Short-Term Outcomes of the Boston Night Shift in the Treatment of Adolescent Idiopathic Scoliosis: A Retrospective Study

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Abstract

Introduction: Idiopathic scoliosis is characterized by a lateral curvature of the spine with a Cobb angle greater than 10 degrees, along with vertebral rotation. Bracing with thoracolumbosacral orthoses (TLSOs) has been shown to prevent curve progression. Nighttime-only brace wear is an alternative bracing approach that eliminates the need for TLSO use during waking hours. The aim of this study is to retrospectively assess the outcomes of the Boston Night Shift orthosis in the non-operative management of adolescent idiopathic scoliosis (AIS) based on the Scoliosis Research Society (SRS) and the International Society on Scoliosis Orthopedic and Rehabilitation Treatment (SOSORT) criteria.

Methods: An electronic medical records search was conducted to identify first-time brace wearers who were fit with a Boston Night Shift scoliosis TLSO at a Boston Orthotics and Prosthetics clinic between January 1, 2019 – February 1, 2023. The initial out-of-brace (OOB), in-brace (IB), and last follow-up X-rays (taken at least 12 months after initial fitting) were independently reviewed by three blinded clinicians, and data were compared. The following variables were assessed: initial Cobb angle (°), IB Cobb angle (°), follow-up Cobb angle (°), first sensor reading (hours/day) (FSR), IB correction (%), curve location (thoracic, thoracolumbar, or lumbar), compensation (compensated, decompensated left, or decompensated right), single or double curve pattern, sex (male or female), and Risser sign (0, 1, or 2).

Results: 31 patients were included in this study. Six (19.4%) patients' major curves improved by six degrees or more, 20 (64.5%) patients' major curves remained unchanged, plus or minus five degrees, and five (16.1%) patients' major curves progressed by six degrees or more. When separated by curve type, thoracolumbar curves displayed the greatest stability, with 83.3% of thoracolumbar curves classified as unchanged and 16.7% improved. 70% of thoracic and lumbar curves improved or stayed the same.

Conclusion: The Boston Night Shift scoliosis orthosis is an effective part-time wear brace for non-surgical scoliosis treatment. Short-term results show efficacy in preventing progression, and, in some cases, improving scoliotic curves. In this study sample, the Boston Night Shift appeared to have more favorable outcomes in adolescent idiopathic scoliosis patients with major thoracolumbar curves, compensated curves, Risser signs 0-1, or who are female, warranting further investigation in powered, larger studies.

Key words: adolescent idiopathic scoliosis, outcomes, Boston night shift

Introduction

Idiopathic scoliosis is characterized by a lateral curvature of the spine with a Cobb angle greater than 10 degrees, along with vertebral rotation.[1] Scoliosis bracing with the use of thoracolumbosacral orthoses (TLSO) has been shown to prevent the progression of the scoliotic curve.[1,2] Prescribed wear time for scoliosis bracing is divided into full-time and part-time categories. Full-time bracing is considered 16-23 hours/day,[1] and part-time bracing is typically 12-13 hours/day.[3] Nighttime-only wear of a scoliosis TLSO is a subgroup of part-time bracing that eliminates the need to wear a TLSO during waking hours. Current nighttime scoliosis bracing studies primarily report outcomes on the Providence or Charleston TLSO designs,[4,5,6] or compare these designs to the Boston Brace, a full-time wear TLSO design.[3,7,8] Research indicates that nighttime bracing can be an effective alternative to full-time bracing for patients with adherence concerns, curve apices at or below T7, flexible curves, and higher Risser signs.[3,4,6,7,9,10,11]

The Boston Brace 3D is a derivative of the original Boston Brace, first described by Watts then developed by Hall and Miller in the 1970s.[12] The Boston Brace 3D principles, which include internal pushes and shifts opposite to the areas of relief, are oriented based on clinical exam and X-ray blueprinting.[13] Internal pads are added to enhance the computer-aided design (CAD) internal forces and allow the optimization of the orthosis after the initial in-brace X-ray and continued growth of the individual.[13] The Boston Night Shift is an alternate TLSO design that is custom fabricated from a scan or measurements of the patient. It incorporates the Boston Brace 3D principles. The Boston Night Shift is a nocturnal brace, designed to optimize correction while the patient is supine.

