CASE STUDY

Management of Adolescent Idiopathic Scoliosis Using the Spinecor Brace System: A Case Study

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Abstract

Objective: To report on the use of the Spinecor system dynamic brace on a patient with Adolescent Idiopathic Scoliosis.

Clinical Features: A 10-year-old girl presented with a right thoracic type one Adolescent Idiopathic Scoliosis measuring 36 degrees.

Intervention and Outcome: Specific corrective movement was implemented utilizing the dynamic Spinecor bracing system to address Adolescent Idiopathic Scoliosis. Elastic straps were positioned specifically to correct the rotational and translational distortions of the right thoracic type 1 scoliosis using a compressive mechanism. The brace was worn for 20 hours per day for 8 months, at which time a 100% correction was noted. At her one year follow-up, the correction remained.

Conclusion: The case of a ten year old female with Adolescent Idiopathic Scoliosis utilizing the Spinecor system dynamic brace was presented. The brace proved to be an effective treatment for idiopathic scoliosis. Further research is warranted to support these findings and to compare the Spinecor brace to other non-invasive treatments for idiopathic scoliosis.

Key Words: scoliosis, Spinecor, scoliosis bracing, Adolescent Idiopathic Scoliosis, chiropractic

Introduction

Adolescent Idiopathic Scoliosis is defined by the Scoliosis Research Society (SRS) as: occurring in patients 10 years or older with idiopathic structural lateral curve of 10 degrees or greater measured with the Cobb technique; vertebral rotation on a standing longitudinal radiograph of the spine; combined with asymmetry on forward bending.¹ Customary medical care involves careful observation of patients with a Cobb measurement between 20-25 degrees. ³ Patients with curves between 26 and 40 degrees are potential candidates for bracing, and patients with curves beyond 40 degrees are potential candidates for surgery.²

Adolescent Idiopathic Scoliosis can be managed most effectively by conservative means when treated before skeletal maturity.³ Bracing, being the most common form of conservative treatment, has been shown to be most effective when the patient is compliant to the recommended bracing protocol.³ Poor compliance with the bracing protocol is associated with decreased quality of life.⁴ The non-compliant patient lacks vitality and will function poorly physically, emotionally, and socially.⁴

References:

1. Private Practice of Chiropractic, Starkville, MS
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Current bracing is rigid and presents obvious challenges to the patient, such as issues with temperature.\textsuperscript{5} To determine whether intervention is absolutely necessary the following should be considered: Natural history of the condition is undesirable, the intervention alters this natural history in a favorable and reproducible fashion, the complications are minimal, the long term side-effects of the intervention are not detrimental, and the risk-benefit ratio favors the intervention over the condition’s natural history. The more invasive surgical options have shown a complication rate of 5-20\.\textsuperscript{6} The dynamic Spinecor system flexible brace offers a less invasive alternative for the treatment of adolescent idiopathic scoliosis. The treatment of a patient with adolescent idiopathic scoliosis using the Spinecor system flexible brace is discussed.

**Case Report**

**History**

The patient was a 10-year-old pre-menarchal female with an idiopathic scoliosis presenting to a chiropractic office for an evaluation for the Spinecor system dynamic brace. The patient presented with no concomitant pathologies. Her mother was the only relative affected by Adolescent Idiopathic Scoliosis. The patient had been previously determined to be a candidate for the rigid Boston brace. With two weeks of full-time wear of the brace, the patient found the rigid brace too restrictive and uncomfortable.

**Examination**

Upon initial examination, a diagnosis was made of a right thoracic type one idiopathic scoliosis with a Cobb angle measurement of 36 degrees. The Cobb angle is attained by drawing a horizontal line across the superior endplate of the most superior vertebrae of the curve and drawing one across the inferior endplate of the most inferior vertebrae of the curve, then measuring the resulting angle.

Clinical evaluation revealed a counter-clockwise rotation of the shoulders, clockwise rotation of the thorax, and a T8 rib prominence of one degree. The anteroposterior full spine radiograph revealed a Cobb angle of 36 degrees measured from T7 to L2 and Risser sign 0. (Figure 1) The lateral full spine radiograph demonstrated a kyphosis of 23 degrees from T2-T12 and a lordosis of 48 degrees from T12-L5. This right thoracic type one presentation warranted brace strap orientation such to induce counterclockwise rotation of the thorax, clockwise rotation of the shoulders, with a slight left lateral shift of the trunk.

