

### How is scoliosis treated?

The treatment of scoliosis cannot be boiled down to a single principle. Many aspects of treatment, such as brace treatment or the best time to operate, are very controversial subjects of discussion depending on curve angle data. As in other medical disciplines, opinions on therapeutic procedures can differ appreciably, which does not make it any easier for the patient to choose in favor of any particular recommended course of therapy.

A precise diagnosis based on an intensive interview, physical and neurological examinations, and a radiological examination provide a good basis for consultation in which the patient, along with parents as necessary, can be informed by the treating physician about the diagnosis of "scoliosis," its progression, pertinent risks and therapeutic strategies based on conservative or surgical approaches.

Treatment strategy requires a differentiated approach. A given curve angle for a scoliosis is not sufficient to determine when surgery should be performed. Congenital scoliosis due to a vertebral body anomaly or neuromuscular scoliosis both require an entirely different sort of therapeutic management than an idiopathic scoliosis. The patients in these two groups exhibit different pathogenesis and risks of progression in the development and worsening of the scoliotic malposition, which is why the existing primary diseases with congenital and neuromuscular scolioses frequently require very early surgery in small children.

Treatment of scoliosis is composed of three elements:

- Physiotherapy
- Brace therapy
- Surgical correction of the deformity

### Physiotherapy

Depending on the specific findings, use of targeted physiotherapeutic measures under professional supervision is a central element in conservative treatment.

- Katharina Schroth method of three-dimensional scoliosis treatment

The Katharina Schroth method of three-dimensional scoliosis treatment is a highly complex physiotherapeutic technique that can be very helpful if practiced intensively and regularly under appropriate supervision.

- The Vojta treatment concept

Vojta developed a movement development model that includes an individual pattern of movement for each person that ensures spatial posture and makes an upright stance and targeted movement possible, and differentiates the different muscle functions within the muscle chains. The spinal column is at the center of these functions, which are automatic and involuntary in nature. Patterns of movement can be activated reflectively, thus influencing the spinal column in three dimensions.

- E-technique (Hanke concept)

This is a neurophysiologic method of treatment that was developed based on the Vojta concept. It helps improve pathological movement and postural patterns.

When combined with special breathing techniques, these therapeutic approaches can help patients stabilize their spinal columns and learn new patterns of posture and movement. As with all supportive conservative treatment, success depends on professional supervision and the successful integration of the exercises as a regular part of everyday life.

## Brace therapy

The earliest descriptions of a brace, or corset, therapy for scoliosis go back to Hippocrates, and the French army surgeon Ambroise Paré (1510-1590) developed a supporting device made of iron plates in the Middle Ages.

Since the Milwaukee brace was developed by Blount in 1945, a variety of further developments and modifications of corsets have become an established element of conservative scoliosis therapy. The objective of brace therapy is to prevent the further progression of the spinal column curvature and to straighten an existing pathological curvature to some degree.

Scoliosis therapy using a brace or corset worn for a longer period of time is a heavy burden, both mental and physical, to place on a growing young person, who has to deal with it on a day-to-day basis. Successful therapy in such cases depends on intensive supervision and support from both parents and therapists.

Brace therapy can only succeed if the following factors are considered:

- Location and degree of scoliosis
- Skeletal age
- Selection of the correct brace
- Correct brace structure
- Inspection at regular intervals so adjustments can be made
- The patient must understand the situation and be willing to cooperate completely
- Intensive, comprehensive support by family and therapists

Back brace therapy for scoliosis has been controversial for a number of years. The international recommendations are not uniform.

A decision to use a back brace is often questionable since the effectiveness of this treatment is far from proven. What can be stated as a general proven truth is that a highly progressive (worsening) scoliosis cannot ultimately be influenced by a back brace at all!

The different brace types are described below.

## Milwaukee brace

The Milwaukee brace was developed in 1945 by Blount in the US. It consists of a molded plastic pelvic girdle connected by aluminum bars in the front and back to a closed neck ring. The neck ring closes at the back with a screw where the support pad for the back of the head is located. There is a padded hollow for the chin to rest in at the front. Spinal malposition is corrected by the insertion of additional pressure pads.

The brace is supposed to result in active extension, derotation, and lordosis adjustment. Milwaukee back brace treatment is accompanied by special physiotherapeutic exercises performed in the brace.