While current literature strongly supports the effectiveness of nighttime bracing as an alternative to full-time bracing[3,4,6,7,10,11] there is a lack of research specifically on the Boston Night Shift. The aim of this study is to retrospectively assess the outcomes of the Boston Night Shift orthosis in the non-operative management of AIS based on the Scoliosis Research Society (SRS) and the International Society on Scoliosis Orthopedic and Rehabilitation Treatment (SOSORT) criteria.

Methodology

This is a retrospective study. Internal Review Board (IRB) exemption was obtained for this retrospective study by Pearl IRB (IRB 2025-0171, accessed April 7, 2025). Athenahealth Electronic Medical Records (EMR) were utilized to identify patients that meet the following inclusion criteria: fit with a Boston Night Shift orthosis between January 1, 2019 – February 1, 2023 at a Boston Orthotics and Prosthetics (BOP) clinic, diagnosis of adolescent idiopathic scoliosis (AIS), Risser sign between 0-2, major, or primary, curve Cobb angle between 25-40 degrees, first-time brace wearer, aged between 10-17 years at the date of brace fitting, and obtained follow-up out-of-brace (OOB) X-ray at least 12 months after initial fitting of orthosis. Patients both with and without adherence monitors (Boston Sensor or iButton) were included in the study as these monitors are optional to patients and families. Patients were excluded from the study if they met the following exclusion criteria: not fit with a Boston Night Shift orthosis, diagnosis of non-idiopathic scoliosis, Risser sign 3 or greater, major curve Cobb angle less than 25 or greater than 40 degrees, not a first-time brace wearer, age at fit less than 10 years or older than 17 years, or no appropriate follow-up at BOP (Figure 1).

