

### Orthopedic technology, 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:

- 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.

The decision to use a back brace is often questionable since the efficiency of this treatment is far from proven. In contrast, it has been conclusively proven that a highly progressive (worsening) scoliosis cannot ultimately be influenced by a back brace at all!

See the "Deformities, scoliosis" chapter for the therapeutic objectives for scoliosis therapy set by our department.

Below are brief descriptions of the different types of back braces available.

#### The Milwaukee brace (CTLSO = cervico-thoraco-lumbo-sacral orthosis)

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 scolioses.

### **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 scolioses.

### **Wilmington brace**

This brace is made of thermoplastic material and is mainly used for 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 scolioses.

**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.