

Diseases of the spinal column that result from wear are called degenerative diseases. The spinal column with its structural elements, the vertebral bodies, intervertebral discs and ligamentous apparatus, is subject to a physiological aging process. Lack of sufficient exercise, excess weight, poor posture and extreme physical exertion and stress loads may accelerate the aging process. Most back pain is caused by degenerative diseases of the intervertebral discs. Disease onset is normally between the ages of 30 and 60.

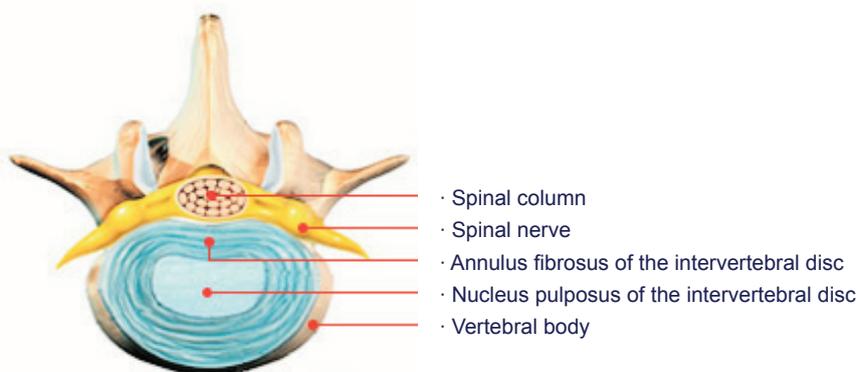
What are intervertebral discs?

The spinal column has 23 intervertebral discs (disci intervertebrales) positioned between the vertebral bodies. There are no discs between the 1st and 2nd cervical vertebrae and the fused sacral and coccygeal vertebrae. The discs are made up of fibrous-cartilaginous material. They closely fit the contact surfaces of the vertebral bodies and are connected to them.

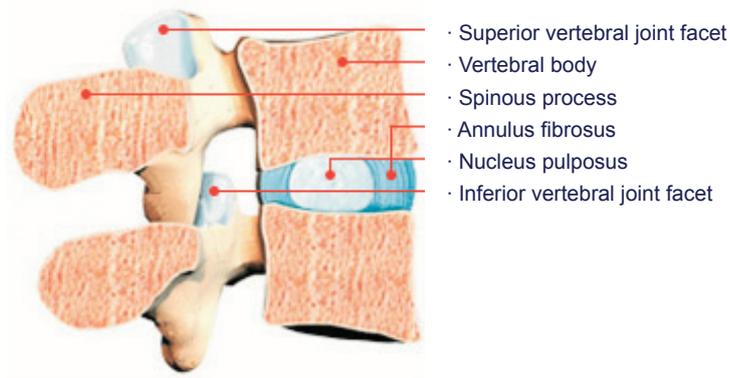
Each intervertebral disc has two elements:

1. The outer ring of the intervertebral disc (annulus fibrosus) is made of concentric sheets of collagen fibers wound in a spiral around the lengthwise axis of the spinal column. The individual layers cross each other and this interlaced structure gives the disc the strength to absorb rotating movements of the spinal column.
2. The annulus fibrosus encloses the gelatinous core (nucleus pulposus) which has a high water content. Its deformable nature allows it to act as a buffer, similar to a water-filled cushion. The close proximity of the intervertebral disc to the spinal column and exiting spinal nerves means that a herniated disc can cause pain and neurological symptoms such as sensory dysfunctions or paralysis.

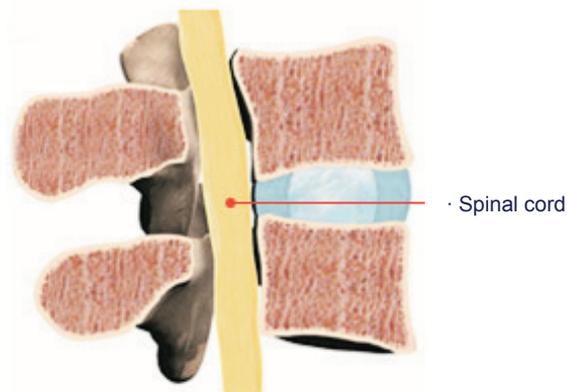
- View from above of a lumbar vertebra with the intervertebral disc, spinal column and spinal nerves



- Cross-section of a lumbar vertebral column segment with intervertebral disc



- Cross-section of a lumbar vertebral segment with spinal cord and intervertebral disc



How does an intervertebral disc function?