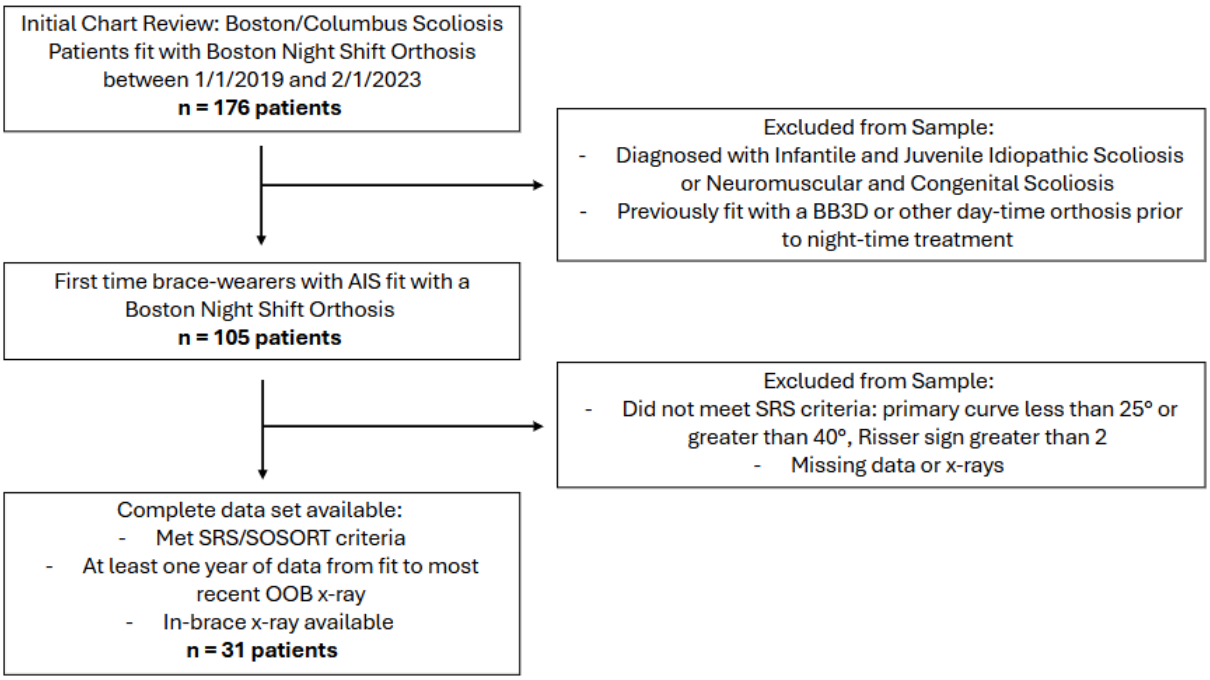

Figure 1. Refining the data for final criteria of patients included in the report.

Each patient had three X-rays included in this study: initial evaluation, first in-brace (IB), and final follow-up OOB (at least twelve months after initial fitting). X-ray review and Cobbing was completed by six individual clinicians using the radiograph analysis software *Synapse* [Computer software].Version 7.4.220. Boston Children's Hospital Radiology: FUJIFILM Healthcare Americas Corporation; 2024-2025. Each X-ray was randomly assigned to three clinicians and clinicians were blinded to other answers during data collection. X-ray analysis was completed by multiple clinicians to improve accuracy and reduce biases that are inherent to manual reviewing and Cobbing. Each X-ray was evaluated for the following: Risser sign, compensation, curve quantity (single or double), curve apex, curve direction, and curve severity (Cobb angle). Each clinician input their findings into an electronic survey form which was then converted into a spreadsheet.

Intra-rater reliability was determined by having each of the six individual clinicians Cobb thirteen randomly assigned X-rays twice, with the second round being one month after the original round. The difference between Cobbing answers was calculated (Table 1). Inter-rater reliability was determined by assessing the range in degrees of Cobb angle answers for each curve (Table 2). For each reliability assessment, if the range of answers was less than six degrees, the answers were classified as 'reliable'[14]. If the range of answers was greater than six degrees, it was classified as 'outside of standard acceptable error'[14]. Intra- and inter-rater reliability are variable, as X-ray Cobbing has large potential for intrinsic error, such as poor-quality images and incorrect definition of upper/lower end vertebrae and line drawing[15-18]. The reliability assessment was performed based on individual curves and per individual patient, as reported below.

Table 1: Intra-rater reliability

Cobber Number	Reliability per Patient	Reliability per Curve
1	92.3%	96.2%
2	76.9%	88.5%
3	100.0%	100.0%
4	69.2%	84.6%
5	61.5%	80.8%
6	76.9%	88.5%

Table 2: Inter-rater reliability

X-Ray	Reliability per Patient	Reliability per Curve
Evaluation	74.2%	83.9%
In-Brace	74.2%	87.1%
Follow Up	64.5%	80.6%

Data was processed in *Microsoft Excel* [Computer software].Version 2510 (Build 16.0.19328.20190). Microsoft 365 MSO; 2025. One finalized set of radiograph analysis answers was formed by averaging or majority ruling of the three survey answer sets. Continuous variable answers, including initial Cobb angle (°), IB Cobb angle (°), follow-up Cobb angle (°), and first sensor reading (hours/day), were averaged to obtain the values used for outcome analysis. IB correction (%) was calculated in Excel but not ultimately used for outcome analysis. Categorical variable answers, including curve location (thoracic, thoracolumbar, or lumbar), compensation (compensated, decompensated left, or decompensated right), single or double curve pattern, sex (male or female), and ordinal variable answers including Risser sign (0, 1, or 2), were assessed using a majority system (2+/3) to obtain the values used for data analysis.

