



American
Association of
Neurological
Surgeons

ANATOMY OF THE SPINE AND PERIPHERAL NERVOUS SYSTEM

PATIENT INFORMATION

This resource, developed by neurosurgeons, provides patients and their families trustworthy information on neurosurgical conditions and treatments.

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The spinal cord is an extension of the central nervous system (CNS), which consists of the brain and spinal cord. It begins at the bottom of the brain stem (at the area called the medulla oblongata), and it ends in the lower back as it tapers to form a cone called the conus medullaris.

Anatomically, the spinal cord runs from the top of the highest neck bone (the C1 vertebra) to approximately the level of the L1 vertebra, which is the highest bone of the lower back and which is found just below the rib cage. The spinal cord is about 18 inches (45 centimeters) in length and is relatively cylindrical in shape. The cervical (neck) and lumbar (lower back) segments house the spinal cord's two areas of enlargement. Beginning at the tip of the conus medullaris, a fibrous band called the filum terminale begins at the tip of the conus medullaris and extends to the pelvis.

At the bottom of the spinal cord (conus medullaris) is the cauda equina, a collection of nerves that derives its name from the Latin translation of "horse's tail." (Early anatomists thought the collection of nerves resembled a horse's tail.)

Cerebrospinal fluid (CSF) surrounds the spinal cord, which is also shielded by three protective layers called the meninges (dura, arachnoid and pia mater).

The spinal cord lies inside the spinal column, which is made up of 33 bones called vertebrae. Five vertebra are fused together to form the sacrum (part of the pelvis), and four small vertebra are fused together to form the coccyx (tailbone).

The spine itself is divided into four sections, not including the tailbone:

- Cervical vertebrae (one through seven, which are located in the neck)
- Thoracic vertebrae (one through 12, which are located in the upper back and attached to the ribcage)
- Lumbar vertebrae (one through five, which are located in the lower back)
- Sacral vertebrae (one through five, which are located in the pelvis)

Between the vertebral bodies (except C1 and C2) are discs serving as a supportive structure for the spine. These oval-shaped discs have a tough outer layer (annulus) that surrounds a softer material called the nucleus pulposus. These discs act as shock absorbers for the spinal bones. Ligaments attached to the vertebrae also serve as supportive structures.

There are 31 pairs of spinal nerves and roots. Eight pairs of cervical nerves (called C1-C8) exit the cervical cord at each vertebral level. One member of the pair exits on the right side, and the other exits on the left. The first cervical root exits above the C1 vertebra. The second cervical root exits between the C1-C2 segment, and the remaining roots exit just below the correspondingly numbered vertebra. The C8 nerve root exits between the C7 and T1 vertebra.

There are 12 thoracic nerve pairs (T1-T12). The T1 nerve root exits between the T1 and T2 vertebrae. There are five lumbar nerve pairs (L1-L5). The L1 nerve root exits between L1 and L2. There are five sacral nerve pairs (S1-S5). The S1 nerve root exits between S1 and S2. One pair of coccygeal (Co1) nerves meets in the area of the tailbone.

By way of the peripheral nervous system (PNS), nerve impulses travel to and from the brain through the spinal cord to a specific location in the body. The PNS is a complex system of nerves that branch off from the spinal nerve roots. These nerves travel outside of the spinal canal to the upper extremities (arms, hands and fingers), to the muscles of the trunk, to the lower extremities (legs, feet and toes), and to the organs of the body.

Any interruption of spinal-cord function by disease or injury at a particular level may result in a loss of sensation and motor function below that level. Depending on the severity of the disease or injury, the loss of function may be permanent.

Glossary of Terms

Annulus fibrosus – The fibrous, ring-like outer portion of an intervertebral disc.

Anterior – Referring to the front of the body.

Anterolateral – Situated or occurring in front of and to the side.

Arachnoiditis – Inflammation of the arachnoid membrane (the middle of the three protective layers called the meninges); most commonly seen around the spinal cord and cauda equina.