The intervertebral disc acts as a buffer that absorbs and distributes applied forces. In contrast to other tissues in the body, the blood vessels in intervertebral discs degenerate at a very early stage, after which the intervertebral discs must be supplied by diffusion, meaning that the tissue absorbs water from or gives off water to the structures that surround it.

When the spinal column is subjected to a load, the elastic intervertebral discs normally distribute the resulting pressure, tensile, and shearing forces by deforming to accommodate the movement of the spinal column and pressing water out of the inner space through a permeable membrane, thus losing thickness. When the pressure is relieved, such as when we lie down and sleep at night, the discs are supplied with water containing the necessary metabolic substances, and again become turgid and elastic.

Constant alternation between load application and load release is of primary importance for disc metabolism and therefore for the preservation of physiological disc function.

What happens as intervertebral discs age?

The tissues of the annulus fibrosus and the nucleus pulposus in particular lose water over the years, reducing their elasticity and regenerative capacity. The disc grows dense and brittle, it fibroses, loses height and the first cracks in the fibrous structure may appear. These structural changes may lead to shifts in the position of intervertebral disc tissue.

How does a herniated intervertebral disc occur?

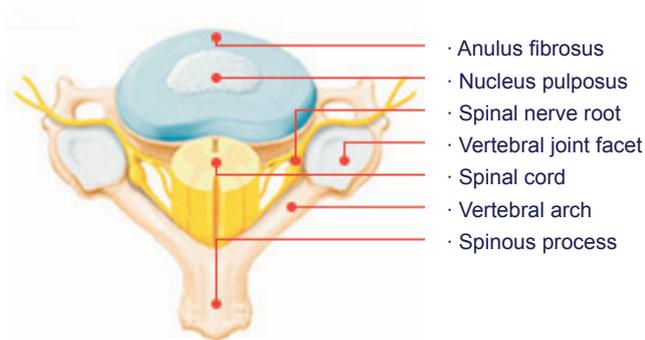
When the intervertebral disc shows degenerative changes with cracks and gaps, heavy mechanical loads can cause parts of the fibrous ring and pulpous core to change position.

This can have different forms:

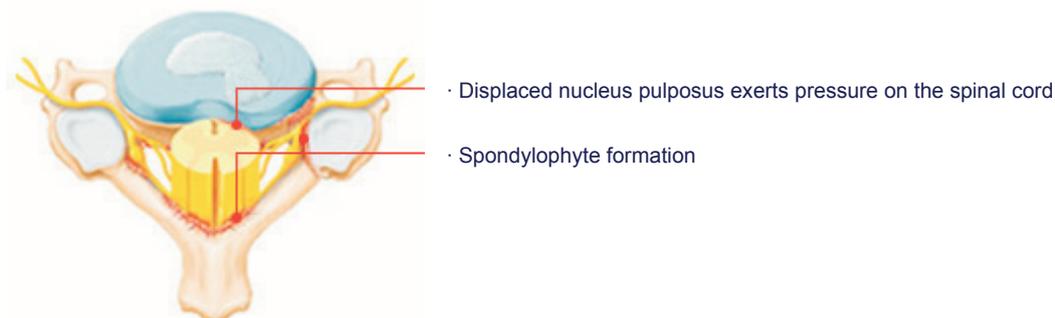
- Protrusion of the disc is a bulging out of the gelatinous center where the annulus fibrosus remains intact.
- Prolapsed disc or fully herniated disc where part of the nucleus pulposus can extrude through the destroyed annulus fibrosus of the disc.
- Sequestration or a sequestered disc occurs when parts of the displaced nucleus and annulus are severed and separated from their original structures.

The bulging or shifting of elements of the intervertebral disc may be central or lateral, so that the terms medial or lateral herniated discs are used. The shifted or sequestered disc parts may then press against the spinal cord or exiting spinal nerves, resulting in correlating symptoms.