Bracing outcomes were calculated by comparing the patients' major curves. Major curves are defined as the spinal curvature with the greatest Cobb angle[19]. If a patient presented with a single curve, that was deemed the major curve. The outcome measure, follow-up change (°), was assessed using standard six-degree Cobbing error[14,20]. When comparing the initial Cobb angle (°) to the follow-up Cobb angle (°), if the degree change was less than six, the curve was classified as 'Unchanged'[20]. If the degree change was greater than or equal to six, with an increase in magnitude, the curve was classified as 'Progressed'[20]. If the degree change was greater than or equal to six with a decrease in magnitude, the curve was classified as 'Improved'[20].

The statistical analysis of Boston Night Shift bracing outcomes was completed using both Excel and *R* [Computer software].Version 4.5. Copyright (C) 2025 The R Foundation for Statistical Computing, with R Studio interface. Power analysis of outcomes was completed for all variable subgroups. Significances between outcome categories in the entire sample and in the categorical variable groups were calculated using two-tailed t-tests assuming unequal variance or ANCOVA tests. The following variables were assessed: follow-up change (°), in-brace correction (%), curve location, compensation, single or double curve, sex, Risser sign, and first sensor reading.

Results

The initial chart review revealed that 31 patients, aged 10-15 years, with a diagnosis of adolescent idiopathic scoliosis, were fit with a Boston Night Shift scoliosis TLSO at a Boston Orthotics and Prosthetics clinic between January 1, 2019 – February 1, 2023.

Patient data was organized into whole sample analysis and broken down into the following categories: curve location (thoracic, thoracolumbar, or lumbar), compensation (compensated, decompensated left, or decompensated right), single or double curve pattern, sex (male or female), and Risser sign (0, 1, or 2). Descriptive statistics of continuous variables are shown in Table 3a. Descriptive statistics of categorical variables are shown in Table 3b. No statistically significant difference in initial Cobb angle (as evidenced by p values > 0.05) was seen in any subgroups, except Risser sign.

Table 3a: Continuous variable descriptive statistics

Variable	n (non-missing)	Mean	σ	Minimum	Maximum
Age	31	12.6	1.5	10.0	15.0
First Sensor Reading	23	5.9	2.6	1.9	10.1
Initial Cobb Angle	31	45.1	41.7	19.7	40.0
In-Brace Correction (%)	31	72.7	50.2	9.9	186.7
Follow-Up Change (°)	31	0.1	6.5	-11.7	24.3
Follow-Up Change (%)	31	5.5	25.0	-42.5	100.0

Table 3b: Categorical variable descriptive statistics

Variable	Category	n	% of Total	*p* Value
Sex	Female	26	83.9%	
	Male	5	16.1%	0.85
Risser	0	19	61.3%	
	1	6	19.4%	
	2	6	19.4%	0.04
Decompensation	Left	19	61.2%	
	Compensated	12	38.7%	0.97
Major Curve Type	Lumbar	10	32.3%	
	Thoracic	12	38.7%	
	Thoracolumbar	9	29.0%	0.13
Single or Double	Single	15	48.4%	
	Double	16	51.6%	0.07

Boston Night Shift bracing outcomes were calculated by comparing major curve magnitude between evaluation and OOB follow-up (at least 12 months after initial evaluation). Cobb angle change was organized per the SRS/SOSORT guideline for research studies: Improved (Cobb angle reduced by 6 degrees or more), Unchanged (Cobb angle change was less than or equal to 5 degrees), or Progressed (Cobb angle increased by 6 degrees or more)[20]. A summary of outcome breakdowns by quantity and percentage is shown in Table 4.

Table 4: Quantity and percentage of patients with curves that progressed, improved, or remained unchanged in each sample category.

