THE CHARLESTON BENDING BRACE

NIGHTTIME MANAGEMENT OF ADOLESCENT IDIOPATHIC SCOLIOSIS

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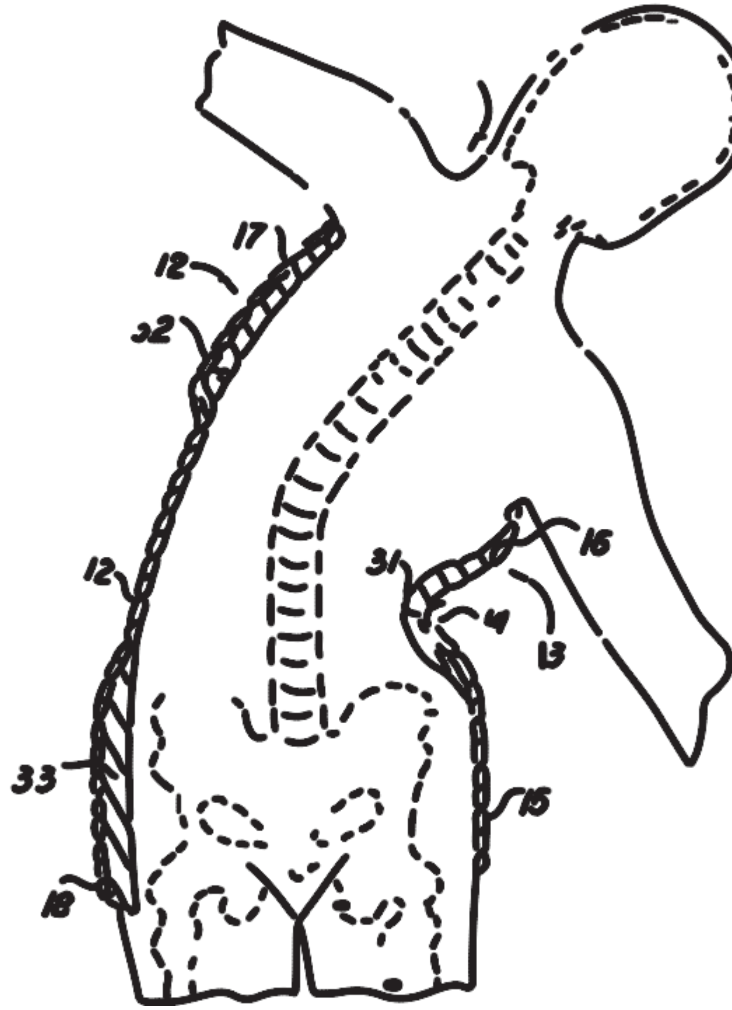

United States Patent [19]

Hooper, Jr. et al.

[54] **ORTHOPEDIC APPLIANCE**

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[52] **U.S. Cl.** **128/78**; 2/44
[58] **Field of Search** 128/78, 75, 69; 2/44

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THE CHARLESTON BENDING BRACE

AN ORTHOTIST'S GUIDE TO SCOLIOSIS MANAGEMENT

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The History of Sidebending: A Scoliosis Treatment

Nonoperative treatment of scoliosis has a long and diverse history. The method of sidebending as an orthotic treatment, while having such a lengthy past, has been a durable technique that remains in use today.

The Kalibis splint, also called the "spiral bandage", was one of the earliest reported orthosis for scoliosis treatment found in the medical literature. Several braces designed in the nineteenth century by German orthotists Heine, Hessing, and Hoffa bear remarkable similarities to later designs by Barr-Buschenfeldt. Probably the most successful and widely accepted sidebending device was the Risser turnbuckle cast, reported in the United States in 1931 by Hibbs, Risser and Ferguson. During the 1970s Lawrence Brown, M.D., of Greenville, South Carolina, utilized a bending brace in a full-time wear program. (*Fig. 1*)

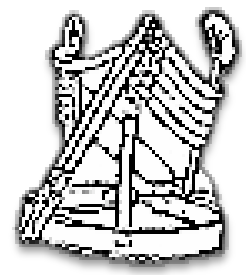


Fig.1

> Sidebending orthosis are found throughout historical medical literature, bearing out the fact that, while subject to hardware development, the method of sidebending is an effective technique for scoliosis treatment.... a technique with a past, as well as a future.

The Charleston Bending Brace

Early Development of the Charleston Bending Brace

Ralph Hooper, C.P.O. and Frederick Reed, M.D. of Charleston, South Carolina, collaborated on the early development of a new sidebending orthosis for nocturnal wear. This new brace was first fabricated in 1978 in Charleston for treatment of idiopathic adolescent scoliosis. Originally, the new orthosis was used to treat patients in which other types of orthotic management had failed; patients who continued to show progressive curvatures, but whose skeletal maturity obviated full-time bracewear, and patients who had refused other treatment options. In these cases, time-modified bracewear seemed preferable to complete non-compliance, for obvious reasons.

In 1984 an investigational team was formed to study lateral bending time-modified bracewear. Team members included: Frederick Reed, M.D. of Charleston, South Carolina; Ralph Hooper, Jr. of Winter Park, Florida; Max F. Riddick, M.D. of Winter Park, Florida; and Charles T. Price, M.D. of Orlando, Florida.

Since 1984, there have been over 25 research articles published regarding the results of patients using the Charleston Bending Brace (CBB) for the treatment of adolescent idiopathic scoliosis. Dr. Charles T. Price continues to be the lead investigator and research physician for scientific studies related to CBB.

The Charleston Bending Brace Objectives

The goals of the Charleston Bending Brace program are to maintain the patient's scoliotic curvatures at, or near, pre-brace values throughout the growth period and on to skeletal maturity. Our goals are to promote better brace wear compliance through the nocturnal wear. This component alone may reduce patient and family conflict, while helping to eliminate negative self-image problems associated with brace wear in adolescents.

The Advantages of the CBB Program

There are several distinct advantages to the Charleston Bending Brace program, nearly all of which are related to the nightwear component:

1. Allows full, unrestricted musculoskeletal development.
2. Allows opportunity for athletic participation, if desired.
3. Improved patient compliance.
4. Results can be assessed without the customary long-term follow-up.

Sidebending Theory

In theory, bending of the spinal column should add tensile and opposite compression forces to the vertebral epiphyses compared with forces at work in the upright posture. The benefits of uncompromised postural muscle tone during upright activities and the opportunity for the patient to remain at hletically active during their brace course may enhance the phenomenon of spontaneous curve correction that occurs on a day-to-night basis.

