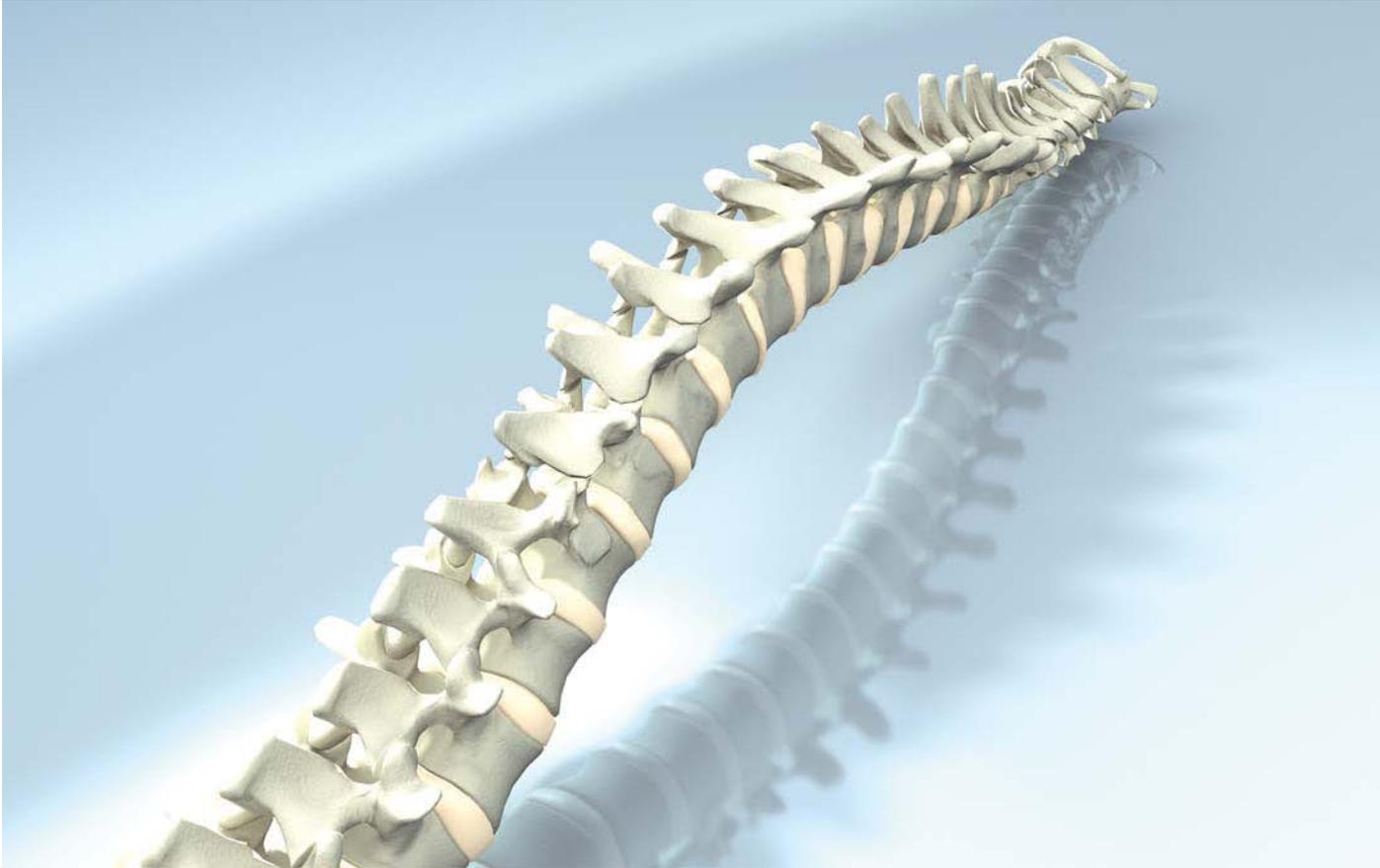


# Aesculap Patient Information

Anatomy of the Spine



Aesculap Spine

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## Anatomy of the Spine



The spinal column is one of the most important and mobile structures of the human body. It supports and stabilizes the upper part of our body (trunk) and represents the centre of our musculoskeletal system, making our motion sequences possible.