The drawbacks of the brace include a pronounced lordotic effect on the thoracic spine and discomfort due to the neck ring.

Today, the Milwaukee brace is normally used only to treat upper thoracic scoliosis.

## Underarm braces (TLSO = thoraco-lumbo-sacral orthosis)

Underarm braces have no neck ring and are the successor to the Milwaukee brace. In TLSOs, built-in pads exert pressure on the spinal column at three points to apply the corrective force necessary to improve the malposition of the spinal column. These so-called three-point corsets are fitted with pressure pads along the lumbar spine, around the outer pelvis and along the ribcage.

The Boston, Chêneau and Lyon (Stagnara) derotation braces are examples of this type of orthosis.

### **Boston brace**

The Boston brace is a further development of the Milwaukee brace.

The brace is made of plastic molded using a plaster cast. Integrated pads are intended to achieve a partially active correction of the spinal column malposition

The first Boston brace models featured pronounced delordosing of the lumbar spine, though this proved to be disadvantageous. The brace's modular structure has allowed for the development of a number of variations of the Boston brace with lumbar lordosis up to a Cobb angle of 15°. This is a decisive feature when it comes to correcting a malposition, since the only way to achieve kyphosis of the thoracic and thoracolumbar spine is through physiological lumbar lordosis. The combined effect of the modules and integrated pressure pads are intended to both straighten and derotate the spinal column.

The Boston brace is normally used in the treatment of lumbar and thoracolumbar scoliosis.

### **Chêneau brace**

The Chêneau brace was developed in the mid-seventies by the French physician Jacques Chêneau.

The orthosis is made of plastic molded using a plaster cast, featuring a pelvic corset that pushes the pelvis into an upright position and allows for traction to stretch the lumbar spine.

The Chêneau brace is a partially active inspiration-derotation brace, i.e. correction of the existing spinal malposition is achieved through pad pressure, the voids in the orthosis serve as compensatory spaces, and a special respiratory technique is learned as a part of this treatment method. The Chêneau brace is normally used for the conservative treatment of idiopathic thoracic scoliosis.

### **Lyon or Stagnara brace**

This brace provides high shoulder support for torso extension, i.e. its upper structure reaches up high beneath the shoulders to provide support. The pelvic girdle and auxiliary supports are connected in the front and back by aluminum rods. The integrated pressure pads are used to achieve derotation.

The Stagnara brace can be used in treatment of thoracolumbar and mid-level thoracic scoliosis.

### **Wilmington brace**

This brace is made of thermoplastic material and is mainly used in thoracolumbar scolioses without a fixed rotary pivot of the spinal column.

### **Charleston bending brace**

This is a bending, or sidebending, brace. In contrast to the orthoses described above, here a bending force acts upon the spinal column malposition. When wearing the brace, the patient is held in a maximum counterlateral bend, i.e. countering the malcurvature to be treated. An integrated pressure pad exerts pressure at the apex of the curvature, thus achieving a rebending effect on the scoliotic deformity. The brace is intended to be worn for 8 hours during the night and is used for treatment of short thoracolumbar or lumbar scoliosis.

### **Lukeschitsch bending brace**

A pressure pad in the pelvic girdle of this brace design exerts pressure on the lumbar vertex of the scoliotic malcurvature. Pressure pads can be continuously positioned and adjusted along the front and back aluminum rods of the brace. These pressure pads serve to derotate and straighten the spinal column.

### Surgical therapy

Surgical correction of a scoliosis is a form of major spinal column surgery which, as is the case with major surgery in general, can result in complications. For this reason, the indication for surgery must meet the following criteria:

- Progression (increasing) of curve angle
- Unfavorable sagittal profile
- Pain

The following criteria should be considered when selecting a surgical technique:

- Flexibility of the major curve
- Flexibility of the secondary curves
- Sagittal profile
- Determination of the terminal vertebra for instrumentation
- Stable zone

A number of approaches and methods are available for the surgical therapy of scoliosis with which the curvature and rotation of a scoliotic deformity can be corrected and stabilized:

- Dorsal techniques with access from the back
- Ventral techniques with access from the front
- Combined dorsal and ventral techniques.

For further information on surgical therapy for the different forms of scoliosis and selected surgical methods used in our department to treat scoliosis, see the chapters on “idiopathic scoliosis”, “congenital scoliosis” and “neuromuscular scoliosis.”