

Bracing for Scoliosis

The main goal of a brace in scoliosis is to prevent further deformity, as well as to prevent or delay the need for surgery. If surgery is needed, delaying the procedure as long as possible helps to optimize spinal height and avoid stunting of truncal growth.

Assessing the degree of skeletal maturity in a child with scoliosis is important; with more advanced skeletal maturity, a reduction in skeletal growth and, consequently, a reduction in the progression of the scoliosis would be expected. This has obvious implications when forming a treatment plan.

Risser classification of ossification of the iliac epiphysis is used to evaluate skeletal immaturity. Ossification of the iliac crest occurs from the anterior superior iliac spine (ASIS) to the posterior superior iliac spine (PSIS). When ossification is complete, fusion of the epiphysis occurs to the iliac crest. Risser staging is based on the use of radiographs to determine what percentage of the excursion (along the length of the iliac epiphysis) has ossified. A Risser score of 0-I with a curve of 20-30° indicates a nearly 70% chance of progression.

Risser stages are defined as follows:

- Stage 0 - 0% excursion
- Stage I - 25% excursion
- Stage II - 50% excursion
- Stage III - 75% excursion
- Stage IV - 100% excursion; correlates with the end of spinal growth
- Stage V - Fusion to the ilium, indicating the cessation of vertical height growth

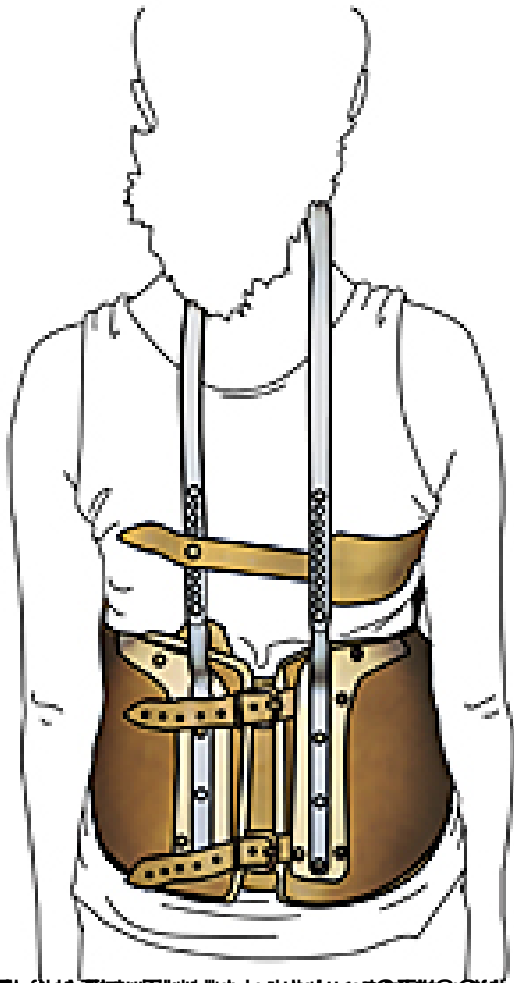
The clinician must take into account several bits of clinical information about the use of braces in scoliosis, including the following:

- Only 3% of patients with prebrace curves of 20-29° require surgery, whereas 28% of patients with prebrace curves of 40-49° require surgery.
- Patients younger than 13 years with a 30-39° curvature require surgery 25% of the time, while surgery is needed in only 14% of patients who are older than 14 years and have a 30-39° curvature.
- The most common time to lose control of idiopathic curves is at puberty. Boys tend to show less curve progression than do girls. Boys also tend to have a later onset of curve progression (between 15 and 18 years).
- Younger patients show greater initial in-brace correction. Curve correction with bracing that is greater than 50% is expected to have a final net correction, whereas curve correction of less than 50% is expected to have limited progression.
- Generally, curves between T8-L2 have the best response to correction. Young patients with large curves usually fail treatment with a brace.
- Patients whose curve initially measures 20-45° and who successfully complete treatment for idiopathic scoliosis using a TLSO can anticipate that their scoliosis will remain stable until adulthood. The correction of the curvature can be lost over time, with the curve returning to its initial magnitude. Therefore, obtaining a spinal radiograph in the third or fourth decade of life to check progression is reasonable.

