

What is “scoliosis“?

Scoliosis is a complex three-dimensional deformity of the spinal column that causes structural changes in the three planes of the spine (frontal, sagittal and transverse plane) and may occur in all vertebral segments.

The word “scoliosis” comes from the Greek for “crooked” (scolios).

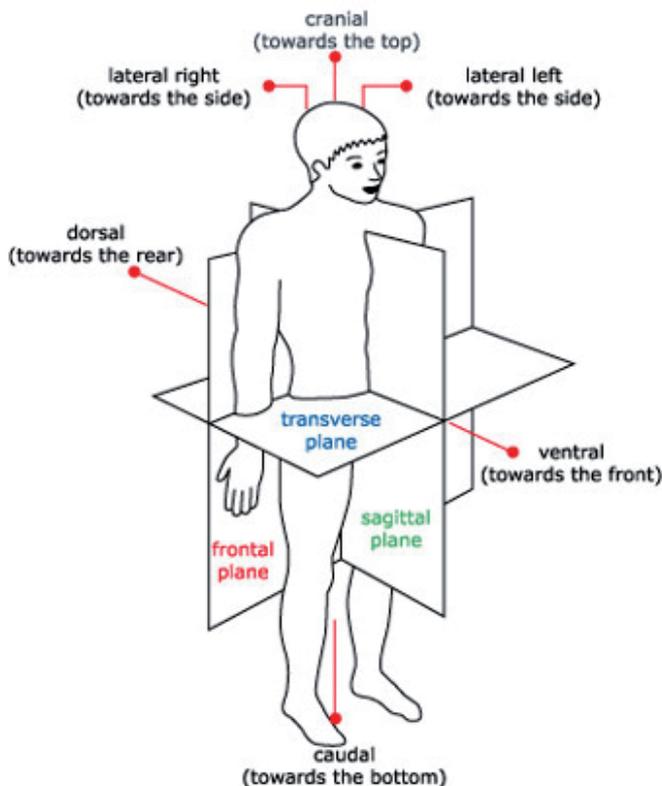
Scoliosis viewed from the frontal plane exhibits a (partially) fixed lateral deviation of the spinal column with deformation of the vertebral bodies. In the transverse plane, a rotation of the vertebrae about their own axis is observed around the apex of the scoliosis, and torsion (spiraling) of the spinal column also occurs in this area. In the sagittal plane the physiological curves (kyphosis and lordosis) are changed, with an increase or decrease in kyphotic or lordotic curvature depending on the type of scoliosis present.

Due to the rotation, the costal hump may be on the convex side of the spinal curve and the costal concavity may come to be on the opposite (concave) side. Lateral deviation of the spinal column cannot be completely compensated, either passively or actively. In cases of progressive lateral deviation of the spine, the vertebral segments stiffen progressively. A distinction is made between structural scoliosis with deformation and rotation of the vertebral bodies that cannot be completely compensated actively and passively and a purely functional scoliosis. Functional scoliosis is mainly seen in cases of postural damage, e.g. different leg lengths. In such cases, the scoliosis is not fixed and can be adjusted in a prone position.

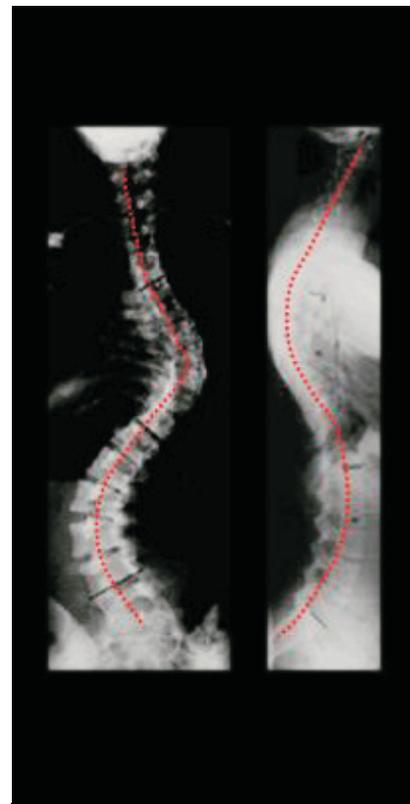
From a morphological standpoint, the increasing malposition of the vertebral bodies results in structural changes in all vertebral body elements (vertebral bodies, spinous processes, transverse and arch processes, pedicles, and uncovertebral joints).

