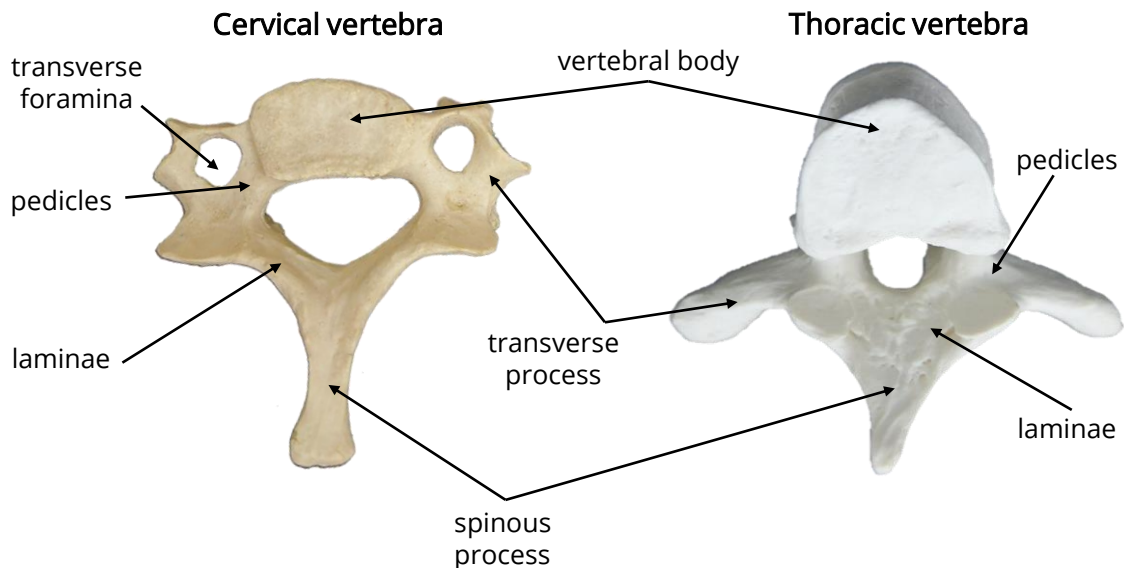# Spinal cord

Structure of the vertebra

The vertebra consists of the vertebral body, two pedicles (small foot) and two laminae (plate). The hole in the center of the vertebra is the vertebral foramen. Between each lamina and pedicle, find the transverse process. Between the two laminae, find the spinous process.

The cervical vertebrae (neck) are similar in structure to the other vertebrae. However, they also have holes in the transverse processes, the transverse foramina, through which the vertebral arteries pass.

Cervical vertebra   **Thoracic vertebra**

transverse foramina — vertebral body — pedicles — pedicles — laminae — transverse process — laminae — spinous process

Structure of the vertebral column

Humans have 33 vertebrae that form the vertebral column. When the vertebrae are placed on top of each other, the vertebral foramina form the spinal canal that contains the spinal cord. On each side, a lateral hole is formed between each pair of vertebrae, the intervertebral foramen through which the spinal nerves pass. Intervertebral discs separate between the bodies of the vertebrae.