Sample Categories	Improved (≥6°)	%Improved (≥6°)	Unchanged (+/- 5°)	%Unchanged (+/- 5°)	Progressed (≥6°)	%Progressed (≥6°)
N	6	19.4%	20	64.5%	5	16.1%
Sex						
Female	5	19.2%	18	69.2%	3	11.5%
Male	1	20.0%	2	40.0%	2	40.0%
Risser Sign						
Risser 0	3	15.8%	14	73.7%	2	10.5%
Risser 1	2	33.3%	3	50.0%	1	16.7%
Risser 2	1	16.7%	3	50.0%	2	33.3%
Compensation						
Left Decomp.	3	15.8%	12	63.2%	4	21.1%
Compensated	3	25.0%	8	66.7%	1	8.3%
Curve Type						
Thoracic	3	30.0%	4	40.0%	3	30.0%
Thoracolumbar	2	16.7%	10	83.3%	0	0.0%
Lumbar	1	10.0%	6	60.0%	3	30.0%
Single or Double						
Single	3	20.0%	10	66.7%	2	13.3%
Double	3	18.8%	10	62.5%	3	18.8%

In the overall sample, six (19.4%) patients' major curves improved, 20 (64.5%) patients' major curves were classified as unchanged, and five (16.1%) patients' major curves progressed. Patterns were similar across subgroups. Sex outcomes displayed a 29.2% difference in unchanged classification and 28.5% difference in improved classification when comparing outcomes for males versus females. However, it is important to note that the male sample size was only five patients compared to the 26 female patients. Patients evaluated with Risser signs 1 and 2 had the greatest variance between outcome categories. Risser sign 2 displayed the greatest percentage of curves that progressed and Risser sign 1 showed a greater percentage of curves that improved. A total of 19 patients were decompensated to the left, with three (15.8%) having

curves that improved, 12 (63.2%) that did not change, and four (21.1%) that progressed. 12 patients were compensated, and of those 12, three (25%) had curves that improved, eight (66.7%) did not change, and one (8.3%) progressed. In curve type, thoracolumbar curves displayed the greatest stability, with 83.3% of thoracolumbar curves classified as unchanged and 16.7% as improved. 70% of lumbar curves and thoracic curves were classified as unchanged or improved. Thoracic curves showed the most equal distribution of degree change outcomes. Single versus double curves displayed similar outcome distributions. Although this study uses only a patient's major, or primary, curve to determine outcomes, secondary curve data was collected. Of the 15 single curve patients, four had development of a secondary, or compensatory, curve at follow-up (10+ degree Cobb angle).

Once classified as progressed, unchanged, or improved, the data were further processed to determine the average and standard deviation of degree change in each category for the overall sample and each sample subgroup. (Table 5).

Table 5: Mean and standard deviation of major curve degree change for total subgroup and improved/progressed only

Subgroup	Total Mean	Total σ	Improved Mean	Improved σ	Progressed Mean	Progressed σ
N			10.4	7.0	-9.5	1.8
Sex						
Female	1.2	7.2	11.2	8.0	-10.8	1.4
Male	-2.3	6.6	6.3	ODP	-8.5	2.6
Risser Sign						
Risser 0	1.0	7.6	12.4	10.3	-11.0	0.1
Risser 1	2.9	6.3	9.5	0.7	-6.7	ODP
Risser 2	-2.7	6.0	6.0	ODP	-9.3	0.5
Compensation						
Left Decompensation	-1.2	6.0	8.6	1.7	-9.3	2.1
Compensated	3.6	8.1	12.2	12.7	-10.3	ODP
Curve Type						
Thoracic Curve	0.1	7.6	7.6	2.4	-9.7	0.7
TL Curve	1.9	8.0	16.7	10.8	N/A	N/A
Lumbar Curve	-0.3	6.1	6.3	ODP	-9.2	3.5
Single or Double						
Single Curve	1.7	8.3	13.6	9.5	-10.0	0.5
Double Curve	-0.3	6.0	7.2	1.6	-9.1	2.5

ODP indicates one data point; therefore, the statistic in question does not apply.