Milwaukee brace

The Milwaukee Brace is commonly used for high thoracic (mid-back) curves. It extends from the neck to the pelvis and consists of a specially contoured plastic pelvic girdle and a neck ring connected by metal bars in the front and the back of the brace. The metal bars help extend the length of the torso and the neck ring keeps the head centered over the pelvis. Pressure pads, strategically placed according to the patient's curve pattern, are attached to the metal bars with straps.

The Milwaukee Brace was the first modern brace designed for the treatment of scoliosis. Developed by Drs. Walter Blount and Albert Schmidt of the Medical College of Wisconsin and Milwaukee's Children's Hospital in 1945, its design has been tweaked through the years until reaching its current design around 1975. Today, the brace is used less frequently now that more form-fitting plastic braces have been developed; however, it's still prescribed for some types of curves that are located very high in the spine.

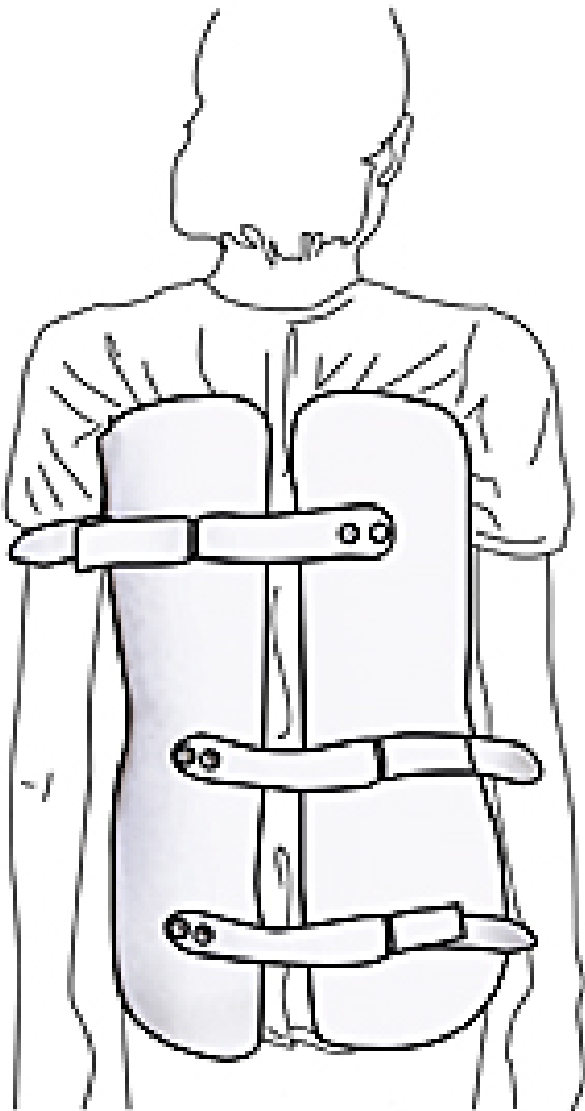


Boston brace

There are a variety of TLSO braces, but the one most commonly used to treat scoliosis is the "Boston Brace." TLSO braces are often called "low-profile" or "underarm" braces. They are not as large or bulky as the Milwaukee Brace (see below), and their plastic components are custom-molded to fit the patient's body.

The Boston Brace extends from below the breast to the beginning of the pelvic area in the front and from below the shoulder blades to the tail bone in the back. This type of brace works by applying three-point pressure to the curve to prevent its progression. It forces the lumbar area to flex, which pushes in the abdomen and flattens the posterior lumbar curve. Strategically placed pads place pressure on the curve, and "relief voids" are located opposite the areas of pressure.

Developed in the early 1970s by Dr. John Hall and Mr. William Miller of The Boston Children's Hospital, the Boston Brace is typically prescribed for curves in the lumbar (low-back) or thoraco-lumbar (mid- to low-back) sections of the spine.



The Boston brace is a prefabricated, symmetric, thoracolumbar-pelvic mold with built-in lumbar flexion, that can be worn under clothes. Lumbar flexion is achieved through posterior flattening of the brace and extension of the mold distally to the buttock. Braces with superstructures have a curve apex above T7. Curves with an apex at or below T7 do not require superstructures to immobilize cervical spine movement. Unlike the Milwaukee brace, the Boston brace cannot be adjusted if the patient grows in height. Both braces need to be

changed if pelvic size increases. The average cost of the Boston brace is approximately \$2000.