The shape of the vertebrae and the height of the intervertebral discs differ depending on the spinal region. According to those characteristics, the vertebrae are divided into regions:

- Cervical Spine
- Thoracic Spine
- Lumbar Spine
- Sacrum
- Tailbone (Coccyx)

The human spine usually consists of 33 vertebrae, which are flexibly connected by intervertebral discs. By adult age, the vertebrae of the sacrum fuse together. The adjacent tailbone is attached to the sacrum by fibrous tissue, which permits slight movements of this spinal region. Due to that fact, the adult spine consists of 24 flexibly connected vertebrae.

The single anatomical structures are finely adapted to each other, in order to create a highly flexible yet resilient construct which serves for many functions.

The main purpose of the elements of the spinal column and vertebrae is the protection of the spinal cord.

# Anatomy of the Spine

## Cervical Spine / Lordosis

- Also called neck
- Consists of 7 small vertebrae (C1-C7)
- Forward curvature (lordosis)
- Shows the highest range of motion within the spine
- Begins at the base of the skull and ends above the shoulders

## Thoracic Spine / Kyphosis

- Consists of 12 vertebrae (T1-T12)
- Backward curvature (kyphosis)
- Compared to the rest of the spine it shows a very low range of motion
- Shows connection points for ribs

## Lumbar Spine / Lordosis

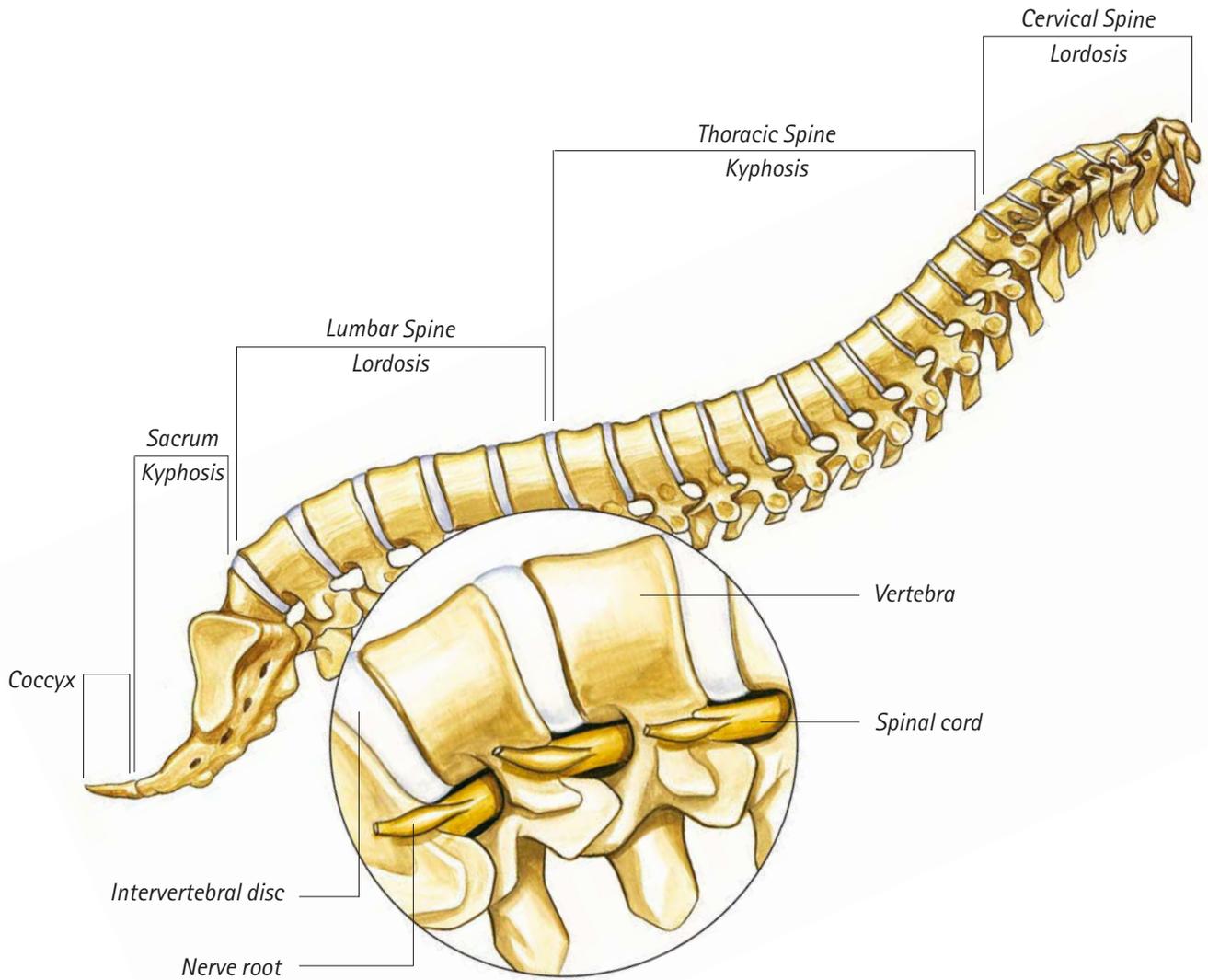
- Consists of 5 large vertebrae (L1-L5)
- Vertebrae and discs are thicker than the other vertebrae and carry most of the body's weight
- Forward curvature (lordosis)
- Allows motion, especially in flexion and extension