**Intervention & Outcomes**

Four straps were anchored to the Spinecor shorts and bolero and fitted to the patient to achieve this desirable positioning while still allowing as much functional movement as possible. Post-radiographs were taken while in-brace on the same visit revealing a decrease in Cobb angle from 36 degrees to 16 degrees. The patient was prescribed to wear the brace for 20 hours per day with the remaining 4 hours broken into two hour out of brace time periods.

Comparative radiographs were obtained after approximately one month of wearing the Spinecor brace. At this time, a Cobb angle measurement of 8 degrees was determined from T7-L2. Approximately 5 months into bracing treatment, her Cobb angle from T7-L2 was 2 degrees. Upon reassessment after 8 months of care, her Cobb angle measurement was found to be 0 degrees. The patient continued to use the Spinecor brace through a one year follow-up, at which time the Cobb angle measurement was still 0 degrees. (Figure 2)

**Discussion**

Non-invasive treatments with the least amount of negative impact on the daily activities of patients with idiopathic scoliosis are being sought out by patients and their families alike. The typical treatment for patients with idiopathic scoliosis depending on severity include observation only, bracing, and surgery.\textsuperscript{7} Evidence is limited supporting the success of other treatments like therapeutic exercises and chiropractic intervention.

Surgery is typically a last resort in cases where a risk of progression could lead to organ compromise. Danielsson et al reporting on a 22 year follow-up on 142 surgically treated patients with idiopathic scoliosis revealed an average curve deterioration of 3.5 degrees.\textsuperscript{8} The complications noted from the surgeries included pelvic venous thrombosis, wound hematoma, post-operative anemia requiring blood transfusion, pseudoarthrosis, and vertebral arch fracture requiring instrument replacement surgery.\textsuperscript{8}

Lange et al reported on the use of the Boston brace, a type of rigid brace. After an average of 19.2 years, the primary curve in 86 patients was about the same as it was at the beginning of brace treatment.\textsuperscript{9} It had progressed 5.9 degrees from brace weaning and 6 patients had major curve progression.\textsuperscript{9} The Boston brace has shown only to limit progression and not completely correct three-dimensional deformities.\textsuperscript{5} The lack of reducibility of the Cobb angle in this study suggests a limitation of this rigid bracing system. A comparison study showed better outcomes and more avoidance of surgery in patients treated with bracing as opposed to observation only.\textsuperscript{6}

Chiropractic protocols such as the Pettibon system, a combination of adjustments, body weighting, and traction, have been documented as successful in a few cases of mild to moderate idiopathic scoliosis and as well as in conjunction with rigid bracing.\textsuperscript{11-13} One study showed a higher rate of success with combined chiropractic care and medical care than medical alone.\textsuperscript{2} While limited, traditional chiropractic care as a primary intervention has shown to reduce the Cobb angle measurement as well.\textsuperscript{14}

Evidence suggests that in-brace treatment in addition to patient compliance leads to the highest success with bracing.\textsuperscript{15} With that in mind, the Spinecor system dynamic bracing utilizes flexible bands anchored by the close-fitting shorts and a cloth bolero on the posterior upper torso. The bracing parameters are determined based on curve classification and applied according to the Spinecor Assistant software.

Specific corrective movements initiated by the bands include detorsion known as opposite rotations, single rotation, lateral shift/translation, lateral flexion/tilt. A shoe lift is utilized.
when necessary to level the pelvis. The brace applies a continuous corrective movement. The correction is made through neuromuscular integration of the corrective movement through active biofeedback.\textsuperscript{16}

Colliard et al reported an overall correction of greater than 5 degrees in 55% of 195 patients with curves and a stabilization in 38% treated with the Spinecor bracing system.\textsuperscript{17} The curves treated were within the range of 15 to 50 degrees.\textsuperscript{17} A more recent study showed 97.5% correction or stabilization of curves between 25 to 40 degrees up to two years following bracing.\textsuperscript{16}