Indications for the use of a Boston brace include the following:

- A curve of 20-25° with 10° progression over 1 year
- A curve of 25-30° with 5° progression over 1 year
- Skeletally immature patients with a curve of 30° or greater

Problems that are associated with the use of a Boston brace include the following:

- Local discomfort¹
- Hip flexion contracture
- Trunk weakness
- Increased abdominal pressure
- Skin breakdown
- Accentuation of hypokyphosis in the thoracic spine, above the brace

Certain preventive measures can reduce difficulties that are associated with the use of a Boston brace, including the following:

- A regimen of hip stretches decreases contractures at the hip.
- Exercise to promote active correction in the brace is suggested.

The presence of thoracic hypokyphosis is a relative contraindication for the use of a Boston brace.

Failure of the Boston brace to correct deformity can occur because of several factors, including the following:

- Curve above T7
- Improper fit

- Poor patient compliance

The Boston brace's duration of use is determined by several factors, including the following:

- Daily use ranges from 16-23 hours per day.
- Treatment should continue until the patient is at Risser stage IV or V.
- If the curve is greater than 30° , consider continued use for 1-2 years after maturity, because these curves are at risk of progression.
- The Boston brace is as effective without the superstructure as it is with the superstructure in the treatment of curves in which the apex is below T7. ¹⁵

Clinical information that is relevant to the use of the Boston brace includes the following:

- Use of a Boston brace is a more effective means of preventing curve progression and avoiding surgery than is the use of a Charleston bending brace.
- One study looked at skeletally immature patients with idiopathic scoliosis who were at least age 10 years when a brace was prescribed. In members of this group who had a curve of $36-45^\circ$, nearly 43% who used the Boston brace experienced a curve progression of more than 5° , compared with 83% of those using the Charleston bending brace. ¹⁶
- The use of a Charleston bending brace is indicated only with lumbar or small thoracolumbar curves; avoid use in thoracic curves.
- Radiographs used to evaluate scoliosis in the Boston brace are taken with the patient in a standing position.
- Successful outcomes with brace treatment show an in-brace curve reduction of greater than 50%.

Charleston bending brace

Developed in 1979 by Dr. Frederick Reed and Ralph Hooper, the Charleston Bending Brace is worn only at night, which is why it's also known as a "part-time" brace

The Charleston Bending Brace is molded to conform to the patient's body while he or she is bent towards the convexity—or outward bulge—of the curve, the concept behind this design being that it "over-corrects" the curve during the eight hours the brace is worn.

The Charleston brace is typically recommended for spinal curves of 20-35 degrees, with the apex of the curve below the level of the shoulder blade.

Other braces your doctor may recommend include:

- The **Providence Brace**, a computer-fitted brace worn only at night.
- A bracing method called **SpineCor**, which uses adjustable bands and a cotton vest that allows flexibility.
- The **Wilmington Brace (TLSO)**, a total-contact orthosis typically fabricated from a lightweight plastic material called Orthoplast. The brace is designed as a "body jacket," with a front closure and adjustable Velcro straps.



The Charleston bending brace is a rigid, custom-made orthosis that is designed to improve patient compliance by correcting scoliosis at nighttime.¹⁷ This brace holds the patient in maximum side-bending correction. The Charleston bending brace costs approximately \$2000.

Indications for the use of this particular brace include the following:

- A curve of 20-25° with 10° progression over 1 year
- A curve of 25-30° with 5° progression over 1 year
- Skeletally immature patients with a curve of 30° or greater

Clinical information regarding the use of the Charleston bending brace includes the following:

- The Charleston bending brace is significantly less effective than the Boston brace in the treatment of double major curves and single thoracic curves in patients with Risser stage 0-I.
- Over 50% of patients with a single thoracic curve who were treated with a Charleston bending brace required surgery, compared with 24% of patients who were treated with a Boston brace.
- As a result, the Charleston bending brace is not recommended for use in thoracic curves.
- The Charleston bending brace is less effective in the treatment of single thoracolumbar or lumbar curves, but the figures are not statistically significant compared with those for the Boston brace.¹⁶
- Radiographs that are used to evaluate scoliosis with the Charleston bending brace are performed with the patient in a supine position, because the patient wears the brace while sleeping supine.
- Successful outcomes with brace treatment show an in-brace curve reduction greater than 50%.

reference: http://www.iscoliosis.com/articles-brace_types.html