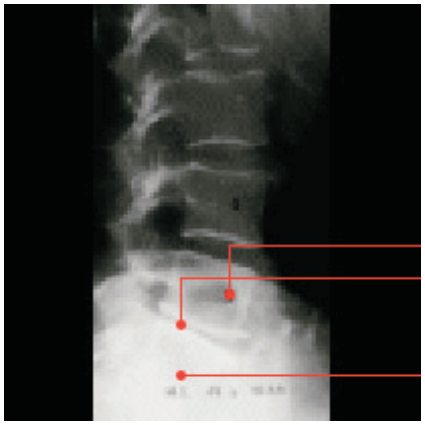
What is degenerative lumbar scoliosis?

It is a pathological condition in the region of the lumbar spine that develops due to degenerative multisegmental changes in the mobile segments (deterioration of several lumbar vertebral segments) and causes a lateral displacement of the spinal column in the frontal plane (scoliosis), a narrowing of the spinal canal, and instability of the vertebral segments.

What are the causes of this disease?

The intervertebral discs are subject to a normal aging process characterized by metabolic changes in the disc and pathological load distribution in the spinal column.
The intervertebral discs lose their elasticity; cracks form in the outer fibrous ring (annulus fibrosus) and the inner gelatinous core (nucleus pulposus) loses water and grows hard. Cavities may form inside the disc tissue, in which gas may collect (vacuum phenomenon). The first change noted in osteochondrosis is a detectable loss of height of the intervertebral spaces visible on an x-ray.

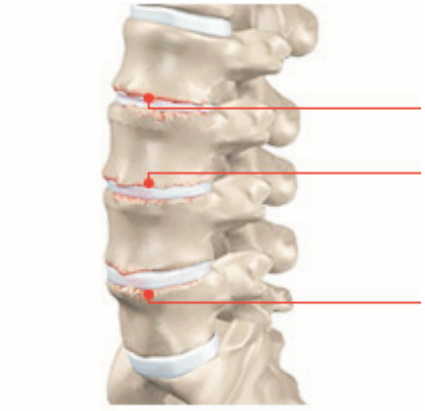
• X-ray of the lumbar spine from the side:
Osteochondrosis L5/S1 with a narrowing of the intervertebral disc space L5/S1



· 5th lumbar vertebra
· Narrowing of the intervertebral disc space L5/S1 with bony transformation of the vertebra (osteochondrosis)
· 1st sacral vertebra

Subsequent intervertebral disc shifts (protrusions) or herniations can develop, with compression of the spinal cord and spinal nerves. This wearing of the intervertebral discs initiates severe changes in the stability of the mobile segment. The intervertebral discs may no longer be able to dampen the forces to which they are exposed, the altered pressures cause further bony degeneration on the vertebrae; spondylosis develops.

• Spondylosis L2-L5 with exophytic outgrowths on the base and upper plates, reduced height of the intervertebral disc spaces between L2 and L5



· Reduced height of the intervertebral disc space
· Bony transformation of the base plate
· Bony transformation of the upper plate

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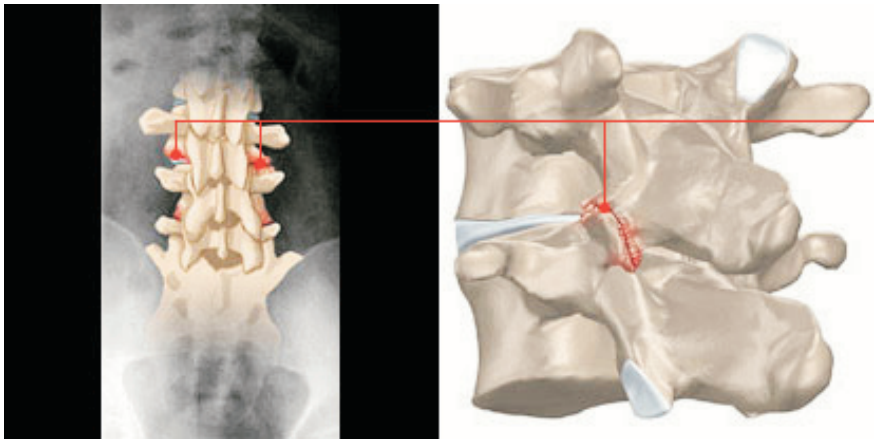
The vertebral segment becomes unstable, and the altered shearing forces result in structural changes in the small vertebral joints with asymmetrical arthrosis of the articular surfaces (spondylarthrosis).

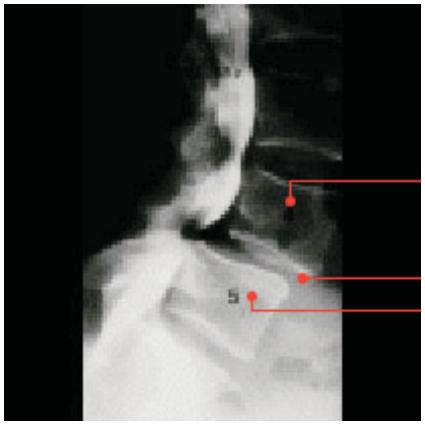
• Arthrosis of the small vertebral joints (spondylarthrosis)



· Arthrosis of the vertebral joints (spondylarthrosis)

The complex ligamentous apparatus that stabilizes the vertebrae in relation to each other is overstretched and thickens (hypertrophy), adding a further destabilizing element.
Taken collectively, the developments described above result in a dysbalance of the mobile segment, normally in a state of balance between intact intervertebral disc and stabilizing ligamentous apparatus where the vertebral joints act as centers of rotation. The instability and structural loosening subsequently alter the physiological angular interrelationships among the individual segment structures. The increasing widening of the vertebral arch angle (between the axis of the inferior vertebral joints and the root of the vertebral arch) may cause a vertebra to slip forward (pseudo-spondylolisthesis). This degenerative slippage of a vertebra is observed almost exclusively with the 4th lumbar vertebra, more rarely in L3/L4 or L5/S1.