All Bracing systems depend on the nocturnal wear component as part of their programs. There are no harmful physiological, biomechanical, or clinical effects noted in the nocturnal wear program. With documented successful outcomes, the positive aspects of the Charleston Bending Brace system are evident even if the reasons for a success are not entirely clear.

Guidelines for Use

Single curves are the easiest curves to treat with sidebending because inadvertently increasing a second ary curve through bracing is not a concern. The single curve can be aggressively reduced in the CBB. Patients with single curves are considered the best candidates for treatment with the greatest likelihood of positive outcomes.

Treating double curves with the CBB is considered an advanced technique. Double curves respond well when treated correctly but a high level of expertise and care are required in the molding and fitting processes. It is important to designate the primary and secondary curves beforehand when bracing double curves in the CBB. The primary curve is always the curve that is unbent.

Curvatures of 25 degrees to 40 degrees fall within standard orthotic treatment guidelines. There are no contraindications recognized for treating curves outside these parameters due to the high level of patient acceptance of the CBB program and many documented successful courses.

Concurrently, standard orthotic management of scoliosis calls for treatment of only skeletally immature curves. Some skeletally mature patients have benefited from CBB treatment. This is also reflected in the reporting.

Clinical Examination

A clinical examination is always conducted by the orthotist prior to the measuring session. Patient flexibility can be assessed and a reasonable prediction of in-brace results may be determined from the clinical exam. This is also a good time to gauge the patient’s tolerance level and take appropriate action to alleviate fears and anxieties in order to help the procedure go smoothly.

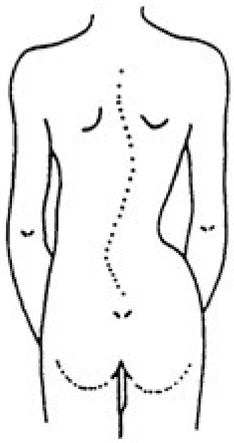


Fig. 2a

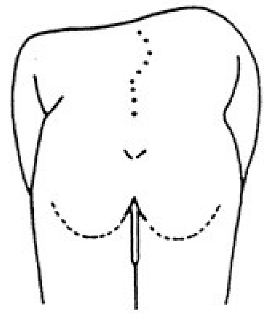


Fig. 2b

Forward Bending–Have the patient stand facing away from you with weight equally distributed on both feet. (Fig.2a)

With arms extended and palms together, bend the patient forward to 90 degrees and stop. (Fig.2b)

Ask the patient to try and touch the floor to evaluate hamstring tightness. Observe and note trunk rotation limitations.

Testing for relative flexibility or stiffness– Have the patient stand upright and then bend laterally at the waist. (Fig. 3a)

Note how much range the patient has.

Next, place your hand at the apex of the curvature and apply a resistive force. Ask the patient to bend laterally over your hand. (Fig. 3b)

Note how much range the patient has.

Fig. 3a

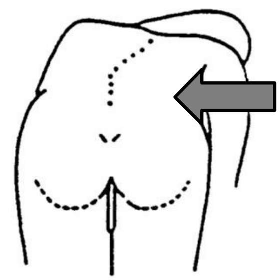


Fig. 3b

Radiography

Full-length standing PA X-rays are necessary for the patient evaluation and brace planning. Films should include the full spine and the iliac crests. Bending films are helpful for evaluation but are not necessary for brace "blueprinting". X-rays should be carefully marked "left" or "right", by the technician. All in-brace x-rays should be taken in the supine position. If indicated, it should be explained to parents that modern X-ray techniques limit exposure through advanced equipment, special grids and high-speed film. Digital X-Rays are preferred.

"Blueprinting"

The "blueprint" is an essential resource for the orthotist during the CBB molding and fabrication processes. This process determines where the optimal corrective forces should be applied both during the molding and at brace application.

Center Line—the center line is a vertical drawn on the X-ray indicating where the patient's spine would be if it were straight and free from scoliosis.

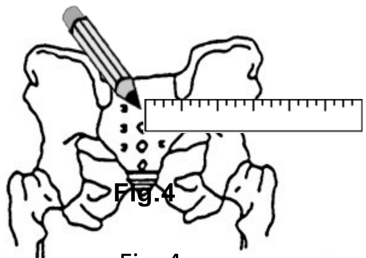


Fig. 4

Sacrum visible Locate and mark a spot at the center of S-2.With a straight edge, measure the distance from the mark to the edge of the X--ray. (Fig. 4)

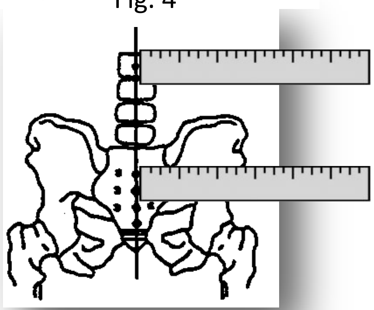


Fig.5

Center Line·

·At a point several inches above S-2, make a second mark that same distance from the edge of the X-ray as the first mark. Draw a vertical line through the marks. This line is the center line (Fig. 5).

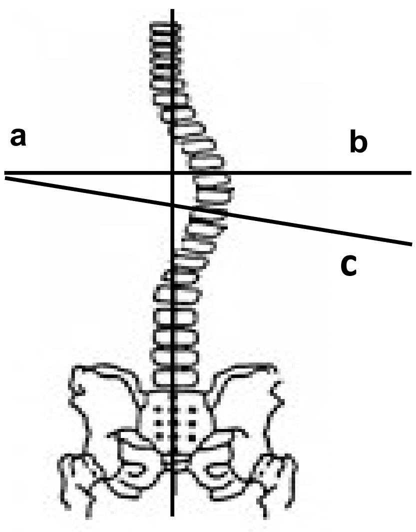


Fig.6

Vertebral Tilt Angle—The vertebral tiltangle*(Fig.6a)* is formed by the intersection of a line perpendicular to the center line *(Fig. 6b)* and a line drawn across the inferior endplate of a selected vertebral body. *(Fig. 6c)* The vertebral tilt angle is useful in determining the limits of each scoliotic curve and to properly measure the Cobb Angle.

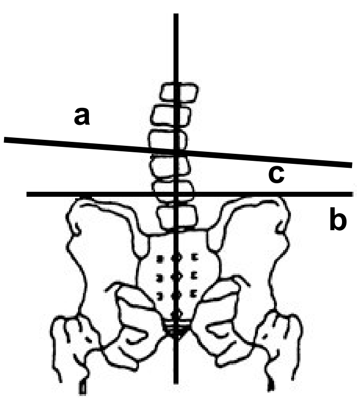


Fig. 7

Pelvic Tilt Angle—The pelvic tilt angle is formed by the intersection of a line drawn perpendicular to the center line *(Fig.7a)* and a line across the superior edge of the iliac crests. *(Fig. 7b)* The angle formed by the intersection of the two lines is the pelvic tilt angle. *(fig. 7c)* The line perpendicular to the center line may be “lowered” until an angle is formed.

