

Review Article

Use and impact of Cheneau brace in adolescent idiopathic scoliosis: a literature review

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ABSTRACT

The Cheneau brace is the most commonly used rigid thoracolumbosacral orthosis in Europe. It is designed to de-rotate the apical segment of the curve and provide 3D correction of the spinal deformity. In terms of brace application outcomes, the Cheneau brace has been shown to prevent curve progression and decrease axial rotation. The objectives of the Cheneau brace are to achieve a three-dimensional correction of the scoliotic deformity, focusing on the sagittal plane as well as the coronal and transverse planes. This literature review aims to review the impact of Cheneau brace on usage and compliance in adolescent idiopathic scoliosis. PubMed, Cochrane Library, Google Scholar, and reference lists from all retrieved papers were used to conduct an electronic database search. The Cheneau brace may be beneficial in preventing curvature progression in AIS patients. With careful fitting and adjustment of the pads by an experienced Orthotist, the curve should be corrected to the greatest extent possible in the brace. Poor outcomes can also be the result of poor patient management, which can have an impact on compliance. A successful treatment outcome can be achieved with close monitoring of the patient's compliance and in brace correction. According to the literature, the Cheneau brace is an effective treatment for mild to moderate AIS. Starting brace usage at a younger age and taking into account the child's routines and preferences, as well as the treatment plan and prescribed orthosis regimen, can drastically improve compliance.

Keywords: Adolescent idiopathic scoliosis, Bracing, Cheneau brace and curve progression, Cheneau brace and axial rotation

INTRODUCTION

Scoliosis is a lateral curvature of the spine with rotation of the vertebrae within the curve that deviates from the normal vertical line of the spine. Scoliosis is usually diagnosed when the posterior-anterior radiograph shows at least 10 degrees of spinal angulations along with vertebral rotation.¹

In Adolescent idiopathic scoliosis (AIS), an orthosis is the only potentially effective non-operative treatment for preventing curve growth (AIS). Several forms of orthoses,

such as the cervicothoracolumbosacral orthosis or Milwaukee brace, Thoracolumbosacral (TLSO), and nighttime orthoses, such as the Providence and Charleston orthoses, have been used with varied degrees of efficacy. All of these orthoses with varying treatment criteria have been studied for their efficacy in the treatment of AIS, usually retrospectively. As a result, the efficacy of orthotic management remains debatable.²

The Cheneau brace is the most commonly used rigid TLSO orthosis in Europe. It is designed to de-rotate the apical segment of the curve and provide 3D correction of the

spinal deformity. The primary mechanism of this orthosis is 3D correction of spinal deformity via a system of multipoint pressure zones and expansion chambers. The Cheneau brace applies pressure to the convexity of a curve, while wide expansion chambers in the frontal, sagittal, and horizontal planes are located on the opposite side. In terms of brace application outcomes, the Cheneau brace has been shown to prevent curve progression and reduce axial rotation. Most brace systems aim for frontal and horizontal curve correction, but sagittal plane correction, particularly preservation of Lumbar lordosis (LL), has been the focus since 2004 due to the development of sagittal plane measurement methods and the 3D reconstruction technique.³

The aim of the study was to highlight the impact of Cheneau brace on usage and compliance in adolescent idiopathic scoliosis.

A computerized search was conducted in Google Scholar, Science Direct, PubMed and Cochrane Database. The search queries used were- 'AIS AND Orthotic management', 'AIS AND Spinal braces' 'AIS AND Cheneau brace', 'Cheneau brace AND Curve progression', 'Cheneau brace AND Axial rotation', 'Cheneau brace AND efficacy', 'Cheneau brace AND compliance', 'Cheneau brace AND usage'.

Total 11 articles were included in the study and based on their findings a review was made. Table 1 summarizes the details of the reviewed articles.

Table 1: Details of the reviewed articles.

Authors	Title	Conclusion
Lang et al, 2019	Factors that influence in-brace correction in patients with Adolescent idiopathic scoliosis (AIS).	The study's main finding was that certain factors, such as the major curve Cobb angle, minor curve Cobb angle, total curve Cobb angle, coronal and sagittal balance, and lumbar pelvic relationship, can influence in-brace correction in patients with AIS (LPR). It is widely assumed that the Cobb angle of the major curve is related to in-brace correction. ⁴
Fang et al, 2015	Long-term effects of the Cheneau brace on coronal and sagittal alignment in adolescent idiopathic scoliosis	The Cheneau brace may be beneficial in preventing curvature progression in AIS patients. However, the findings of this study show that the effect of brace treatment on sagittal and pelvic alignment varies greatly. The Cheneau brace may also have an effect on sagittal balance. ³
Papadopoulos et al, 2013	Adult scoliosis treatment combining brace and exercises	The brace and exercises together produced good results. In general, we found that only exercises or the brace alone reduced discomfort and/or improved posture in some cases, but that the maximum improvement was achieved when both were used, with the brace worn for more than eight hours each day after the exercises. ⁵
Giorgi et al, 2013	Cheneau brace for adolescent idiopathic scoliosis: long-term results. Can it prevent surgery?	Given the natural history of the disease, a Cheneau brace may be effective in preventing curve progression and surgery in AIS. ⁶
Ovadia et al, 2012	Factors associated with the success of the Rigo System Cheneau brace in treating mild to moderate adolescent idiopathic scoliosis	The RSC brace is a very good alternative for treating mild to moderate AIS and has demonstrated, for the first time, that it provides three-dimensional scoliosis control. ⁷
Sapeta et al, 2011	Effectiveness of Cheneau brace treatment for idiopathic scoliosis: prospective study in 79 patients followed to skeletal maturity	In 48.1 percent of patients, conservative treatment with a Cheneau orthosis and physiotherapy was effective in preventing scoliosis progression. In comparison to natural history, the findings of this study indicate that bracing is effective in reducing the incidence of surgery. ⁸
Werkmann et al, 2010	"Brace Technology" thematic series- The ScoliOlogiC® Cheneau light™ brace in the treatment of scoliosis	When compared to the correction effects of other braces described in the literature, the use of the Cheneau light™ brace results in above-average correction effects. The reduction in material appears to increase patient comfort and reduce stress that patients may experience while wearing the brace. ⁹

