

Efficacy of Symmetric Force Control Brace on Adolescent Idiopathic Scoliosis: A Case Study

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ABSTRACT

Background: The role of bracing in patients with Adolescent Idiopathic Scoliosis with a higher curve and those who are at risk for curve progression is always controversial. The purpose of this study was to investigate the effect of a spinal orthosis on scoliotic curve correction, alignment of altered posture and to address pulmonary dysfunction.

Case Description and Methods: A 14-year-old boy diagnosed with Adolescent Idiopathic Scoliosis was fitted with a custom-molded Symmetric force control brace to stop the progression of the curve and to align the posture. The anterior-posterior radiographs were analyzed for measuring the Cobb angle. A plumb line test was used to assess the postural improvements and George's Respiratory questionnaire was used to address pulmonary dysfunction. Pre and post-test were used with adaptation time for 12 weeks with spinal the brace on.

Findings and Outcomes: The Cobb angle was decreased from 37 to 29 degree after the adaptation period of 12 weeks. There was also improved posture by shifting of the plumb line 8 mm towards the midline with the use of the brace. No significant difference was observed in breathing problems as per the score of George's Respiratory questionnaire.

Conclusion: The Symmetric force control brace can be considered as a new, effective method for treatment Adolescent Idiopathic Scoliosis with a higher curve and it also can be used for maintaining an aligned posture.

Clinical relevance: This case report gives an objective prescription of Symmetric force control brace for improving posture in Adolescent Idiopathic Scoliosis if designed with appropriate biomechanical principle and properly fitted.

Keywords: Adolescent Idiopathic Scoliosis, Symmetric Force Control Brace, Cobb's angle, Posture, Pulmonary dysfunction.

INTRODUCTION

Adolescent Idiopathic Scoliosis (AIS) is characterized by a lateral curvature of the spine with a Cobb angle of more than 10 degrees and vertebral rotation. Whereas scoliosis develops in approximately 3% of children younger than 16 years of age, only 0.3 to 0.5% have progressive curves requiring treatment. [1] The conservative treatment of AIS has a great role on postural improvements and reducing the chances of surgical intervention. There are a number of

studies which shows bracing in adolescent idiopathic scoliosis decreases the risk of curve progression. [2,3,4] Basically there are three main concept of bracing prevail: traction (2 point system), pushes on the trunk (3/4 point system), and side bending (3 point system). [5] However in case of higher curves the first two concepts works and it is represented by the Milwaukee brace a Thoraco Lumbo Sacral Orthosis (CTLSO) [6] that applies a correction in the frontal and horizontal plane through an

active elongation required for the patient to avoid the collar and some specific mobile thrusts on the trunk : the main limitations of this concept include the psychological burden on the patient [7] and negative action in the sagittal plane and results did not meet comparable to other braces. [8]

There are wide varieties of Thoraco Lumbo Sacral Orthosis (TLSO) present in the market but most of them include an asymmetrical construction to treat the scoliosis. Therefore within such asymmetric concept to bring a symmetric is also a question mark so far its quantum, its degree of involvement, degree of correction and post fitment effects. Sometimes the imagination is also a surge to investigate a new plane, a new concept beyond of existing design and called as an odd thought. But the odd thought may be very useful, if it is applicable in a control manner. Here the orthosis is designed on the basis of critical loading and critical failures. The brace itself is a bivalve system which can be easily incorporated to the human torso within the controlled intra cavity pressure. Moreover the brace is also working under high aesthetical sense. The aim of this case study was to quantify the amount of curve correction, the postural improvements and to address pulmonary dysfunction with spinal bracing.

MATERIALS AND METHODS

A 14 year old male subject with spinal curvature was referred to the Swami Vivekananda National Institute of Rehabilitation Training and Research (SVNIRTAR). The child's cognitive functions were normal, and he was interactive. Prior to assessment and prescription the subject and his father gave written consent to participate in this study. A detailed assessment was performed with demographic data, medical history, x- ray evaluation, and Cobb angle, angulations in

sagittal and frontal plane and functional outcome. Findings on the detail assessment are as follows –

- The apex vertebra and end vertebra was thoroughly checked in the x-ray and the Cobb's angle was measured - Cobb's angle-37 degree
- With the x-ray and Adam's forward bending test the apex of the curve was determined - Apex is at T 5 level
- Risser's sign - 2
- Checked the ASIS level in standing and lying position to rule out the Leg Length Discrepancy(LLD) – there was no LLD
- Plumb line test – 18 mm from the midline

The treatment programme planned was to start physiotherapy exercises, strengthening exercises for all four limbs and also including the trunk, stretching exercises for tight muscles, standing balance. A custom moulded Symmetric force control brace bivalved designed (TLSO) with an anterior abdominal opening with posterior aluminum bar and hinge was planned and fabricated to prevent the further progression of scoliotic curve, to align the posture, to support the weakened trunk musculature and to enhance the breathing capacity.