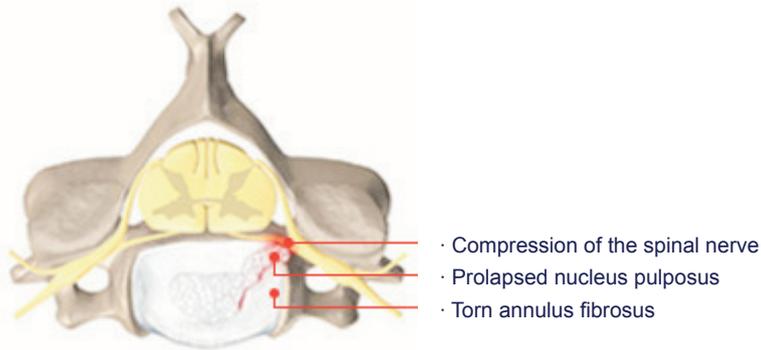
- Normal relationship of vertebral body, intervertebral disc, spinal cord and spinal nerves



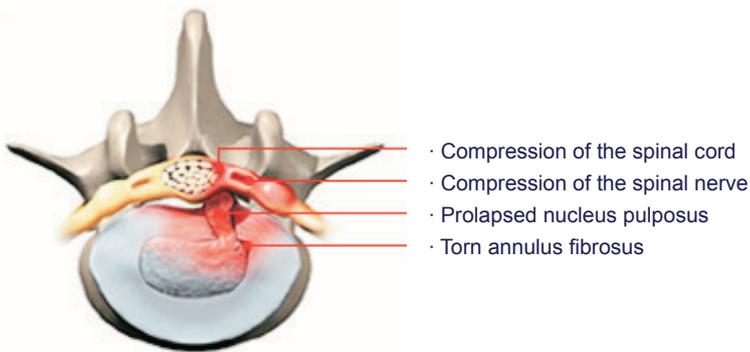
- Protrusion of the intervertebral disc with intact annulus fibrosus, mediolateral shift of nucleus pulposus. Compression of the spinal cord and spinal nerve.



- Lateral herniated disc with pressure on the spinal nerve



- Medial herniated disc with compression of the spinal cord and spinal nerve root



Are there risk factors relevant to the occurrence of herniated intervertebral discs?

Malpositions of the spinal column, lack of exercise, weak development of muscles and connective tissues, excess weight, and unfavorable stress loads in the workplace are factors that can raise the probability of a herniated disc.

Where can herniated intervertebral disc occur?

A herniated intervertebral disc can occur in all vertebral column segments. Most herniated discs occur in the lumbar spine and at its transition to the sacrum, followed by those in the cervical spine and, with the lowest level of prevalence, the thoracic spine.

What symptoms are caused by a herniated intervertebral disc?

Depending on location and severity, local pains with or without radiation and, in the presence of strong pressure on the spinal cord or spinal nerves, sensory and motor dysfunctions up to and including paralytic conditions may occur as a result of a herniated disc.

See the special chapters on diseases of the cervical and lumbar intervertebral discs for details on the symptoms.

How are herniated intervertebral discs diagnosed?

After a review of the patient's medical history and clinical and neurological exams, the treating physician can arrive at a tentative diagnosis. Further specific diagnostic procedures involving x-rays of the affected section of the vertebral column, including functional imaging as required, are generally done for confirmation. Imaging methods such as computer tomography, magnetic resonance tomography and myelography provide additional information that forms the basis for an exact diagnosis.

How is a herniated intervertebral disc treated?

As long as there are no severe dysfunctions or pains, a herniated disc is treated conservatively with painkilling drugs, physiotherapy and rest. Immediate surgical intervention is required in the presence of acute symptoms such as paralysis, loss of bladder or colon control, or increasing motor dysfunctions due to root compression. If pain persists despite adequate conservative treatment, perhaps accompanied by dysesthesias as well, surgery may be indicated if a herniated disc has been confirmed. The actual surgical approach employed depends on the specific individual findings. In the cervical intervertebral disc disease and lumbar intervertebral disc disease sections, we discuss the various surgical approaches available for the surgical treatment of intervertebral disc problems.