• Vertebra slippage towards the front (pseudolisthesis L4)



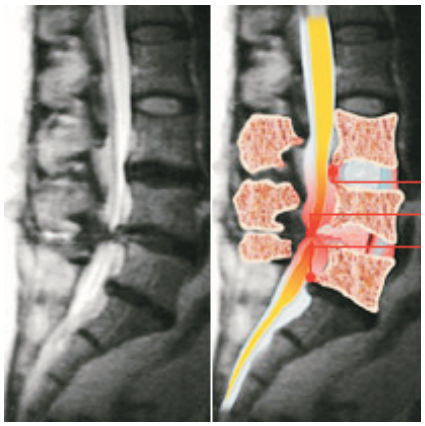
· 4th lumbar vertebra

· L4 has slipped in front of L5

· 5th lumbar vertebra

Due to the changes in the vertebral segment described above, instability caused by spondylosis, spondylarthrosis, intervertebral disc degeneration with herniation or protrusion, and degenerative spondylolisthesis, a narrowing of the spinal canal may also develop.

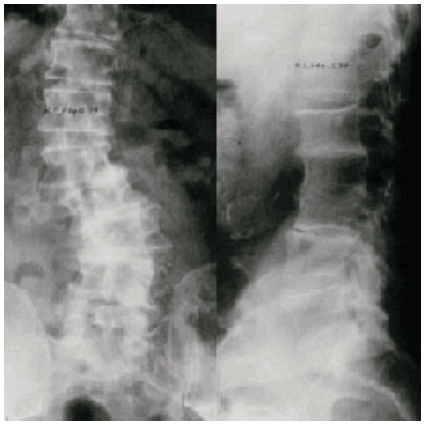
• Lumbar spinal canal stenosis L3-L5



· Herniated intervertebral disc
· Spinal canal stenosis
· Retrospondylosis

Degenerative lumbar scoliosis results from the occurrence of the mechanisms described above as affecting individual mobile segments in multiple segments. Asymmetric (uneven) wearing of the intervertebral discs appears to play a significant role as well. When these changes occur in several adjacent lumbar spine segments, the resulting pronounced instability leads to a lateral deviation of the lumbar spine and to the development of a scoliotic deformity. The existing instability results in a loss of rotational control of the lumbar spine, so that the physiological curvature of the lumbar spine (lordosis) and the normal sagittal spinal profile are both lost.

• Degenerative lumbar scoliosis with pronounced changes in the vertebral bodies, lateral deviation and loss of lumbar lordosis



How is it diagnosed?

A patient's medical history is reviewed, followed by physical and neurological examinations. The extent of bony transformations, any lateral deviation of the spinal column, herniated intervertebral disc, or spinal canal narrowing can be detected in x-rays of the lumbar spine, or computer or nuclear magnetic resonance tomography. Electrophysiological tests can confirm any damage to the spinal cord or spinal nerves.

What are the symptoms?

The lumbar spine hurts. If scoliosis is present, the lateral deviation from the body's midline is evident. The lumbar muscles are tense.
Lumbar scoliosis can be the cause of all the symptoms also seen with lumbar diseases of the intervertebral

discs and lumbar spinal canal stenosis.
Depending on the location of a herniated intervertebral disc or existing spinal canal stenosis with pressure on the spinal cord or spinal nerves, pain and dysesthesias that are either local or radiate into the legs can be considered signs of neurogenic claudication.
If the above findings are pronounced, compression of the spinal cord may result in cauda syndrome affecting bladder and colon function.
Increasing spinal column deformation can seriously reduce the patient's quality of life.

How is it treated?

Conservative treatment consists of physiotherapy, isometric exercises to stabilize the back muscles and physical applications.
Pain relief may be achieved with analgesic and antiphlogistic medications, infiltration treatment with local anesthetics and corticoids, accompanied by wearing of a supporting corset as required.
The objectives of surgical treatment are pain reduction, decompression of the spinal cord and spinal nerves, restoration of the frontal and sagittal vertebral column profile and prevention of further instability. In the presence of cauda syndrome or rapidly worsening neurological dysfunctions, surgical decompression of the spinal cord and nerve roots must be performed as soon as possible (absolute surgical indication).

Depending on the constellation of findings, a number of different surgical approaches are available for the surgical treatment of degenerative lumbar scoliosis.
The surgical approach must always be determined individually. In general, however, surgical access from behind (dorsal) only is the only feasible option in the great majority of cases
Front (ventral) surgical access is necessary in cases where the malposition of the lower lumbar spine cannot be treated by dorsal measures or if such measures alone would not suffice to correct a pronounced lumbar kyphosis.
Surgical methods often used in treatment of degenerative lumbar scoliosis:
· Multisegmental decompression with fusion using the TLIF (transforaminal lumbar interbody fusion) or ALIF (anterior lumbar interbody fusion) method
· Dorsal repositioning spondylodesis with dorsolateral fusion only
· Pedicle subtraction osteotomy in combination with multisegmental spondylodesis using the TLIF or ALIF method