



CBB

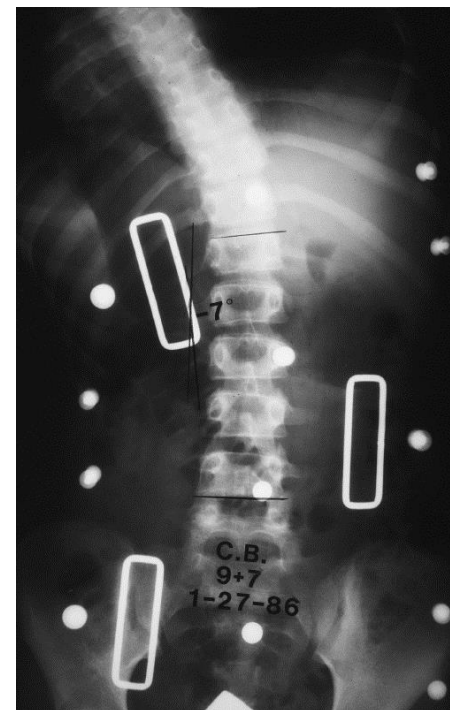
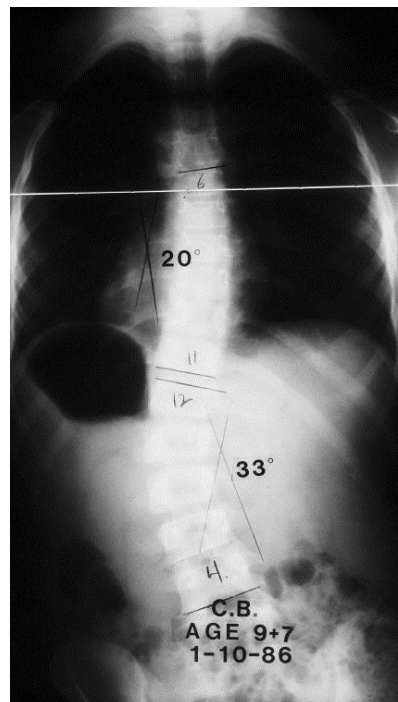
CHARLESTON BENDING BRACE

Non-Surgical, Nighttime, Scoliosis Management



CGM

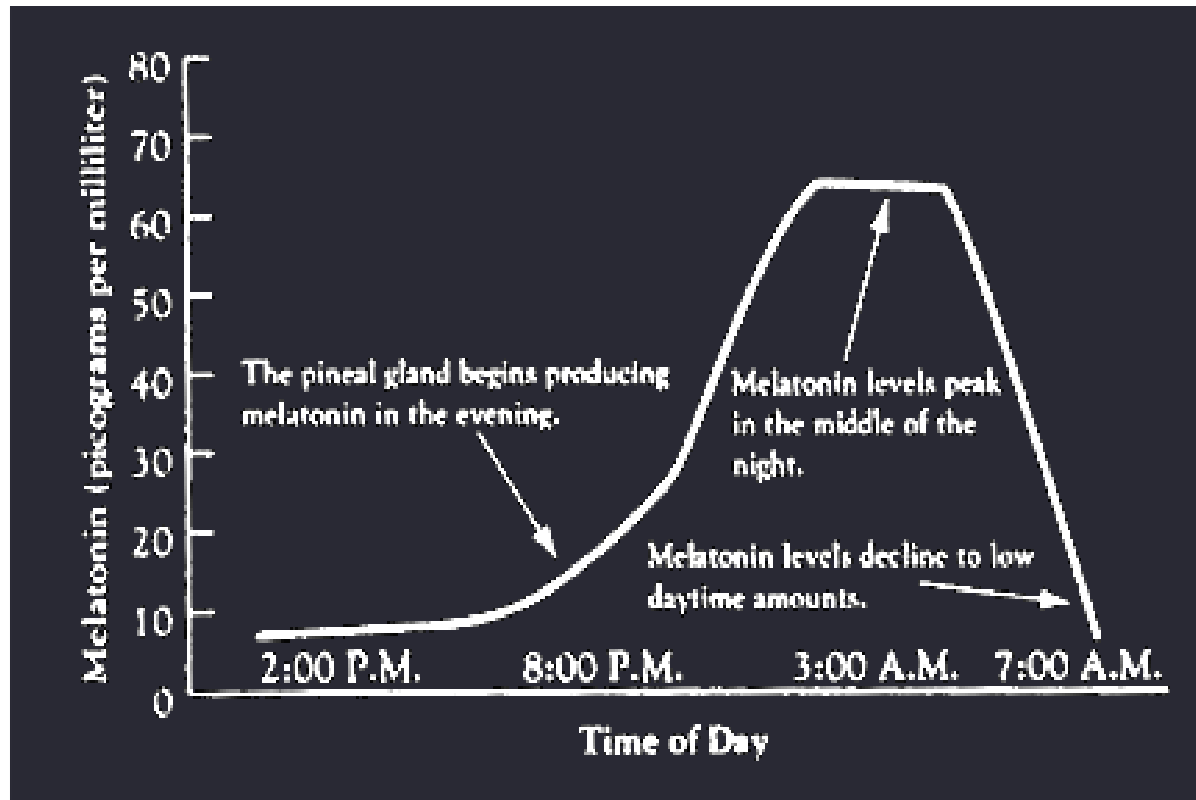
CHARLESTON: GROWTH MODULATION



Gravity vs. Growth

- **IF** scoliosis is a disorder of **GRAVITY** then **daytime** support is necessary.
- **IF** scoliosis is a disorder of **GROWTH** then **nighttime** bracing may be all that's required.