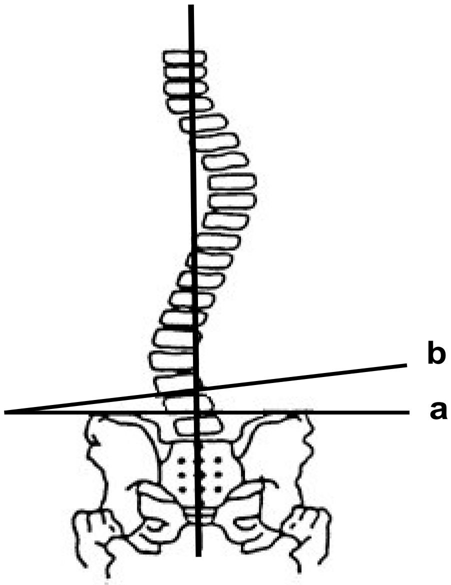


Fig.8

Lumbar/Pelvic Relationship Angle *(LPR)*—
The LPR is the angle formed by the intersection of the pelvic tilt line *(Fig. 8a)* and the vertebral tilt line of L-3, L-4, or L-5 individually *(Fig.8b)*.

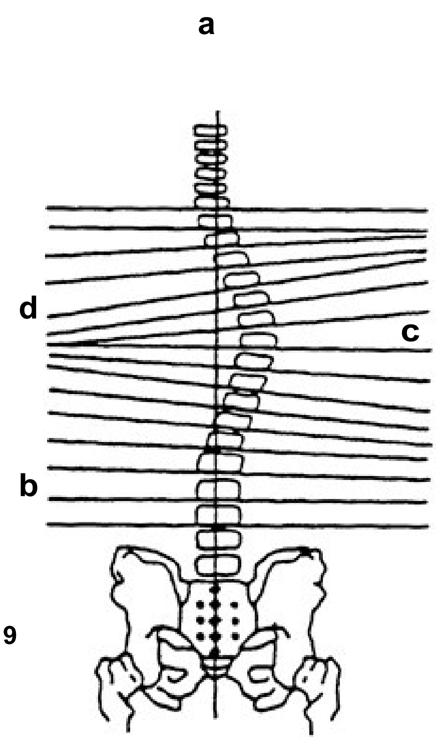


Fig. 9

Curve Limits

1. Locate and draw a center line on the X-ray *(Fig.9a)*.
2. Draw a vertebral tilt line for each vertebra *(Fig. 9b).*
3. Find the null point by locating a vertebral tilt line, which is perpendicular to the center line. If no vertebral tilt lines are perpendicular to the center line, draw a line perpendicular to the center line, which lies equidistant between the two most nearly perpendicular lines. This line will represent the null point (*Fig. 9c).*

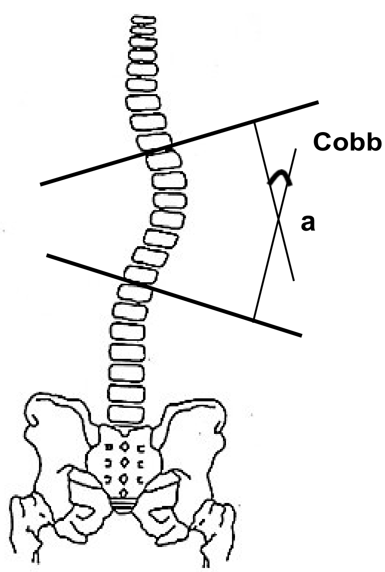


Fig.10

4. Begin at the null point and measure the vertebral tilt angles of each successive superior vertebra. As long as the angle increases, the vertebral body is included in the curve. The first vertebra with a less er tilt angle is not included in the curve. To locate the most inferior vertebra in the curve, follow the same procedure and travel in the inferior mode.
5. After locating the superior and inferior vertebral bodies inthe curve, draw a line across the superior endplate of the superior vertebra and another line across the inferior endplate of the most inferior vertebra. *(Fig.10)*

Definitions of Terms

Lateral Shift Force: Laterally directed force with 10 degrees to 15 degrees of angulations from the perpendicular, applied to the apex of the primary curve. Lateral shift force must be sufficient to move the spine beyond the center line to a point which is equidistant to, and opposite, the original position and to maintain this position during unbending. This force is the single most important force in the curve correction process and should never be compromised. *(Fig. 11)*

Stabilizing Force: Force applied opposite to the lateral shift force at the trochanter or the apex of a lumbar curve. The intensity of the stabilizing force is dictated by the strength of the lateral shift force. *(Fig.11)*

Unbending Force: The unbending force is the final force applied and is the main curve reducing fo rce. Pressure is applied at the axillary region opposite the curve's apex. *(Fig. 11)* apex of a lumbar curve, shift force is added at the apex of the thoracic curve, and unbending force is exerted at the axilla opposite the apex of the thoracic curve. The secondary unbend is made at the trochanteric region opposite the stabilizing force as an additional corrective measure. *(Fig. 11)*

Secondary Unbending Force: An advanced technique in which stabilizing force is applied at the apex of the thoracic curve, and bending force is exerted at the axilla opposite of the apex of the thoracic curve. The secondary bend is made at the throcanteric region opposite the stabilizing force as an additional correction measure. (Fig. 18)

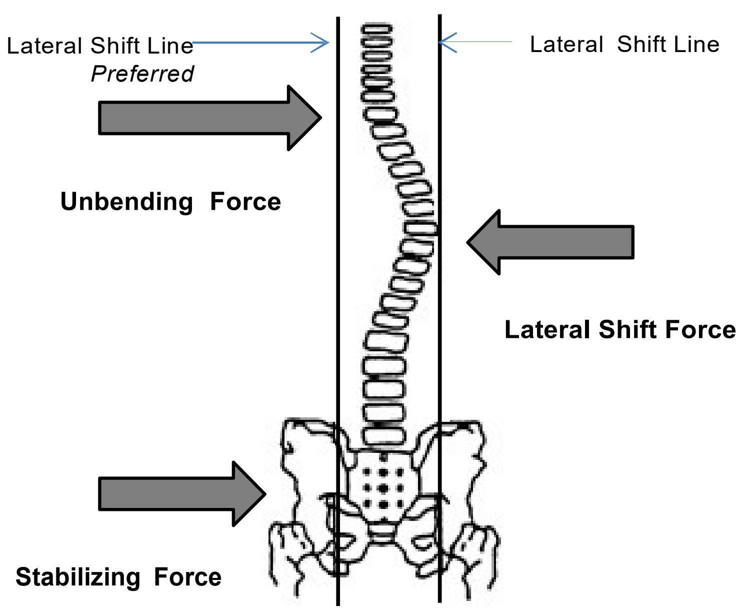


Fig.11

Maxims forCurveCorrectionTechnique: Effective scoliosis management with the Charleston Bending Brace calls for careful, consistent curve reduction technique. Several keys to proper curve nomenclature and control should become part of the orthotist's basic knowledge. (Confidence in and use of these maxims will enable the orthotist to produce an accurate mold with relative ease, thereby ensuringasatisfactoryresult).

