coccygeal spinal roots form a bundle called cauda equina (ponytail). Along with it, find the **filum terminale**, a silvery strand of pia that continues beyond the conus medullaris.





### Cross section of the spinal cord

In the center, find the butterfly-shaped **gray matter** of the spinal cord. The **ventral horn** of the spinal cord is slightly wider and it contains neural cell bodies that belong to the motor system. The **dorsal horn** of the spinal cord is narrower and it contains neural cell bodies that belong to the sensory system. The **ventral median fissure** runs along the ventral aspect of the spinal cord and above it the **anterior spinal artery**. The **dorsal median sulcus** runs along the dorsal aspect of the spinal cord and on both of its sides are the two **posterior spinal arteries**. The white matter is surrounding the gray matter, as a result of the preservation procedures and the direction of the cut (perpendicular to the direction of the fibers) it appears darker.