Fabrication procedure of the brace –

Casting and rectification of the positive mold was done as per the principle of fabrication of underarm braces. Components of the brace (Fig – 1) were aligned with concept of symmetric force control system. The complete brace (Fig – 2) was fabricated by providing push pads and stop pads as per the location of the apex of the curve. Similarly various straps & D rings were attached for snug fitment of the orthosis.

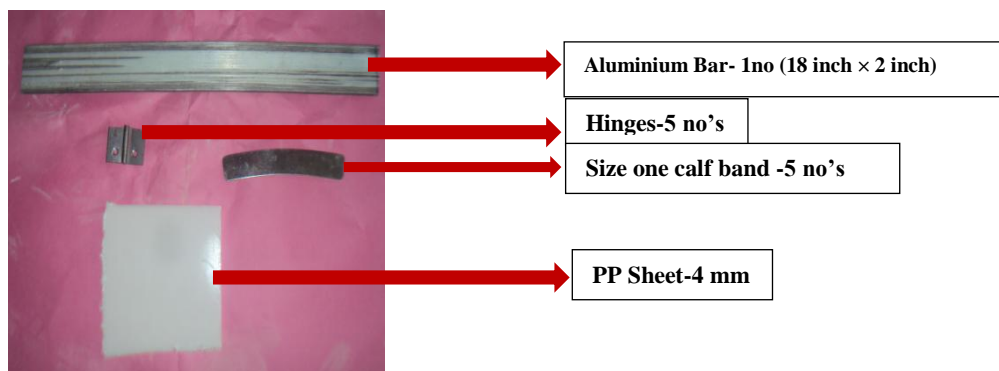


FIG - 1 - COMPONENTS OF THE BRACE

The x-ray examinations were quantified by measuring Cobb angle before the intervention, just after the intervention and after the adaptation period of 12 weeks. The postural deviation was measured by using plumb line from the middle point of occipital protuberance and St. George's respiratory questionnaire (SGRQ) ^[9] to identify the respiratory problem.



Fig - 2(a) shows the front view of the complete brace with Push pads and Stops pad to prevent the progression of curve.
Fig - 2(b) shows the symmetric force control brace with the subject.

RESULT

Result of this case report was analyzed with comparison of pre and post test Cobb angle, deviation of the apex vertebrae from the mid-line and score of questionnaires. Though there was no significant change in the Cobb angle but

progression of the curve has almost stopped (Table - 1). There was also improved posture by shifting of the plumb line 8 mm towards the mid line with the use of brace (Table - 2). SGRQ pre-test score was 55 and post test score was 47. Much change was not reported in SGRQ feedback as well.

Table - 1

| Cobb's angle | Without orthosis | Immediately after using orthosis | After two months of using orthosis |
|--------------|------------------|----------------------------------|------------------------------------|
| Degrees | 37 degrees | 31 degrees | 29 degrees |

Table - 2

| Plumb line test | Without orthosis | Immediately after using orthosis | After two months of using orthosis |
|-----------------|------------------|----------------------------------|------------------------------------|
| Millimetre (mm) | 18 mm | 12 mm | 10 mm |

DISCUSSION

The discussion to begin orthotic treatment for idiopathic scoliosis is a complex process and not often necessarily

detached in term of psychological and body image for many patients and their families. It is therefore crucial that any treatment decision should be based on the best

evidence available with respect to the effectiveness of the treatment and finally the patient's characteristics (Cobb's angle, curve type, age of onset) as well as their specific risk factors. That's why; we created innovative symmetric force control spinal orthosis for adolescent idiopathic scoliosis. It stabilizes or reduces spinal curvatures and it preserves normal body movement and growth and allows normal activities of daily living. Though there is always a controversy between the spinal brace and curve correction but many studies have seen that the progression of curve is significantly reduced with the use of spinal braces. [2, 3, 4] However Atanasio S et al. observed that the symmetric brace is best in worst curves. [10] The brace has designed that it will give some salient features like it provides maximum freedom in the ADL (Activities of Daily Life), versatility and adaptability is better as compared to other braces and it also improves aesthetic sense of the subject compared to other asymmetrical braces.

CONCLUSION

The symmetric force control brace gives confirmatory epilogues that a symmetrical controlled force not only minimizes most acute Cobb angle also reduces appreciable exaggerated muscle tension. It also effectively walks over the deform spine by to elegant sequence such that the postural imbalance is invariably reduces to a major quantum. Therefore the brace is no doubt an active orthosis and influences the local correction procedures. Though the device is little beat multisegmental but still its efficacy is more interesting.

Conflict Of Interest – The author does not have any conflict of interest regarding research, authorship and publication of this article.

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