Classification

King's Classification of Scoliotic Curvature was originally developed as a pre-operative technique for selection of spinal fusion segments in scoliotic surgical patients. Now, King's Classification is an integral part of the Charleston Bending Brace system, but for a different purpose.

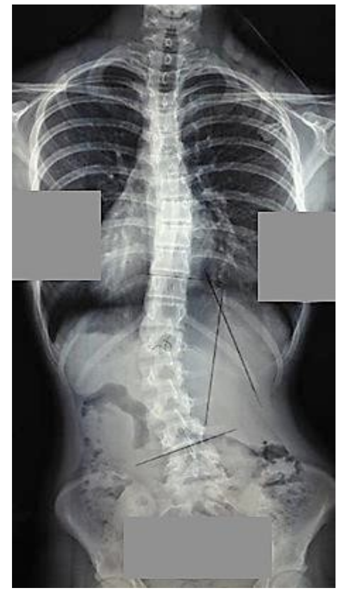
The use of the original King's Classification allows practitioners a standard nomenclature for curve identification. With this common terminology, instruction and feedback are effectively passed between orthopedist and orthotist. This Classification refers to five categories of scoliotic curvatures, with each having a distinct appearance and form. The requisites for each category are easy to learn and use, even if the practitioner has been accustomed to another arrangement.

CURVE PATTERNS		
Type I	Lumbar Primary Curve	S-shaped curve in which both thoracic and lumbar curves cross midline. Lumbar curve is larger than the thoracic curve on standing film.
Type II	Thoracic Primary Curve	S-shaped curve in which thoracic and lumbar curve cross midline. Thoracic curve is larger than lumbar curve.
Type III	Single Thoracic Curve	Thoracic curve in which the lumbar curve does not cross midline (also called overhang.)
Type IV	Single Thoracolumbar/Lumbar Curve	Long thoracic curve in which L5 is centered over sacrum but L4 fits into long thoracic curve.
Type V	Double Thoracic	Double thoracic curve with T1 tilted into concavity of upper curve. Upper curve structural onside-bending.

CBB Type I

Type I –*Lumbar Primary*-curvatures are "S"-shaped curves. Both the thoracic and lumbar components cross the horizontal midline. On standing X-ray, the lumbar curve is larger than the thoracic curve. Even though the lumbar curve is greater in magnitude, the thoracic curve is more flexible. These double curves are treated as lumbar curves. *(Fig.12)*

TYPE I



Lumbar Primary Curve
'S' Shaped L+T cross Midline
Fig.12

Location of Applied Forces I

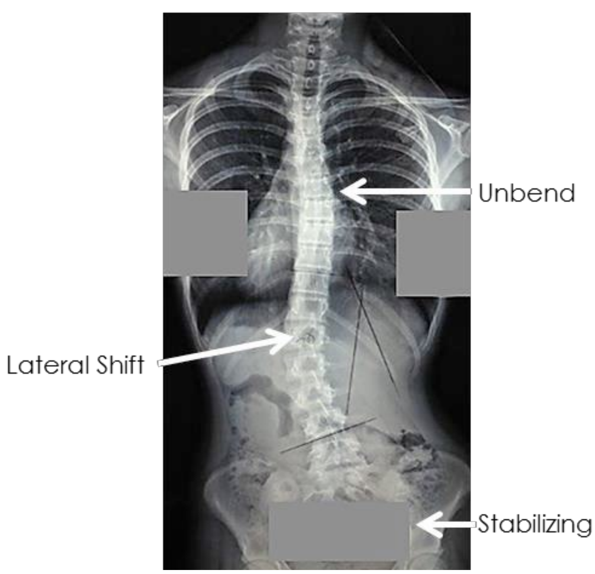


Fig.13

Applied Forces: Measure the Lumbar/Pelvic Relationship Angle of L-3, L-4, and L-5. If any of these individually are greater than 15 degrees, elevate the pelvis on the concave side of the lumbar curve, this will align the lumbar column properly. *(Fig. 13)* Apply stabilizing force to the trochanter opposite the apex of the lumbar curve.

Correct Positioning: Add lateral shift force to the apex of the lumbar curve with sufficient force to move the spine beyond the midline to a point equidistant to, but opposite, the point of origin. Apply the unbending force to the axillaries region opposite the apex of the lumbar curve. Do not overcorrect the unbending force as this can compromise the lateral shift force. At brace fitting, trim the brace to the apex of the thoracic compensatory curve or to a point slightly above it this will minimize the effect of the thoracic curve. *(Fig. 14)*

Corrected Position I

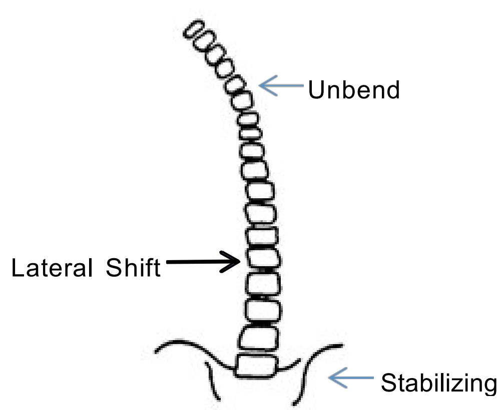


Fig. 14

CBB Type II

Type II --*Thoracic Primary*--curvatures are also “S”--shaped. Again, both the thoracic and lumbar components cross the horizontal midline. The thoracic segment measures greater than or equal to the lumbar portion but the thoracic curve is more flexible. Stabilizing the lumbar curve and unbending the thoracic segment best treat these curves. (*Fig. 15)*

