



(CASE REPORT)



Cobb angle decrease with CAEN brace for adolescent idiopathic scoliosis: A case report

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Abstract

Adolescent idiopathic scoliosis (AIS) is a three-dimensional spinal deformity defined by a lateral curvature of the spine with a Cobb angle of at least 10 degrees. The appropriate treatment is chosen based on the patient's maturity (Risser sign), location, severity, and progression risk of curvature. Skeletally immature patients with a Cobb angle above 25 degrees or less with evidence of progression are usually treated with a brace in order to prevent curve progression, therefore preventing the need for surgical correction. Nighttime bracing was developed to ensure brace compliance without compromising the overall effectiveness of brace treatment. We present the case of an adolescent boy with idiopathic scoliosis and progressive spinal curvature who was treated with a type of nighttime brace (CAEN). The overall result was satisfactory, with not only no increase in the final curvature after brace discontinuance but also a 15° decrease relative to the initial Cobb angle.

Keywords: Adolescent idiopathic scoliosis; CAEN brace; Nighttime bracing; Cobb angle; Skeletal maturity

1. Introduction

Adolescent idiopathic scoliosis (AIS) is the most common form of paediatric scoliosis and occurs in children over the age of 10 years until skeletal maturity in the absence of underlying congenital or neuromuscular abnormalities. The global prevalence ranges from 0.47% to 5.20% [1], with girls being afflicted 5-10 times more than boys [2]. The etiopathogenesis of this disorder remain unknown. Patients with AIS and immature skeletons are most vulnerable to curve progression, which can lead to significant spine deformation, respiratory issues, and back pain if not treated [3]. Bracing serves as the heart of conservative management and is typically recommended in skeletally immature patients with curves ranging from 25 to 40 degrees or curves less than 25° and a documented progression of more than 5 degrees at consecutive follow-up assessments [3, 4]. Success was defined as no surgery, and a main curve Cobb angle progression $\leq 5^\circ$ and/or curve progression $< 45^\circ$ at brace discontinuation (skeletal maturity). Conversely, it became a failure if a curve increased more than 6° and/or curve progression to $> 45^\circ$ [5]. There is no worldwide consensus on the type of brace or wear time [6]. The CAEN nocturnal hypercorrective scoliosis brace, which is normally worn for 8 to 10 hours at night, allows for greater in-brace curve adjustments than a standard full-time brace with the ability to assure brace compliance while minimising the negative impacts of use or compromising the overall effectiveness of treatment [7]. In the present case, we will discuss the outcome of this sort of brace treatment for a boy with AIS.

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2. Case Presentation

2.1. History

A 12-and-a-half-year-old boy presented to our department with a progressive spinal deformity. Upon presentation, he entered puberty six months ago, had normal development, no medical concerns, and no family history of significant spinal deformities or other serious medical conditions. There had been no previous brace treatment.

2.2. Physical examination

The patient is a healthy-appearing adolescent with a near-ideal body weight. At inspection, no neurocutaneous markers were noted, the right shoulder is slightly higher with minimal waistline asymmetry. The TRACE score [8] was 6/12.

The thoracolumbar range of motion is full and painless. There is an 5° right thoracic rotational prominence and an 8° left lumbar region prominence as measured with the Sociometer.

Neurological assessment is normal. There is no clinical leg-length discrepancy. Cardiovascular and respiratory examinations were also unremarkable.

2.3. Radiographic evaluation

Standing posteroanterior and lateral radiographs of the whole spine exhibited a main thoracolumbar curve pattern: left convex curve extending from T11 to L4, apex at L2, and a Cobb angle of 21° with a reaction curvature above measuring 15° (Fig1). The main curvature was less than 16° on an anterior radiograph taken 6 months before his arrival. There were no signs of vertebral abnormalities or spinal dysraphism. he was Risser 3 in skeletal maturity, which means he still had growth potential.



Figure 1 Pretreatment standing radiograph: initial Cobb angle T11 -L4 21°, Risser sign 3

2.4. Diagnosis

Adolescent idiopathic scoliosis was diagnosed according to spinal radiographs and a clinical examination.

2.5. Selected treatment

We chose a CAEN nocturnal hypercorrective scoliosis brace 10/24h based on the recommendations and for compliance purposes.

Bracing was started by wearing the brace for as long as the patient tolerated it. After the first two weeks of brace wear, the in-brace correction was recorded as a percent of curve correction using an in-brace radiograph with the patient lying supine. In our case it's was recorded at 100% (Fig. 2).



Figure 2 In-brace correction on a lying supine radiograph

2.6. Follow-up

Regular follow-up with a clinical examination was carried out every 4-6 months, and a radiological assessment was carried out every 12 months during treatment until end-of-skeletal growth (Risser sign 5).

To ensure the best evaluation of curve progression throughout bracing, the patient and parents were instructed not to wear the brace for three nights prior to the radiographic evaluation. This was assessed by measuring the magnitude of curvature using Cobb's angle and Risser's sign.

Compliance was documented throughout the clinical visit. The patient tolerated the brace without experiencing any skin complaints.

The patient remained active in sports across the brace treatment period, and no physiotherapy or exercises were recommended.

2.7. Outcomes

The treatment time in the brace from brace initiation was 22 months.

The right thoracic rotational prominence was aligned, and the lumbar prominence was reduced to 3° in scoliometer.

Final radiograph follow-up after brace discontinuation reveals a Cobb angle decrease to 6° at Risser 5 with a single curvature (Fig. 3). The patient was clinically re-evaluated 12 months afterward, and no clinical change was observed.

The next follow-up with new radiographs will be performed one year after the previous examination.



Figure 3 Standing radiograph after brace discontinuation

3. Discussion

Several studies have reported effective daytime curve control with braces, despite skin problems and psychological stress caused compliance challenges [9, 10]. As a more acceptable alternative to full-time bracing for adolescents, nighttime bracing was developed to reduce psychological stress and physical discomfort. It's appropriate as a conservative treatment for AIS in skeletally immature patients with single main curves and apex below T8 [2, 11]. In our case, the Cobb angle at baseline was 21° (<16° prior to 6 months), and the Risser sign was 3, revealing that the scoliosis was expected to increase during growth. Lonstein and Carlson revealed that untreated patients with initial curves 20–29° had a 68% probability of curve progression in Risser 0–1 against 23% Risser 2–4 [12]. The CAEN brace, developed in 1992 following the work of Reed and Price on the Charleston bending brace [13], provides a maximal side bending corrective force and is supposed to compensate for a shortened period of brace wear. G. Pierrard et al [7] reported a 75% success rate with 78 adolescents wearing a CAEN brace for 8 hours per night. Our brace decision was influenced by the above literature data as well as our previous experience with this sort of brace. The final outcome was satisfactory, with not only no increase in the final curvature at brace discontinuation but actually decreased by 15° compared to the initial Cobb angle. This case can serve as an example for promoting the use of nighttime bracing in AIS, provided with appropriate indication, compliance, and regular assessment.

4. Conclusion

Nighttime bracing is a viable alternative to full-time bracing for adolescent idiopathic scoliosis patients. If applied early during the period of immaturity or at the onset of maturity, the scoliosis curve can be stabilized might regress by significant degrees.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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