Arthritis – Inflammation of a joint, usually accompanied by swelling, pain and restriction of motion.

Bone spur – Bony growth or rough edge of bone.

Cauda equina – The collection of nerves at the end of the spinal cord that resembles a horse's tail.

Centrum – The body of a vertebra.

Cervical spine – The neck region of the spine consisting of the first seven vertebrae.

Coccyx – More commonly known as the tailbone, this is a bony structure in the region of the spine below the sacrum.

Conus medullaris – The cone-shaped bottom of the spinal cord.

Disc (Intervertebral) – A tough, elastic cushion located between the vertebrae in the spinal column; acts as a shock absorber for the vertebrae.

Disc degeneration – The deterioration of a disc. A disc in the spine may wear out over time. A deteriorated disc may or may not cause pain.

Distal – Located downstream.

Facet – A joint formed when a posterior structure of a vertebra that joins with a facet of an adjacent vertebra; this joint allows for motion in the spinal column. Each vertebra has a right and left superior (upper) facet and a right and left inferior (lower) facet.

Foramen – An opening in the vertebrae of the spine through which the spinal nerve roots travel.

Herniated disc – Condition in which the jelly-like core material of a disc bulges or ruptures out of its normal position; a herniated disc may exert pressure on the surrounding nerve root and/or the spinal cord.

Joint – The junction of two or more bones that permits varying degrees of motion between the bones.

Lamina – The flattened or arched part of the vertebral arch that forms the roof or back part of the spinal canal.

Lateral – Situated on the side or away from the midline of the body.

Ligament – Fibrous connective tissue that links bones together at joints or that passes between bones of the spine.

Lumbar spine – The lower back region of the spine; consists of the five vertebrae between the ribs and the pelvis.

Nerves – Neural tissue that conducts electrical impulses (messages) from the brain and spinal cord to all other parts of the body; also conveys sensory information from the body to the central nervous system.

Nerve root – The initial portion of a spinal nerve as it originates from the spinal cord.

Neural arch – The bony arch of the back part of a vertebra that surrounds the spinal cord; also referred to as the vertebral arch.

Pedicle – The bony part of each side of the neural arch of a vertebra that connects the lamina (back part) with the vertebral body (front part).

Posterior – The back or rear side of the body.

Proximal – Located upstream.

Rotation – Twisting movement of one vertebra on another as a patient turns from one side to the other.

Sacrum – Part of the pelvis just above the coccyx (tailbone) and below the lumbar spine (lower back).

Sciatica – A lay term indicating pain along the course of the sciatic nerve; typically noted in the back of the buttocks and running down the back of the leg and thigh to below the knee.

Scoliosis – An abnormal sideways curvature of the spine.

Spinal canal – A bony channel located in the vertebral column that protects the spinal cord and nerve roots.

Spinal cord – The longitudinal cord of nerve tissue enclosed in the spinal canal. It serves not only as a pathway for nerve impulses to and from the brain, but also as a center for operating and coordinating reflex actions independent of the brain.

Spinal stenosis – Abnormal narrowing of the vertebral column that may result in pressure on the spinal cord, spinal sac or nerve roots stemming from the spinal cord.

Spine – The flexible bone column extending from the base of the skull to the tailbone. It is made of 33 bones known as vertebrae, and also is referred to as the vertebral column, spinal column or backbone.

Spondylitis – Inflammation of vertebrae.

Spondylolisthesis – The forward displacement or "slippage" of one vertebra onto another.

Spondylosis – Degenerative bony changes in the spine, usually most marked at the vertebral joints.

Superior – Situated above or directed upward toward the head of an individual.

Thoracic spine – The region of the spine attached to the ribcage; located between the cervical and lumbar areas, which consists of 12 vertebrae.

Vertebrae – The 33 bones that make up the spine, individually referred to as a vertebra. They are divided into the cervical spine (neck), the thoracic spine (upper back or rib cage), the lumbar spine (lower back) and the sacral spine (pelvis or base of the spine).

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