Trends and Challenges in the Usage and Compliance of Bracing in Adolescent Idiopathic Scoliosis: A Review

Surbhi Nandal¹, Yashika Kumar²

¹Student, ²Assistant Professor (P&O), Master of Prosthetics and Orthotics, ISIC - Institute of Rehabilitation Sciences, Vasant Kunj, New Delhi 110070
Corresponding Author: Surbhi Nandal

ABSTRACT

Background: Adolescent idiopathic scoliosis (AIS) is a three-dimensional lateral curvature of the spine associated with vertebral rotation. It is the most common type of scoliosis and affects 2–3% of the adolescent population. Bracing is the only conservative approach with proven effectiveness. Compliance and primary brace correction are the two most important variables associated with good brace outcomes. Poor compliance with wearing a brace is associated with poor quality of life which may relate to psychosocial coping mechanisms.

Objective: This literature review aims to review the Compliance and usage of spinal braces in Adolescent Idiopathic Scoliosis.

Study Design: Literature Review

Significance: This review was done to investigate the use and compliance in Scoliotic patients. These two factors are defined as the main issue that interferes with treatment success and clinical outcomes in Adolescent Idiopathic Scoliosis.

Method: An electronic database search was conducted using Google scholar, Science direct, Pub Med, Cochrane Library and reference lists from all retrieved articles.

Result & Discussion: The results demonstrated that the type of braces determines structure and appearance and affects compliance. Psychological aspects, age, brace wear pattern (daytime or nighttime or part-time versus full-time) and the assessment method (using temperature versus pressure sensors) can affect recorded compliance. Recent estimate of compliance was around 65-67% and also the compliance rate for nighttime was 80%, and daytime was 55%.

Conclusion: Compliance can be augmented by considering factors in the design and delivery of the brace. Superior appearance and comfortable within the brace can improve psychological acceptance and improve the compliance. Lower age, involving the patient in treatment procedure, considering the child habits, and improved family awareness of the treatment plan of idiopathic scoliosis can also improve overall compliance of the brace.

Keywords: Adolescent Idiopathic Scoliosis, Spinal Braces, Compliance, Usage

INTRODUCTION

Adolescent idiopathic scoliosis (AIS) is a lateral spine curvature that is associated with vertebral rotation. This is the most common form of scoliosis, affecting 2-3 per cent of teenagers. Girls seem to make more headway than boys. According to the Society for Scoliosis Research, Adolescents with mild curves and still growing should be tracked until the skeletal maturity. To growing children with curves of 25-45 Cobb angle, brace care is recommended. The indication for bracing was a major scoliotic curve 20° with an observed progression 5° after 4 months and skeletal immaturity evaluated by Risser sign 3 or bone age. While various non-operative approaches have been attempted, including
physical therapy, exercise, massage, manipulation, and electrical stimulation, only bracing is successful in preventing curve progression and the subsequent surgery requirements. Bracing success is assessed by preventing curve progression on standing x-rays and avoiding surgical influence. The effectiveness of brace treatment can be affected by several factors, including age, gender, bone maturity, prescribed brace times, curve pattern and magnitude.1,2,3

Indeed, the guidelines released by the Society on Scoliosis Orthopaedic and Rehabilitation Treatment (SOSORT) recommendations suggest adherence as a key element in evaluating the bracing effectiveness. The two most important variables associated with successful brace performance are compliance and primary in-brace correction. Low compliance with brace wearing is associated with reduced quality of life, which may contribute to psychosocial mechanisms for coping.3,4

The aim of this study is to highlight trends and challenges in the use and compliance of bracing in adolescent idiopathic scoliosis to recognize which elements bring advantages and disadvantages in compliance rates and brace usage.


| Result | Total 18 articles were taken and reviewed. Of which two were studied for Charleston brace study, two were for Spinecor brace study, two for Wilmington brace study, two for Rigo Cheneau brace study, two for Providence Brace study, two for Boston brace study, and two for Milwaukee brace study, two for TriaC Brace and two for Lyonnaise brace respectively. The descriptions of the papers reviewed are listed in the table provided.

<table>
<thead>
<tr>
<th>Table 1: Details of the reviewed articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author</td>
</tr>
<tr>
<td>Rahimi S, Kiaghadi A, Fallahian N. (2019)</td>
</tr>
<tr>
<td>Yrjönen T, Ylikoski M, Schlenzka D et al.</td>
</tr>
<tr>
<td>Maruyama T, Takeshita K, Kitagawa T. (2014)</td>
</tr>
<tr>
<td>Mo F, Cunningham ME</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td>F. Zaina, J. C. De Mauroy TG</td>
</tr>
<tr>
<td>Nigenbanning G. et al.</td>
</tr>
<tr>
<td>Claude J, Mauroy D, Fender P et al. (2014)</td>
</tr>
<tr>
<td>Brook JI, Lange JE, Gunderson RB et al.</td>
</tr>
<tr>
<td>Rigo MD, Villagraza M, Gallo D. et al.</td>
</tr>
<tr>
<td>Lange JE, Steen H, Brox JI et al. (2009)</td>
</tr>
<tr>
<td>Ran B, Fan Y, Yuan F, Guo K et al.</td>
</tr>
</tbody>
</table>
DISCUSSION