Of all major curves that improved, the average improvement was 10.4 +/- 7.0 degrees. Curves that progressed had a similar mean but a lower standard deviation, -9.5 +/- 1.8 degrees. Power analysis was completed for all variable subgroups. All power results were low, with no output above 0.65. T-test and ANOVA tests were performed on all variable subgroups, with no

statistical significance shown. For example, no statistical significance was found on follow-up change (°) between single or double curve types.

Progressed and improved curves were then separated into variable subgroups. Due to the limited sample size, some of these subgroup divisions only had one data point (ODP) or no data points (N/A). Standard deviation could not be calculated for subgroup divisions with ODP. All but the left decompensation subgroups showed greater standard deviation in the improved curves when compared to the progressed curves. The range of average degree change was similar, -6.7 degrees to -11 degrees for progressed curves and 6.0 to 16.7 degrees for improved curves. For thoracolumbar curves that improved, these curves improved by the largest average, at 16.7 degrees. Patients who were evaluated at Risser sign 1 with curve progression had the largest mean of progression at 11 degrees. Average first sensor reading did not significantly vary between outcome groups (not shown in Table 5). The progressed outcome group had an average FSR of 6.6 hrs/day. The no change outcome group had an average FSR of 6.2 hrs/day. Finally, the improved outcome group had an average FSR of 6 hrs/day. Of the patients who opted out of sensor use, one major curve was classified as progressed, five as no change, and two as improved.

Discussion:

The Boston Night Shift scoliosis TLSO is part of a standardized programmatic approach for the non-operative management of idiopathic scoliosis, which consists of both clinical and fabrication guidelines. The clinical program outlines key elements for the patient evaluation, X-ray analysis (both out-of-brace and in-brace), and brace optimization throughout the episode of care. The fabrication guidelines provide a systematic and repeatable approach that is customized to each individual scan of the patient. The Boston Night Shift is a derivative of the Boston Brace 3D, and each orthosis is custom-fabricated from a scan and or measurements of the individual patient.

The Boston Night Shift orthosis was developed from the Computer-Aided Design (CAD) modifications used when fabricating the Boston 3D orthosis. Fabrication of the Boston Night Shift begins with a scan of the patient. CAD modifications incorporate three-dimensional overcorrective pushes and shifts into the scanned model of the patient, which is then made into a carved model. Boston Night Shift integrated corrective forces are more aggressive than those in the Boston 3D because the patient is in a gravity-eliminated position during brace wear. The Boston Night Shift standard of care includes an offer to include a temperature sensor at evaluation. It is the parent or guardian’s decision on whether or not they would like it included in the orthosis. The standard of care protocol also consists of an IB X-ray taken four to six weeks after the fit appointment, an initial follow-up appointment scheduled one week prior to the X-ray, and a second follow-up scheduled after the X-ray. Figure 2 displays an initial OOB X-ray compared to the in-brace X-ray (left and middle), and an example Boston Night Shift orthosis fit on a patient while supine (right).

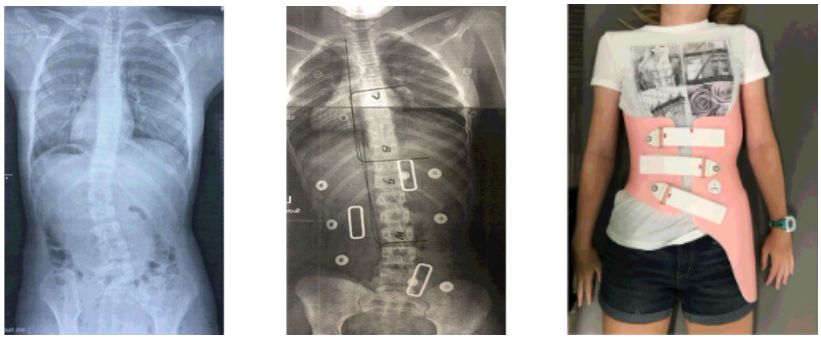

Figure 2. Initial OOB X-ray compared to the in-brace X-ray (left and middle), Boston Night Shift orthosis fit on a patient in supine (right).