TYPE II

Fig.15 **Thoracic Primary Curve**
‘S’ Shaped L+T cross Midline

Location of Applied Forces II

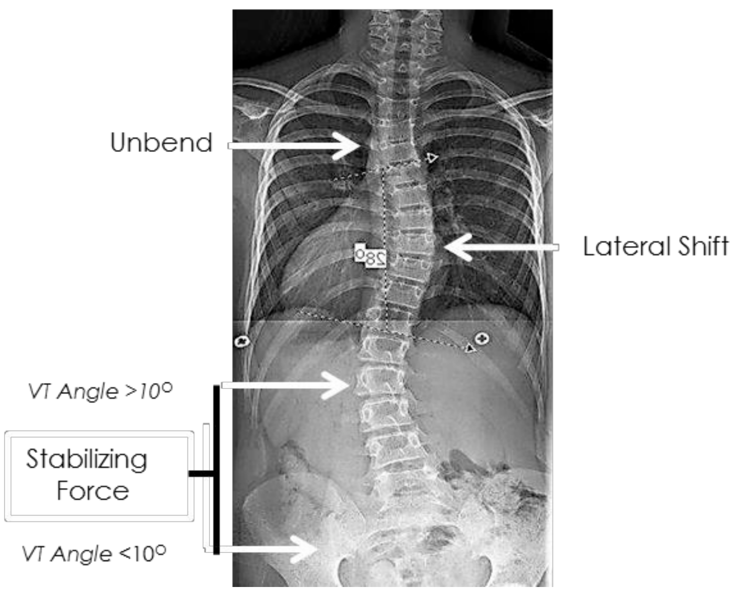


Fig.16

Applied Forces: Measure the vertebral tilt angle of L-3, L-4, and L-5. If the VTA of any of these three, individually is greater than 10 degrees, then apply the stabilizing force at the apex of the Lumbar curve. If the of any of the vertebra measures less than 10 degrees, apply the stabilizing force at the trochanter.

Measure the lumbar pelvic relationship (LPR) angle of L-3, L-4, and L-5. If any of these angles individually measures greater than 15 degrees, elevate the pelvis on the concave side of the Lumbar Curve.

Apply a lateral shift force at the apex of the Thoracic curve and shift beyond the midline as much as possible (applying substantial pressure).

Corrected Position: Apply an unbending force in the axilla region but be careful not to compromise or overpower the lateral shift force.

If the LPR angle of L-3, L-4, or L-5 is greater than 10 degrees, then apply a secondary unbending force at the trochanter opposite the stabilizing force. This secondary unbending force is the last force applied and is a laterally directed force. *(Fig. 17)*

Corrected Position II

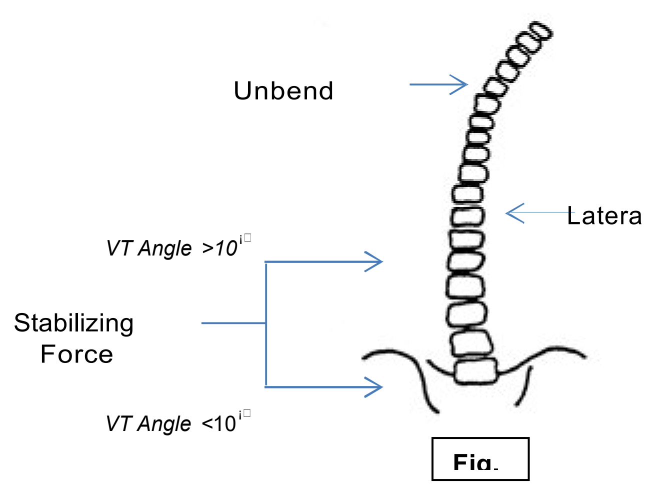


Fig.17

Secondary Unbending Force: (Advanced technique)

Applied Force: in which a stabilizing force is applied at the apex of the thoracic curve, and bending force is exerted at the axilla opposite of the apex of the thoracic curve. The **secondary unbend is made at the trocanteric region opposite the stabilizing force** as an additional correction measure. (Fig. 18)

Location of Applied Forces II

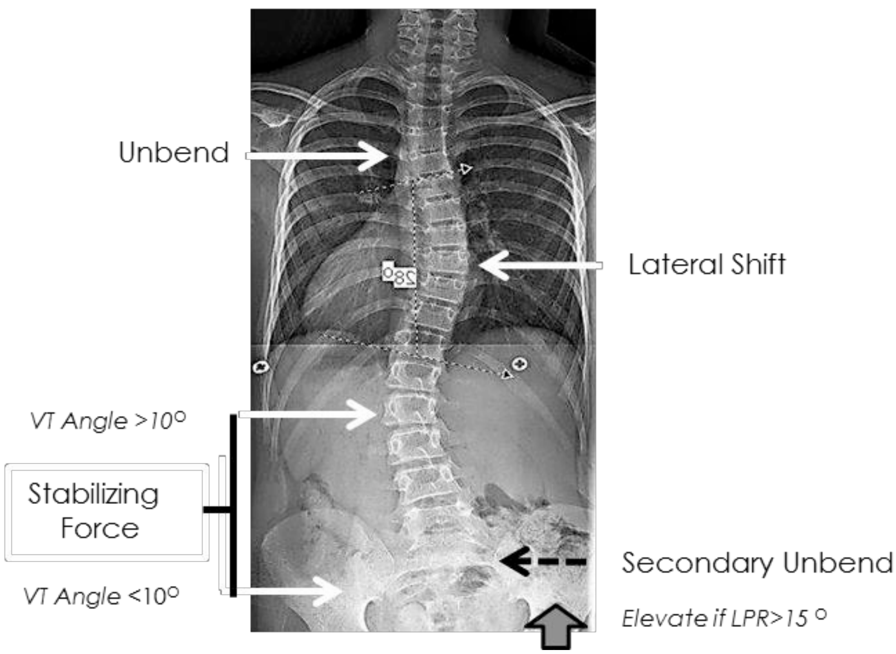


Fig.18

The **in-brace thoracic curve should be corrected to 100% and the lumbar curve to 50%** in-brace x-ray

If the thoracic and lumbar curves are at 20 degrees or **less** and within 5 degrees of each other, treating a Type I-Lumbar Primary as a Type II-Thoracic Primaryis appropriate.

If the thoracic is 27 degrees or greater trim the unbend to the thoracic apex;; under 27 degrees, leave the unbend high for maximum correction of the lumbar. If progression occurs, then trim to the thoracic apex.

A lumbar curve of 35 degrees or greater should always be treated as Type I curve to control the lumbar curve. Always consider Risser age, curve degrees, menses, and family history in deciding treatment.