Results show that compliance can be influenced by the type of brace, designed to measure method, age, daytime or night time or part-time or full-time wear and psychological aspects. Brace type may play a major role in regulation. Studies have suggested the wearing time in the different brace groups is different. Characteristics such as form, colour, style, stiffness and body coverage influence patients' interest in wearing brace. Rigid braces are responsible for problems such as stiffness, high temperature and pressure on bony prominence, difficulty in dressing and doffing, restriction on clothing selection and restriction of movement, while soft braces do not cause problems as much as deeper rigid braces, although their effect on brace treatment performance is still controversial. Another source of inadequate treatment with the use of braces may be increased weight. A study by O’Neill et al found a significant difference between overweight patients and those that were not overweight. Age plays the significant role in compliance rate. Four studies confirmed the rate of compliance in various ages but compliance in younger patients had far better. Accepting new conditions is more adoptable in lower age; moreover, emotional adjustment may be harder for older teenagers. 16,22

They performed study in 10 patients and demonstrated night time compliance was 80%, and daytime was 55%. 6

Compliance

Compliance is called the percentage of hours worn relative to the prescribed 23-h regimen. Apparently no treatment can operate unless the patient needs it. Compliance is a key concern in bracing, but nowadays it seems to be viewed as a justification not to apply braces (because patients do not comply) rather than something that needs to be achieved by diligent attention to the patient and family. Compliance should be considered a failure of the treating doctor and staff, not a failure of the treatment. There are definitely therapies in medicine which cost much more than braces. These are applied whenever necessary, and in such cases the goal of a good physician is to obtain compliance, rather than avoid treatment if compliance is difficult to achieve. It is not the only point to consider when choosing a care, because there are financial, medical, human and social values that are far more important in these decisions, but compliance cannot be seen as an excuse to avoid bracing. 4,23

Compliance Testing

Given these concerns, determining compliance with bracing by either using dedicated questionnaire or applying sensors within the brace. Compliance had been very difficult to measure objectively in the past. The most popular methods relied on subjective surveying of patients regarding brace wear and brace wear and tear inspection. New technological advancements have required devices such as force-sensitive resistors, sensor loggers and temperature-moisture gauges to measure compliance. 3,14,24

Orthosis effectiveness measure

Landauer et al. suggested that an initial correction of over 40% and good compliance would have a significant impact on the outcome. In order to understand its relationship, in-brace correction was categorized as 40 percent or above and below 40 percent; and bracing hours were also divided into three groups: from the lowest level of compliance to the highest level of compliance. No major difference was observed in brace correction between the three groups of bracing hours, but the in-brace correction appeared to be less than 40% for the least compliant category of patients. This implies that the more compliant a patient becomes, the greater the correction in-brace. In addition, Kinel et al. showed a minimum of 16 hours of wearing the Cheneau brace per day, resulting in less clinical deformity than was the result of non-treatment. The study demonstrated that highly compliant patients (85% compliance) showed no curve progression at the end of the treatment, whereas poorly compliant
patients (62% compliance) showed curve progression of more than 6°.\textsuperscript{25,26}

**Compliance Counselling**

Providing a report on brace-compliance and therapy at each appointment could increase the stress already felt by the patient during brace care. Studies have shown that adolescents undergoing scoliosis brace treatment may experience greater psychological stress than is normal. If compliance monitoring and therapy will increase wear every day by 3 hours, some children who receive such therapy during their orthotic use may be treated successfully with the brace and avoid spinal surgery.\textsuperscript{27,28}

The appearance and developing of braces, age and psychological characteristics will alter the amount of brace wearing hours. The awareness of influential compliance factors and their incorporation into each other can affect the improvement of hours of wear.\textsuperscript{6}

Cooperation of the patient in brace design process tends to reduce the level of negative emotions. The idea of co-design can be implemented in the first meeting between the patient and the orthotist and it will offer an opportunity to select the color and design chosen. Psychological dimension is the inseparable element in the compliance protocol, and further research and studies are also needed. If we collect any psychological items listed in this section in one treatment project and design "Psycho-Scolio" (combined psychological aspect and scoliosis brace care) program, adherence may be improved. The Psycho-Scolio plan may include therapy sessions, remembering appropriate encouragement during each visit, educating the family of the patient, peers and classmates to provide a healthy atmosphere and eventually patient cooperation during brace design.

**CONCLUSION**

Literatures have suggested that quality of life should be monitored carefully during treatment, highlighting the difficulties experienced by patients when undergoing conservative treatment. Considering the factors affecting compliance with brace treatment can improve the compliance and overall treatment in idiopathic scoliosis. Spinal braces should be designed with comfortable structure and suitable appearance. Starting brace wear within earlier ages and considering the child habits and preferences along with the treatment plan and prescribed regimen for the orthosis can revolutionize the overall compliance. The ultimate effect of treatment may then be enhanced (in both physical and psychological aspects).

**REFERENCES**

8. Maruyama T, Takeshita K, Kitagawa T. Disability and Rehabilitation: Assistive

How to cite this article: Nandal S, Kumar Y. Trends and challenges in the usage and compliance of bracing in adolescent idiopathic scoliosis: a review. Int J Health Sci Res. 2020; 10(7):75-80.

*****