Continued.

Authors	Title	Conclusion
Weiss et al, 2007	Correction effects of the ScolioLogiC®, Cheneau light" brace in patients with scoliosis	When compared to correction effects of other braces described in the literature, the use of the "Cheneau light" brace results in above-average correction effects. Material reduction appears to have a positive influence on the desired correction. ¹⁰
Pham et al, 2007	Determination of the influence of the Cheneau brace on quality of life for adolescent with idiopathic scoliosis	Wearing the Cheneau brace results in a significant reduction in QoL, regardless of the instruments used to assess QoL, QLPSD, or VAS. The QoL of full-time treated patients was the lowest, followed by part-time treated patients, and patients without brace had the highest QoL. However, the brace has no effect on back pain in adolescents with idiopathic scoliosis. ¹¹
Weiss et al, 2007	Brace related stress in scoliosis patients- Comparison of different concepts of bracing	When compared to heavier brace models previously used, the use of the Cheneau light brace results in less stress and/or impairment for the patients undergoing treatment. ¹²
Schmitz et al, 2005	Visualization of the brace effect on the spinal profile in idiopathic scoliosis	The new MR method, which is based on a 3D data set, allows researchers to study the brace effect on the spinal profile in scoliosis. The MR animation shows that the brace straightened the thoracic spine, causing the sagittal profile to flatten. ¹³

DISCUSSION

The purpose of this study was to determine how effective a cheneau brace was in adolescent idiopathic scoliosis. The results indicate that if high early correction and good compliance can be achieved, a successful outcome can be expected.

Kinel et al demonstrated that wearing the Cheneau brace for at least 16 hours per day resulted in less clinical deformity than non-treatment.¹⁴ Rahman et al found that highly compliant patients (85% compliance) had no curve progression at the end of treatment, whereas poorly compliant patients (62% compliance) had curve progression of more than 6°.¹⁵

Although Weiss and Rigo recommended aiming for an in-brace correction of more than 40%, not all curves can be corrected to the same extent.¹⁶

According to Landauer et al compliant patients with high initial correction can expect a final correction of approximately 7°, whereas compliant patients with low initial correction may not see a change in the curve degree, and poor compliance is always associated with curve progression. While compliance is always an issue that must be addressed, the study's findings suggest that its impact on in-brace correction should never be underestimated.¹⁷

According to Kim et al correction of the curve in the brace should be maximized through careful fitting and adjustment of the pads by an experienced orthotist. Best practices should aim for the best in-brace correction while also providing the most comfort for the patient to encourage compliance. The better the in-brace correction,

the better the final outcome. In fact, the magnitude of the curve has a negative relationship with in-brace correction. Poor results can be attributed to insufficient bracing, which can be confirmed using in-brace radiographs to evaluate the obtained correction. Poor outcomes can also be attributed to poor patient management, which can have an impact on compliance. A successful treatment outcome can be achieved with careful monitoring of the patient's compliance and in brace correction.¹⁸

We do know that compliance is critical to the success of brace treatment and that there are ways to improve compliance. Using the appropriate psychological intervention is unquestionably one way to improve. If the doctor is not convinced that braces work, how can he properly instruct and guide the patient? According to the study, another way to improve compliance is to reduce material, or "make the braces smaller!" When patients experience less stress while wearing the brace, we can assume that compliance improves.¹²

CONCLUSION

According to the literature, brace compliance and brace wearing have an effect on curve progression. From this, it is possible to conclude that brace use has a positive effect on natural history. The Cheneau brace provides excellent clinical results in the treatment of mild to moderate AIS. Its additional benefit is that it allows for three-dimensional correction of a three-dimensional deformity. There is evidence that Cheneau braces built to a high standard of excellence change natural history. Compliance issues in treatment are well known, and a variety of factors can affect compliance, patient awareness, and patient-practitioner interaction, including scoliosis deformity features such as Cobb angle, curve progression, riser grade,

age, gender, and family physician expectations. Hundreds of research projects have included compliance as a topic for many investigators. Nonetheless, there is a lack of well-controlled treatment studies that can be used to develop and evaluate approaches to improve compliance. Starting brace wear at a younger age and taking into account the child's habits and preferences, as well as the treatment plan and prescribed regimen for the orthosis, can significantly improve overall compliance. The treatment's overall effect could then be improved (in both physical and psychological aspects).

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