## Sacrum / Kyphosis

- Consists of 5 fused vertebrae (S1-S5)
- Backward curvature (kyphosis)
- Connects to the pelvis

## Coccyx

- Also called tailbone
- Usually consists of 4 vertebrae
- Attachment point for spinal muscles



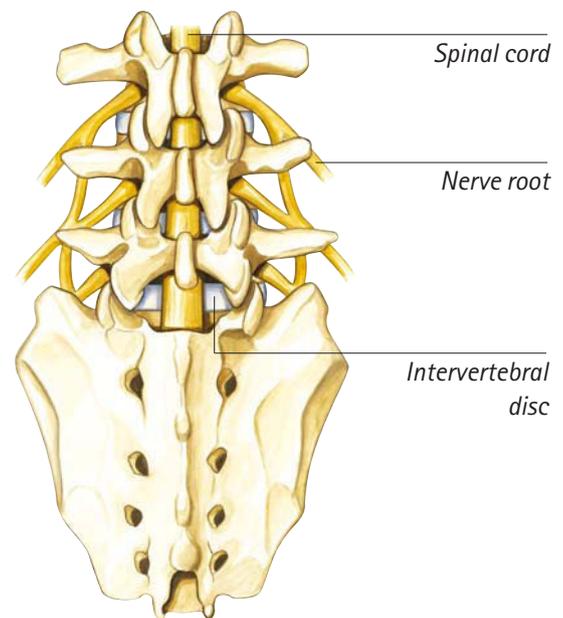
# Anatomy of the Spine<sup>1</sup>

The spinal cord is a slender cylindrical shaped structure composed of nervous tissue. It begins from the back of the head and extends down to the intervertebral disc space between the first and second lumbar vertebra and is protected by the surrounding bony structures of the vertebra.

The spinal cord is the biggest nerve structure of the body and is an essential part of the central nervous system. It works as a conduit for motion information, sensory information (e.g. sense of touch) and as a coordination system for certain reflexes.

The lateral openings (foramina) of the vertebrae permit the passage of the spinal nerve roots, which emerge from the spinal cord at each level on both sides of the vertebra. The nerve roots are responsible for movements and stimulating feeling like pain.

The intervertebral discs are placed between each pair of vertebrae allowing the spine to show a large range of motion. Due to its shock absorbing characteristics, the intervertebral discs work mainly as protection system for the vertebrae, brain and other spinal structures.



## Pathology of the Spine

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The spinal cord and its branching off nerve roots are responsible for the complex interaction between the spinal structures and the brain. These enable us to be mobile and to feel sensations. In case of an injury or an impaired function of the spine, the effects may be painful and obstructive. Depending on the spinal region, the manifestation of pain can differ:

### Cervical Spine<sup>2</sup>

- Neck pain with reduced range of motion
- Headaches
- Pain in shoulder, arm(s), or hand(s)
- Weakness, numbness, and slower reflexes in arms, hands, legs, or feet

### Lumbar Spine<sup>3</sup>

- Pain in the lower back that spreads in one or both legs or buttock
- Tingling, numbness or loss of sensation in one or both legs
- Weakness of muscles in one or both legs
- Loss of reflexes in one or both legs

In this context several treatment options such as analgesics, physical therapy, rest or surgery may be considered.