This study aimed to retrospectively assess the outcomes of the Boston Night Shift orthosis in the non-operative management of adolescent idiopathic scoliosis (AIS) based on the Scoliosis Research Society (SRS) and the International Society on Scoliosis Orthopedic and Rehabilitation Treatment (SOSORT) criteria. The outcome measure used in this study was follow-up change (°) (initial Cobb angle (°) - follow-up Cobb angle (°)). To understand the outcomes of the Boston nightshift, follow-up change (°) was organized by the following three categories: improved, no change, and progressed. The sample was also divided by curve location (thoracic, thoracolumbar, or lumbar), compensation (compensated, decompensated left, or decompensated right), single or double curve pattern, sex (male or female), and ordinal variable answers, including Risser sign (0, 1, or 2). The relationship between each of the subgroups and the Power analysis showed that no subgroup had power above 0.65. Additionally, no statistical significance was found within subgroup categories. For example, no statistical significance was found on follow-up change (°) between single or double curve types. The low power is likely due to the small sample size and indicates that p-value results may not be representative of the actual differences being assessed. A statistically significant relationship or lack thereof cannot be confidently determined in any subgroup-to-outcome-measure relationship. Descriptive statistics of the follow-up change (°) outcome were reported to assess the direction, magnitude, and classification of the results. Results still provide insight into clinically relevant patient demographics.

In the overall sample, six patients' major curves improved (19.4%), 20 patients' major curves were classified as unchanged (64.5%), and five patients' major curves progressed (16.1%). The majority of patients, both in the whole sample and in subcategories, were classified as unchanged.

<u>Sex</u>

This study's population sample consisted of 26 females and five males. The data show that five (19.2%) of the females' curves improved, 18 (69.2%) did not change, and three (11.5%) progressed. Of the males, 1 (20%) curve improved, two (40%) did not change, and two (40%) progressed. Due to the small number of males included in this study, there is a high margin of error and future studies should include more male patients.

Risser Sign

Risser 0 displayed the lowest percentage of curve progression at 10.5%. Risser 1 had the second lowest at 16.6%, and Risser 2 had the greatest curve progression percentage at 33.3%. Although the Risser 2 subgroup had the highest progression rate, three (50%) of the curves remained unchanged, and one (16.7%) improved, so the majority of patients in the Risser 2 subgroup still saw curve stability with nighttime bracing, as a total of 66% of curves did not progress. It is relevant to note that the Risser subgroups (0, 1, and 2) initial Cobb angles were compared and had a statistically significant *p-value* of 0.04. There was a statistically significant difference (p = 0.03) when comparing Risser 0 and Risser 2. The average initial Cobb angle for the Risser 0 group was 26.1°, for Risser 1 it was 28.3°, and for Risser 2 it was 31.7°. Unlike this study, which showed greater success in the Risser 0 subgroup, previous studies have shown nighttime bracing to be effective for higher Risser signs.[7] The clinically and statistically significantly different initial Cobb angles may have influenced bracing outcomes between Risser groups. Future work may include patients who have higher Risser signs, but also seek a larger and more equally distributed sample of each Risser sign for improved outcome comparison.

Compensation

19 patients were decompensated to the left, and 12 patients were compensated. No included patient was decompensated right. Of those who were decompensated, 15 (79%) saw curve improvement or no change, while four (21.1%) saw curve progression. Of the patients who were compensated, 11 (91.7%) saw curve improvement or no change, and one (8.3%) saw curve progression. 25% of the compensated subgroup was classified as improved, while only 15.8% of the decompensated left subgroup was classified as improved. Although a statistically significant difference was not found, likely due to insufficient power and sample size, the 12.8% difference in the progression outcome classification and the 9.2% difference between the improved outcome classification suggest clinical importance. Further research is required to understand the relationship between compensation and a patient's candidacy for successful Boston Night Shift treatment.