CBB Type III

Type III- *Single Thoracic*-
- curvatures are essentially thoracic curves. The lumbar segment does not cross the midline in Type III. This pattern presents the so-called “Overhang” appearance. Type III curves generally present little difficulty in treatm ent. *(Fig. 19)*

TYPE III

Fig.19

Single Thoracic Overhang

Location of Applied Forces III

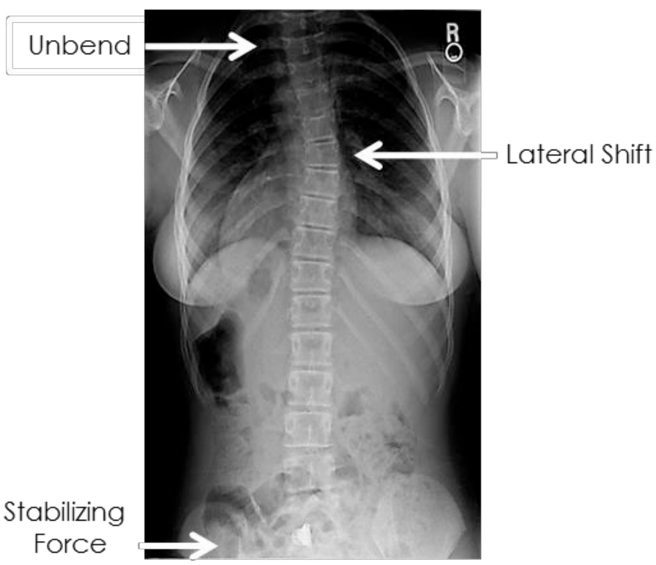


Fig.20

Applied Force: The correction method for Type III is less difficult than Type II because by definition the Lumbar vertebra will not cross the midline or tilt in the opposite direction of the curve or it will be a Type II curve.

However, we still measure the LPR angle and the VT angle to confirm our diagnosis. In some instances the LPR angle may be greater than 15 degrees if the pelvic tilt angle is unusually large.

Corrected Position: The location of forces applied is to apply the stabilizing force at the trochanter and then the lateral shift force at the apex of the thoracic curve, shifting beyond the midline as far as possible.

Last apply the unbending force in the axilla region opposite the L.S. force being careful not to compromise or overpower the L.S. force. (Fig. 21)

Corrected PositionIII

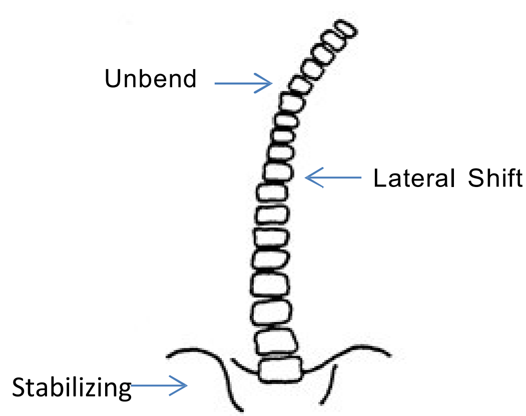


Fig. 21

CBB Type IV

Type IV-*SingleThoracolumbar/Lumbar*-
-scoliosisischaracterized by long thoracic (thoracic /thoracolumbar) curves in which the body of L-5 is centered over the sacrum but the body of L-4 is tilted into the curved segment.

These curves are best treated as thoracolumbar curves, but emphasis should be placed on shifting the spine to the midline prior to unbending. *(Fig. 22)*

TYPE IV

Fig.22

Single Thoracolumbar / Lumbar
L-5 Over Sacrum, L-4 Tilted

Location of Applied Forces IV

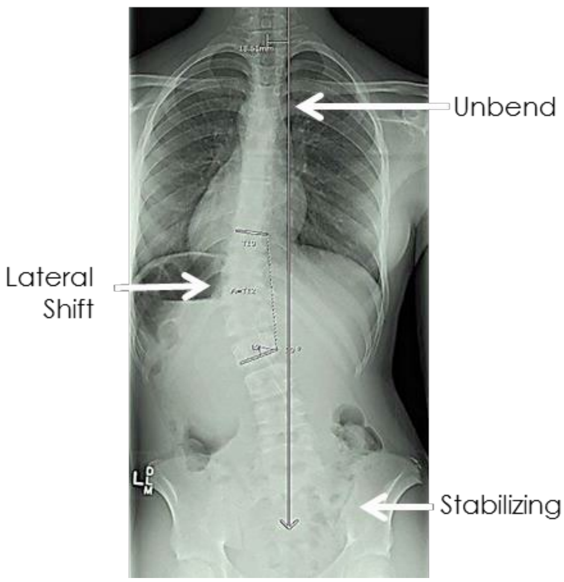


Fig.23

Applied Force: In a Type IV curve there is no need to measure or consider the LPR angle or the VT angle because, by definition of curve types, they will not be a factor. This type curve is a single curve with L-4 tilted into the curve. *(Fig. 23)*

CorrectedPosition: The location offorces for aType IV

curve is to apply the stabilizing force at the trochanter opposite the apex of the thoracolumbar curve, apply the lateral shift force at the apex of the curve and shift laterally beyond the midline as great a distance as possible.

Apply the unbending force in the axilla and unbend, being careful not to compromise or overpower the lateral shift force. *(Fig. 24)*

Correct PositionIV

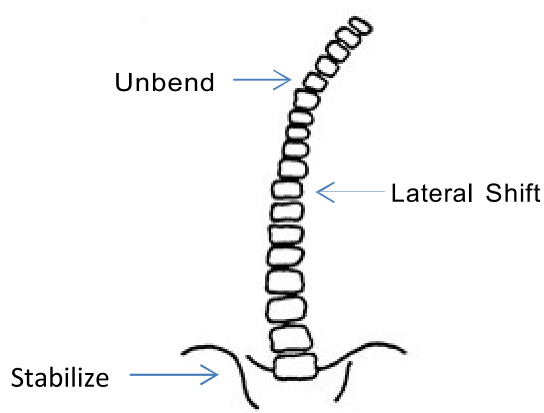


Fig. 24

CBB Type V

Type V-- *Double Thoracic*-- curvatures are double thoracic curves with the body of T--1 tilted into the concavity of the upper curve. The thoracic segment appears to be structural on X--ray. Type V curvatures are treated as thoracic curves. *(Fig. 25)*