The following illustration shows the main geometric terms used to describe the planes of the body and directions of motion used in medicine.

- Body planes and directional terms



- Scoliosis, frontal plane
- scoliosis, sagittal plane



How are scolioses classified?

Scolioses are classified in the following groups:

- Idiopathic scoliosis

80-90% of all scolioses are termed "idiopathic." (Greek: idios = self, pathos = suffering, disease). This refers to a form of scoliosis for which the cause and pathogenesis has not been explained to date. Idiopathic scolioses are classified in the following subgroups according to the patient's age at initial onset:

- Infantile idiopathic scoliosis (initial manifestation of scoliosis up to 3 years of age)
- Juvenile idiopathic scoliosis (initial manifestation from 3 to 9 years of age)
- Adolescent idiopathic scoliosis (initial manifestation between 10 years of age and the end of adolescence)

- Congenital scoliosis

Congenital scoliosis is a spinal deformity with lateral deviation and rotation of the spinal column caused by birth defects in the embryonal development of the vertebrae leading to the formation of one or more deformed vertebrae. The incomplete formation of the vertebrae results in asymmetrical growth of the spinal column. Congenitally anomalous vertebrae can occur in any part of the spinal column.

Formation defects, segmentation defects, or combined forms of vertebral anomalies disturb the normal growth pattern of the spinal column, so that a scoliosis may develop as the spinal column develops.

Congenital scolioses are rare, but may require early surgery due to the severity of the spinal deformity.

- Neuromuscular scoliosis

This term describes a clinical picture resulting primarily from neurological or muscular diseases and characterized by a wide variety of symptoms of varying degrees of severity (for example disorders affecting posture and the locomotor system, mental disability, or damage to sensory perception functions). Many of these diseases have their onset in childhood and may, in addition to the many individual primary symptoms observed, also lead to the formation of a scoliosis due to the neuromuscular disturbance of the postural apparatus with local or generalized muscular dysfunctions.

How often does scoliosis occur (epidemiology)?

The data in the literature on the incidence of scoliosis varies considerably worldwide. This also reflects the differing definitions of the criteria that must be met for a scoliosis to be present. The figures vary from 0.1 to 15%, and an average of around 4% may be assumed. In Germany, about 400,000 persons suffer from scoliosis. About 90% of all scolioses are idiopathic scolioses, which affects girls four times as frequently as boys. The remaining 10% of diagnosed cases of scoliosis are of the congenital and neuromuscular types.

What symptoms can be caused by a scoliosis?

In the initial phase, scoliosis may cause no symptoms at all in children, which is why the disease is frequently discovered by accident.

The following symptoms may characterize an advanced case of scoliosis:

- Row of spinous processes not on plumbline
- Different shoulder heights
- Costal hump on the convex side of the scoliosis resulting from rotation of the vertebrae
- Costal concavity on the concave side of the scoliotic curve, also resulting from the rotation asymmetry of the vertebrae.
- Lumbar bulge in a lumbar scoliosis caused by the accentuation of the paraspinal muscles on the convex side
- Asymmetrical waist triangle
- Slanted head posture
- Lateral torso overhang
- Back pains
- Deformation of ribcage
Advanced deformation of the ribcage may result in compression of heart and lungs, potentially causing a severe reduction of cardiovascular and respiratory function.
- Reduction of performance capacity and quality of life
- Degenerative changes in affected vertebral segments