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The vertebral column
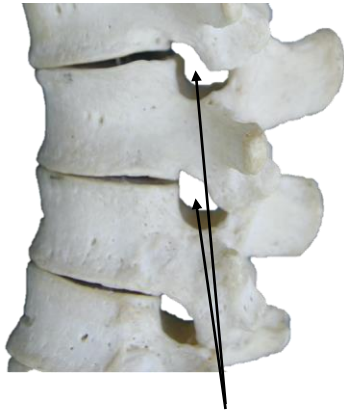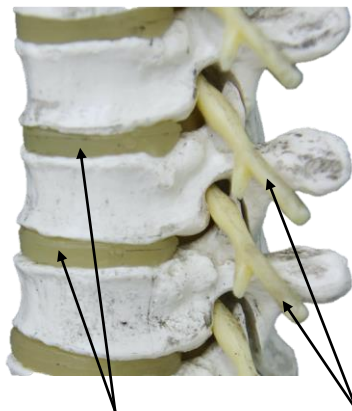
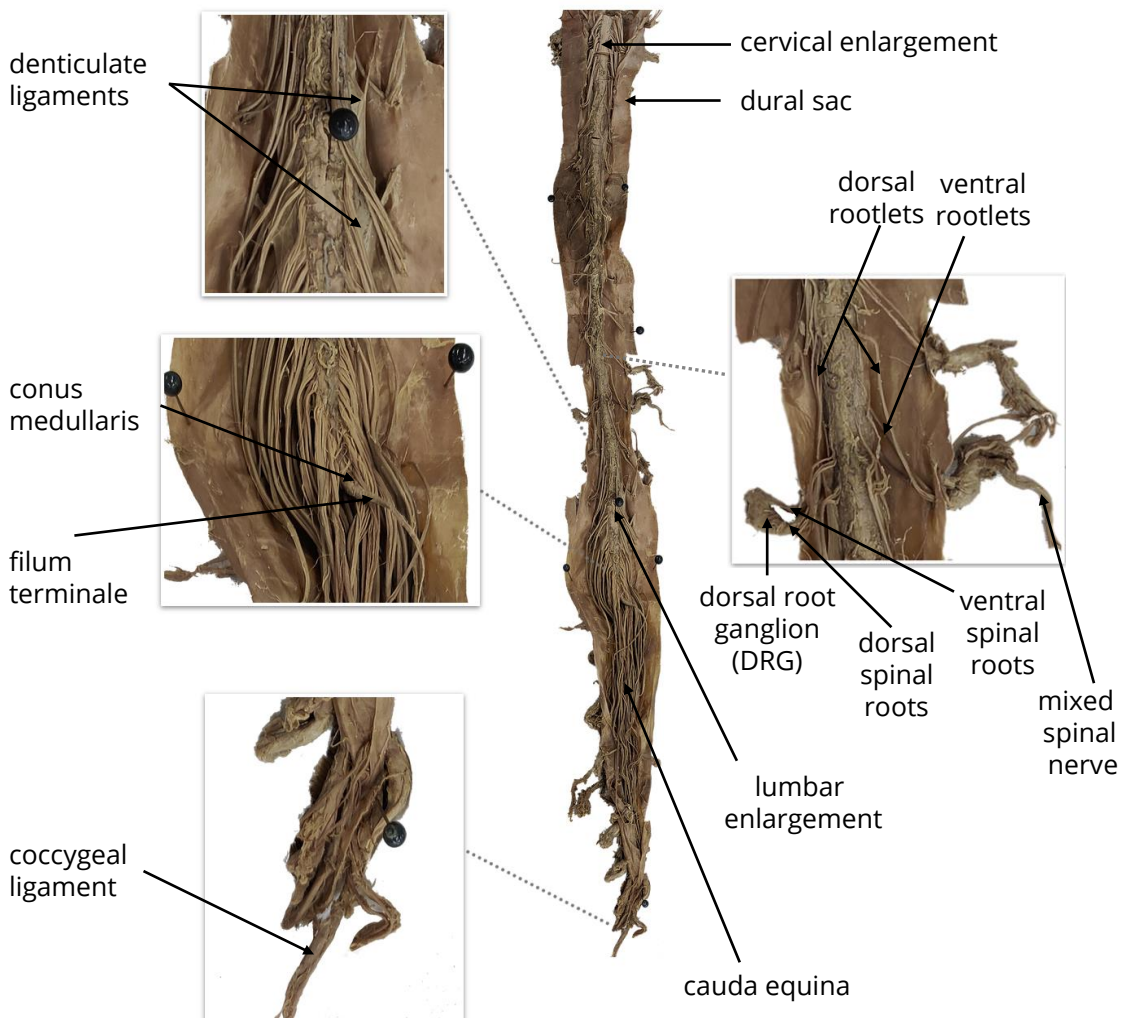intervertebral foramen   Intervertebral discs   spinal nerves   vertebral column

Spinal cord meninges

Three meninges cover the spinal cord and the brain. The most external meninx is the dura mater (hard). In the spinal cord, it creates the dural sac. While the dura around the brain is adjacent to the skull, the epidural space (between the dura and the vertebrae) is filled with blood vessels and fat. The dural sac terminates at the level of vertebra S2 and its extension, the coccygeal ligament, attaches to the coccyx bone.

Make a longitudinal incision to open the dural sac. The next meninx is the arachnoid mater (spider's web) that is attached to the inner part of the dura (in the brain it is more distinct and resembles a spider web). The innermost meninx that covers the spinal cord is the pia mater. The space between the pia and the arachnoid is the subarachnoid space that is filled with cerebrospinal fluid (CSF). Between segments C1 and L1, notice 21 pairs of pia extensions that leave the spinal cord, penetrate the arachnoid and fixate the spinal cord to the dura, the denticulate ligaments. The pia mater that covers the spinal cord continues caudally in a silvery structure called filum terminale that continues into the coccygeal ligament.

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Structure of the spinal cord

Notice that the spinal cord is wider in two places, the cervical enlargement and the lumbar enlargement. These areas include the neural matter of the upper and lower limbs respectively. The spinal cord ends at the level of vertebra L2 in the conus medullaris. Along the length of the spinal cord, notice ventral rootlets and dorsal rootlets that join to create the ventral spinal roots and dorsal spinal roots. Immediately after exiting the dural sac, notice a bulge, the dorsal root ganglion (DRG), it contains the bodies of sensory neurons. Next to it, is the ventral root that contains the axons of motor neurons. The fibers of the dorsal root ganglion and the ventral root join to form the mixed spinal nerve. The dura mater also covers them and it is continuous with the epineurium of the peripheral nervous system. Notice that the rostral rootlets are shorter and horizontal, while the caudal rootlets are longer and diagonal. The lumbosacral and coccygeal spinal rootlets form a bundle that extend beyond the conus medullaris, the cauda equina (horse tail).

denticulate ligaments

cervical enlargement

dural sac

dorsal rootlets   ventral rootlets

conus medullaris

filum terminale

dorsal root ganglion (DRG)

dorsal spinal roots

ventral spinal roots

mixed spinal nerve

coccygeal ligament

lumbar enlargement

cauda equina

Cross section of the spinal cord

In the spinal cord, the butterfly-shaped gray matter is located in the center and the white matter surrounds it. As a result of the preservation procedures and the direction of the cut (perpendicular to the direction of the fibers), the white matter appears darker. 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 ventral to it, the anterior spinal artery.

The dorsal median sulcus runs along the dorsal aspect of the spinal cord and on both of its sides the two posterior spinal arteries can be found.