TYPE V

Fig.25

Double Thoracic Curve

Location of Applied Forces V

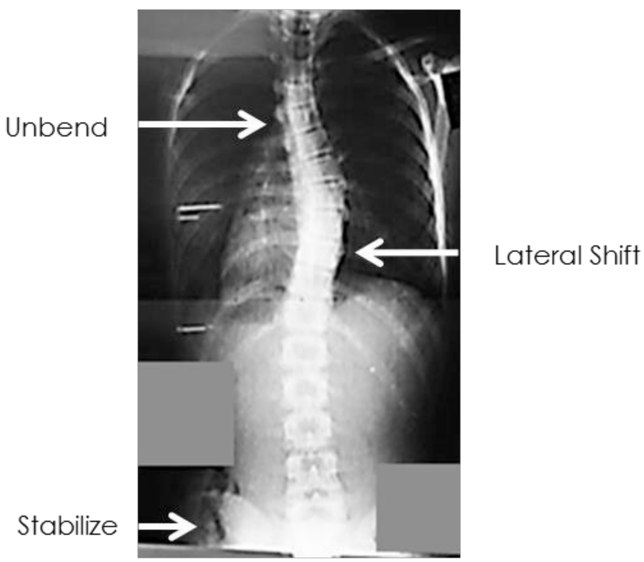


Fig.26

AppliedForce: Applyastabilizingforceatthe trochanter opposite the apex of the thoracic curve.

Then add lateral shift force to the apex of the thoracic curve, using sufficient force to move the spine beyond the midline to a point equidistant to, but opposite,the originalstarting position.

Finally, add unbending force to the axilla opposite the apex of the thoracic curve. *(Fig. 26)*

Corrected Position: The curve correction technique is identical to that used in Type I V curvatures. *(Fig.27)*

Correct Position

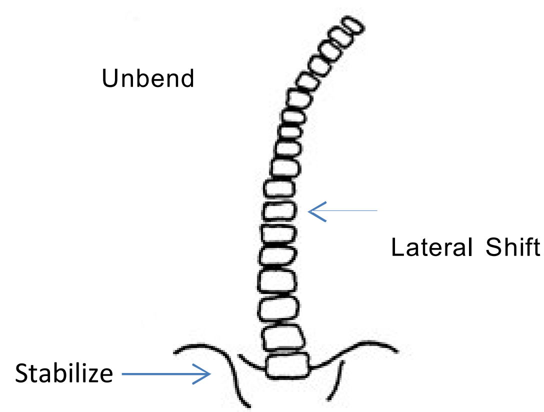
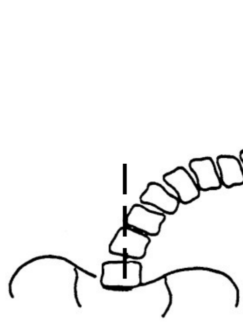


Fig. 27

Understanding Balanced Forces:

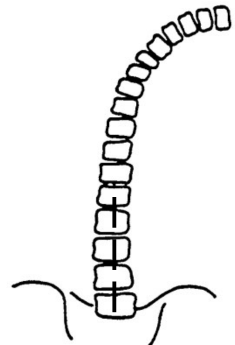
When applying stabilizing, shifting and unbending forces to the spinal column, it is paramount that the forces be balanced so to **prevent gross decompensation,** with little or no curve correction.

Properly distributed forces are essential to successful curve reduction. Unbending forces should not be applied until the lumbar column has reached the midline. *(Fig. 28a and 28b)*



Incorrect

Fig. 28a



Correct

Fig. 28b

Fabrication

Brace Fabrication and Quality Control

Because X-ray interpretation and cast modification are critical to the brace manufacturing process, a specialized and highly trained source is required for fabrication. The exclusive manufacturing and quality control responsibility for the Charleston Bending Brace has been licensed to Charleston Bending Brace, LLC who coordinates data accumulation / transfer and management in cooperation with the Bending Brace Foundation.

CBB Manufacturing Pre-requisites:

- Blueprinted x-ray (determining location of applied forces)
- Complete CBB work order

Digital x-ray (Preferred) can be emailed directly to:
Jackie@cbb.org
Subject:CBB

Brace Fitting and Check-Out

When the new CBB is received, careful attention to trim and fit requirements are the responsibility of the attending orthotists.

1. Place the patient in standing. Straps remain unfastened.
2. Have the lay down supine.
3. Locate the waist indentation on the brace and position it between the patient's ribs and iliac crests.

4. Fasten the Velcro straps and evaluate the axillary trim. Trim for maximum axillary pressure.
5. The patient should be able to lower the arm completely without discomfort. NOTE: The plastic flare above the lateral shift force is expected to be higher than the apex.

6. On the concave side of the brace, the proximal edge of the brace should lie at the apex of the cure If the trim is too high, the patient will be allowed to bend over the apex of the curvature and the amount of curve correction will be compromised.
7. Trim the antero-proximal edge of the brace for breastrelief.
8. The antero-distal trim line should be at or slightly proximal to the gluteal fold. If the trim is too high, the patient will experience discomfort.
9. The postero-distal trim line should be at or slightly proximal to the gluteal fold. If the trim is too high, the patient will experience discomfort.
10. The postero-proximal trim line should describe a smooth diagonal line transitioning form the high, convex side of the brace to the lower concave side.

Caveats Regarding the Initial In-Brace X-ray

The measurement of the scoliotic curvature in-brace is a means of comparing the visible effects of treatment with the state of the anatomy before treatment. The measurement itself is a relative comparison with the original condition but is not an active component of the treatment itself.

The Cobb measurement has been the generally accepted standard of scoliosis measuring techniques. After application of the Charleston Bending Brace , the Cobb Measurement may be "0" degrees, though technically this is not a true Cobb reference. *(Fig. 29)*

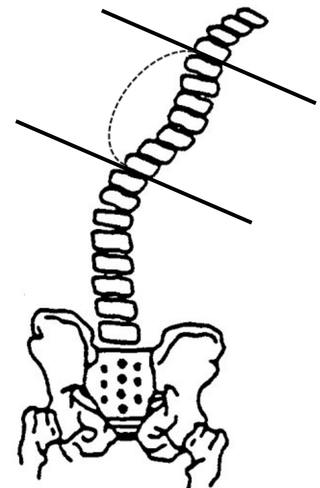


Fig.29

The endplates used, as reference points may arguably be invalid, after the shape of the curve has been completely changed.