# Anatomy of the Spine

## Degenerative Disc Disease (DDD)

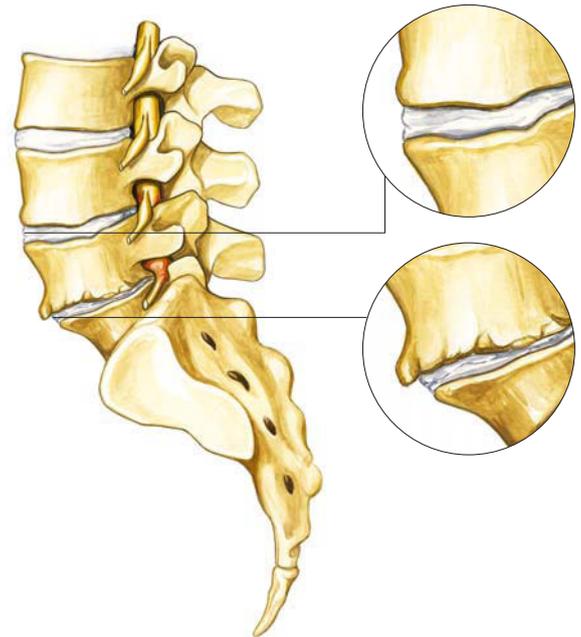
During the natural aging process of the spine, the intervertebral disc will exhibit changes in its consistency with a varying degree of degeneration. In this case the intervertebral disc gradually loses the ability to function efficiently and maintain height, and can lead to back pain.

## Vertebral Displacement (Spondylolisthesis)

Describes the forward displacement of a vertebra in relation to the vertebrae below. Often the lumbar spine is affected by this spinal condition, because it bears the most weight relative to other regions of the spine.

## Intervertebral Disc Herniation

The affected intervertebral disc shows tears in the outer structure, so that the inner gelatinous part of the disc bulges out beyond the damaged structure. Due to the bulge of the herniated disc, the spinal cord and its nerve roots can become pinched, which can lead to various symptoms.



*Degenerated intervertebral disc with osteophytes*

### Spinal Stenosis

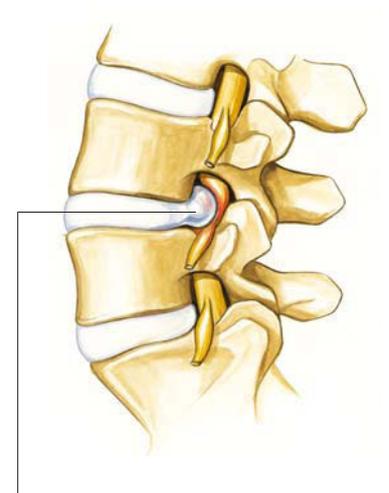
Spinal stenosis describes an abnormal narrowing of the space where the spinal cord and the corresponding nerve roots pass. This narrowing causes a serious restriction of the spinal cord and the nerve roots resulting in neurological deficits.

### Scoliosis / Deformity

Viewed from the back, a typical spine shows a straight contour. In the case of a scoliosis or deformity, the spine shows abnormal sideways curvatures which influence the posture in a critical way.

### Vertebral Breakage (Fracture)

Vertebral fractures are caused by trauma (e.g. accidents) or unfavorable spinal conditions such as osteoporosis. The consequences of a fractured vertebra can be serious. Bone fragments can pinch or damage the spinal cord and the nerve roots.



*Herniated intervertebral disc*

# Anatomy of the Spine

## References

- <sup>1</sup> Dickman C, Fehlings M, Gokaslan Z. *Spinal Cord and Spinal Column Tumors: Principles and Practice*. New York: Thieme. 2006.
- <sup>2</sup> Singh A. *Case-Based Neurology*. New York: Demos Medical Publishing. 2011.
- <sup>3</sup> Filler A. *Do You Really Need Back Surgery?: A Surgeon's Guide to Neck and Back Pain and How to Choose Your Treatment*. Oxford: Oxford University Press. 2013.

This patient information is provided by Aesculap Spine and is intended to provide you with general information about the anatomy and pathology of the human spine.

A detailed consultation with your surgeon can not be replaced by this patient information.

Please contact your surgeon for additional information and clarification of questions about the anatomy and pathology of the spine.