Curve Type

Patterns were similar in the thoracic and lumbar subgroups with three (30%) thoracic curves improving, four (40%) thoracic curves remaining unchanged, and three (30%) thoracic curves progressing; while 1 (10%) of lumbar curves improved, six (60%) remained the same, and three (30%) progressed. Thoracolumbar curves displayed the greatest stability, with 83.3% of

thoracolumbar curves classified as unchanged and 16.7% improved. No thoracolumbar curves were classified as progressed. For thoracolumbar curves that improved, these curves were found to have improved by the largest average, at 16.7 degrees. These results are consistent with previous work studying nighttime bracing, showing that thoracolumbar curves tend to respond best to part-time nocturnal brace designs.[4,6,23,24] When comparing thoracic and lumbar curves, thoracic curves showed more improvement, while more lumbar curves remained unchanged.

Single or Double

Outcomes for single and double curve patterns were very similar, and there was almost equal division between the two groups, with 15 single curves and 16 double curves. For single curves, three (20%) improved, ten (66.7%) remained unchanged, and two (13.3%) progressed. For double curves, three (18.8%) improved, ten (62.5%) unchanged, and three (18.8%) progressed. Outcomes for each curve type did not show a statistically significant clinical difference. Although only the major curve was used for outcome analysis, all curves present in the X-rays were Cobbed during data collection. A review of secondary curves revealed that four patients who initially had single curves at evaluation developed secondary curves by their short-term follow-up appointment. Future research could investigate all curves individually, rather than solely basing outcomes on the major curve, to better understand how often a secondary curve is induced and how secondary curves respond to scoliosis bracing.

Limitations

The limitations of this retrospective review include a limited sample size and inherent variability, such as human Cobbing error. Expected error in X-ray Cobbing and highly customized brace design, such as pad placement, trimlines, axilla extension options (inset, outset, or neutral), lead to inherent variability in scoliosis treatment data collection. Additionally, the reliance on Cobb angle as a measurement of scoliotic curvature is itself a limitation, as Cobb is measured on 2D imaging, while scoliosis is a 3D deformity. This mismatch between the tool's capabilities and the condition’s complexity can result in inaccuracies, limiting the generalizability and precision of the findings. Inherent bias was reduced through the use of three blinded individual Cobbers for each X-ray evaluated in this study.

This study had a limited sample size, resulting in a lack of power during data analysis. Patients were excluded due to SRS/SOSORT criteria, lack of follow-up, or previous alternative scoliosis bracing history. Future studies should aim to have a larger, powered sample to continue investigation regarding outcome trends noticed in this study. Sample size may benefit from expanding the acceptable inclusion criteria. For example, one limiting factor was the Risser sign requirement (0-2). Previous studies have shown nighttime bracing to be effective for higher Risser signs.[7] Future work may include patients who have higher Risser signs to accomplish a larger and more inclusive sample.

Patients were included in this study regardless of their use status of the optional adherence monitors. All descriptive statistics calculated for the first sensor reading subgroup were based on the sample size of patients who used a sensor, n = 23, as opposed to the total sample size, N = 31. Previous studies have highlighted the importance of the dose in successful outcomes.[1,21,22] These studies have shown a correlation between increased dose and better bracing outcomes. In this study, the average first sensor reading did not significantly vary between outcome groups. The progressed outcome group had an average FSR of 6.6 hours/day. The no change outcome group had an average FSR of 6.2 hours/day. Finally, the improved outcome group had an average FSR of 6 hours/day. Of the patients who opted out of sensor use, one major curve was classified as progressed, five as no change, and two as improved.

Conclusion

The Boston Night Shift scoliosis orthosis is an effective part-time bracing solution for non-surgical scoliosis treatment. Short-term results show efficacy in preventing progression, and, in some cases, improving scoliotic curves. In this study sample, the Boston Night Shift appeared to have more favorable outcomes in adolescent idiopathic scoliosis patients with major thoracolumbar curves, compensated curves, Risser signs 0-1, or who are female, warranting further investigation in powered, larger studies.