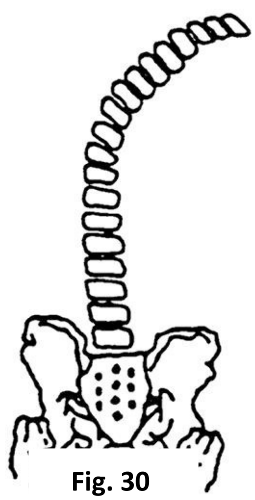


Fig. 30

After CBB application, it is evident that the corrected spine has assumed and unorthodox appearance. Several points should be revisited to mitigate this. The patient is supine in-brace, negating concerns about load bearing on the spinal column and compensation versus decompensation as a desirable or undesirable position. For immediate comparative purposes, the Cobb measure alone suffices, but ultimately a subjective visual evaluation by the orthopedist and the orthotic practitioner will probably be more valuable in determining the acceptability of the finished orthosis. *(Fig. 30)*

Just as the theory of sidebending scoliosis correction is not completely understood, yet successful treatment outcomes are reported. A departure from the traditional measuring system by subjective visual evaluation does not controvert the spine's improved appearance, nor does it negate any positive results.

Exercise Program

The use of a regimented exercise program as an adjunct to scoliosis brace treatment is a concept having many adherents, as well as detractors. Both camps have advocated either explicit programs producing measurable results, or "free play" exercise without regimentation.

The Charleston Bending Brace system is designed to obtain direct as well as subtile benefits from the exercise program supervised by a Registered Physical Therapist. The therapist is able to recognize the strengths and deficits of each individual patient make recommendations, set up programs, and document results. The therapist may also serve as a patient's and family's motivator by altering the program at intervals to freshen theroutine.

The Registered Physical Therapist is able to conduct an individual needs assessment, measure the patient's strength and flexibility, and evaluate such aspects as body control, dexterity and proprioce ption. Special programs may be incorporated, including aerobic and recreational dance or other exercise routines, which are often in conjunction with organized sports.

The goals of supervised exercise programs areto:

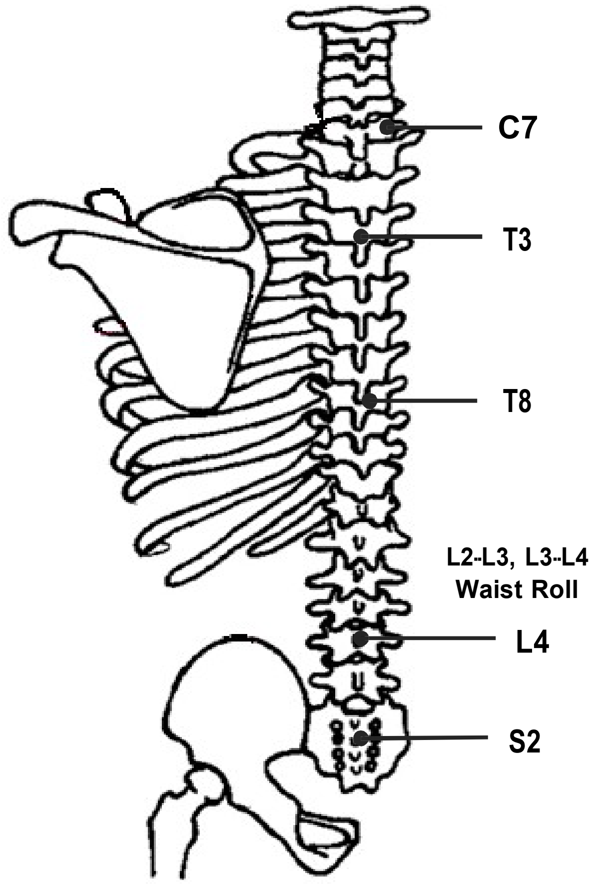
1. Maintain or increase muscle strength and tone
2. Maintain or increase flexibility
3. Promote correct postural alignment
4. Increase awareness of body position

Components of the program may include:

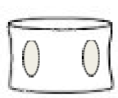
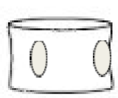
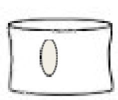
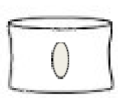
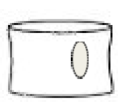
1. Pelvic tilt-supine or upright
2. Abdominal, gluteal and shoulder girdle strengthening
3. Hamstring, hip flexor and pectoralstrengthening
4. Diaphragmatic or other deep breathing exercises

REFERENCES:

Bony Land Marks

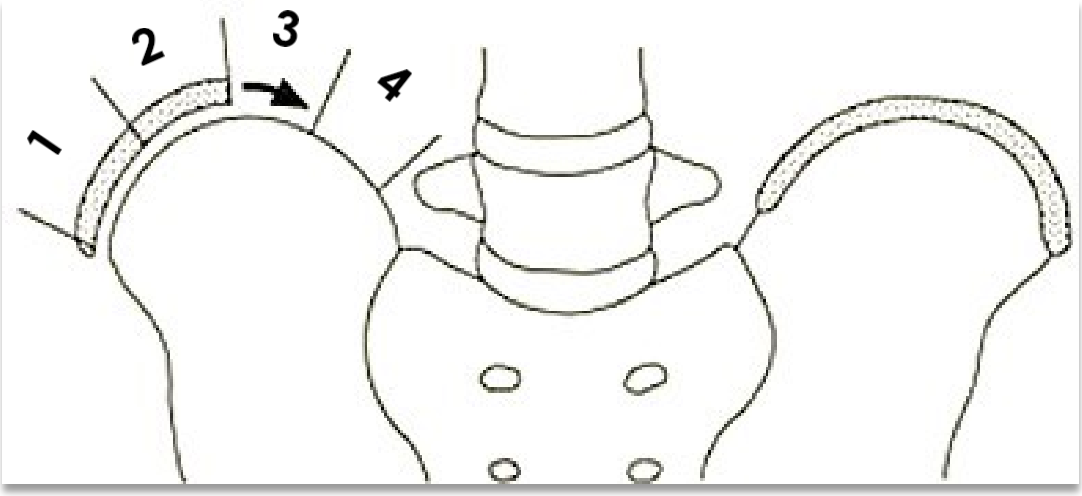


Pedicle Rotation:

	GRADE	Convex Pedicle	Concave Pedicle
	0-Neutral	Symmetrical	Symmetrical
	+1	Pedicle toward midline	Pedicle begins to disappear
	+2	Pedicle 2/3 midline	Pedicle disappears
	+3	Pedicle midline	Not visible
	+4	Pedicle past midline	Not visible

Risser Sign:

Open **Fused**



ADDITIONAL INFORMATION:

Weinstein, et al. New England Med September 2013

- Bracing in Adolescent Idiopathic Scoliosis Treatment(BRAIST)
- Bracing significantly decreased the progression of high-risk curves to the threshold for surgery
- Significant association between the average hours of daily brace wear and the likelihood of a successful outcome
- The benefit increased with longer hours of bracewear

REFERENCES