Moderate curves have the likelihood of complete correction if treated prior to Risser 1 and menarche.\textsuperscript{18} If treated after this period, the primary goal is stabilization.\textsuperscript{18} With the absence of external rigid support, the progressive change induced by the Spinecor brace upon the intact musculature and other soft tissue structures permits no loss of correction after discontinued use of the brace. The dynamic forces implemented by the flexible brace train new movement of the spine and associated structures to guide neuro-muscular integration and progressive curve reduction.\textsuperscript{18}

**SpineCor Brace**

Presentation of a right thoracic type 1 scoliosis describes a curve that must be approached correctly as a detorsion between the thorax and the shoulder girdle. In this case, a shoe lift was contraindicated. The type of scoliosis presents with no lumbar curve, clockwise rotation of the thoracic vertebrae, clockwise rotation of the underlying lumbar vertebrae, and a hypokyphosis of the thoracic spine.

The apex of the curve was located between T7-T10; a decreased distance between the ribs on the concave side at the level of the apex existed. The corrective position of the patient within the brace was counterclockwise rotation of the thorax, clockwise rotation of the shoulders, with a slight left lateral shift of the trunk, and shoulders tilted clockwise. The right thoracic band-1 was designed to engage the counterclockwise rotation of the thorax as well as induce a left lateral shift of the trunk. Band-1 was attached to the most lateral portion of the left pelvic base; the tension on this band was relatively high. Left thoracic band-2 was designed to balance the bolero and was attached to the most lateral portion of the right pelvic base with no tension. The right shoulder band-3 engaged the shoulders in a clockwise rotation and contributed to the clockwise tilt of the shoulders as well as induced the left lateral shift of the trunk. This strap was placed under the axilla and attached as laterally as possible on the left posterior portion of the pelvic base. The tension on this band was relatively high.

The left shoulder band-4 contributed to the clockwise rotation of the shoulders in addition to the left lateral shift of the trunk. This band crossed the chest anteriorly and was attached to the left posterior pelvis base. The tension on band-4 was moderate and always less than the tension of the right shoulder band-3. The correction was achieved as the bands allow repetition and magnification of the corrective movement as the patient partakes in everyday activities. The patient is actually encouraged to remain active while in-brace. It is recommended that the brace be worn 20 hours per day with time out of brace limited to twice a day lasting no more than two hours. (Figure 3)

Additional physiotherapy may be used in conjunction with the Spinecor brace,\textsuperscript{18} but in this specific case no additional therapy was implemented. The Cobb angle was used as the objective measurement to monitor progression or improvement.

**Cobb Angle**

Cobb angle measurement is considered to be the gold standard for determining curve magnitude in scoliosis.\textsuperscript{2} The Scoliosis Research Society endorses this technique as a means to make clinical decisions regarding initiation, termination, and success of treatment.\textsuperscript{2} This angle is measured on the anteroposterior standing radiograph, and according to Harrison’s normal spinal model, should be vertical without deviation equaling zero. The normal spinal model which includes this vertical upright posture is better able to withstand biomechanical spinal loads. Any deviations away from this normal posture expressed as rotations and translations are considered to be abnormal. Static and active posture from this abnormal alignment imposes altered stress relationships between spinal structures.\textsuperscript{19}

**Conclusion**

A case of complete correction of Adolescent Idiopathic Scoliosis in a 10-year-old using the Spinecor system brace was presented. This system poses as an alternative to other rigid brace systems and surgery in mild to moderate situations. The elastic straps allow for a more comfortable means of curve correction while allowing the patient to engage in regular activities. Further research is warranted to support these findings and compare the effectiveness of the Spinecor system to other non-invasive treatments in comparative studies.

**References**

Figure 1. The anteroposterior full spine radiograph revealed a Cobb angle of 36 degrees measured from T7 to L2 and Risser sign 0.

Figure 2. The patient remained in brace through the 1 year follow-up where Cobb angle measurement remained 0 degrees.

Figure 3. SpineCor Dynamic Elastic Brace

http://www.scoliosisspecialists.com/aboutspinecorbrace.htm