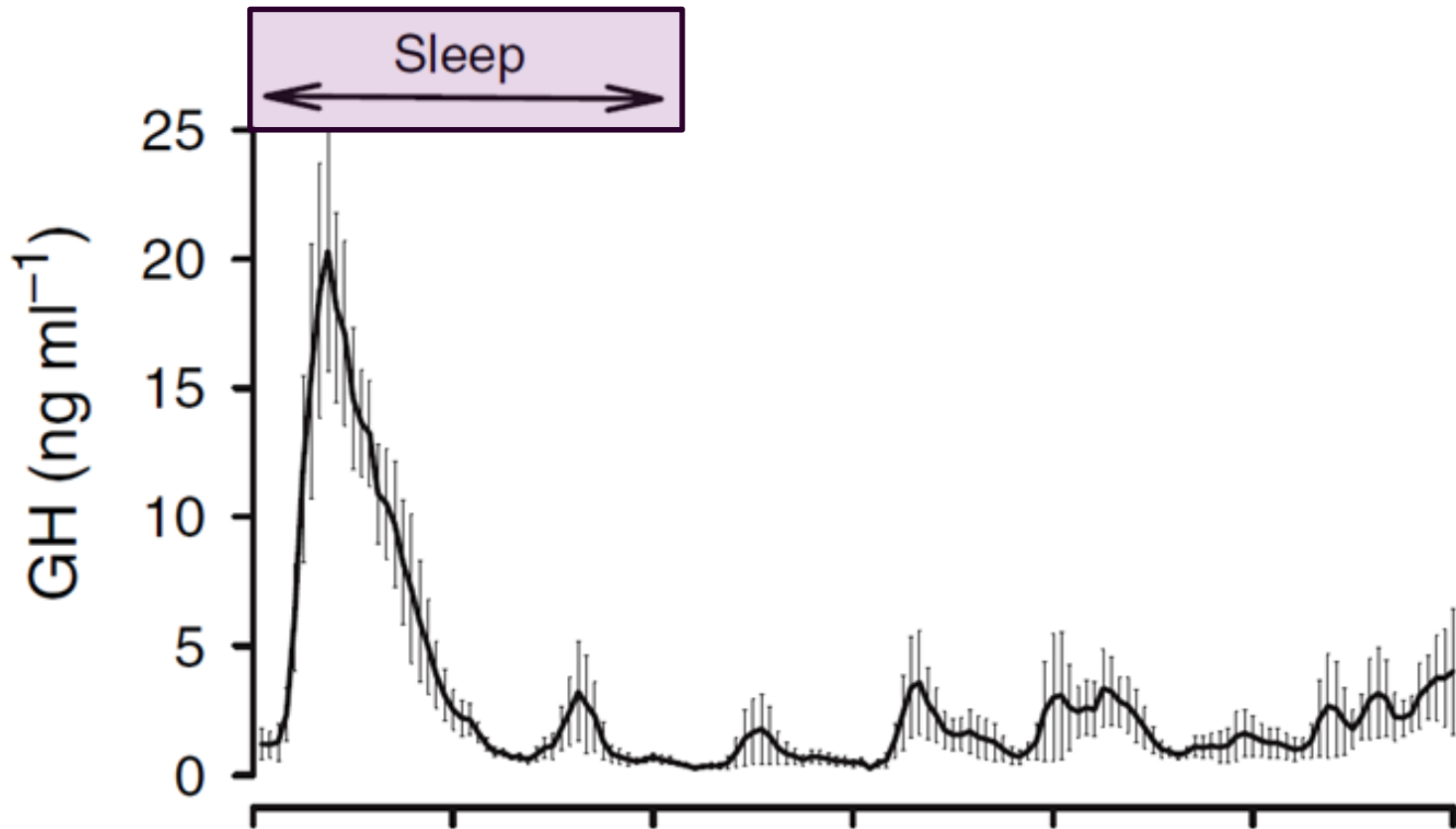
Melatonin



- Levels are high at **night** - minimal levels during the day
- Levels are low in patients with progressive AIS

Growth Hormone

is only present and active at night



Brandenberger G, "The 24-h growth hormone rhythm", J Sleep Res. 2004 Sep;13(3):251-5.

Tibial growth in lambs

“...at least 90% of **bone elongation occurs during recumbency** and almost no growth occurs during standing or locomotion. The authors hypothesize that growth may also occur in children during rest or sleep.”

Noonan KJ, et al. JPO 2004; 24(6):726-31



EVIDENCE-Spinal growth modulation by compression

1. Villemure I. Aubin CE. Dansereau J. Labelle H. *European Spine Journal*. 13:83, 2004
2. Newton PO, et.al. *Spine*. 30:2608, 2005
3. Stokes IA, Aronsson DD, et.al. *Journal of Orthopaedic Research*. 24:1327, 2006

In Brace Correction Correlates to biomechanical effectiveness of brace treatment in AIS

“In the framework of the **Hueter-Volkman principle**...in brace correction predicts long-term outcome of the treatment and provides insights in the understanding of brace biomechanics.”

Clin J, Aubin CÉ, Sangole A, Labelle H, Parent S Spine 2010 ;35(18):1706-13.

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Biomechanical Study

- This study quantified the Charleston brace's biomechanical effect, which consists in inverting the asymmetrical compressive loading in the major scoliotic curve
- The reduction of the major scoliotic curve varied between 58% and 97% and was in the range of published clinical data.
- Internal compressive stresses up to 1 MPa were generated on the convex side of the major scoliotic curve and tensile stresses up to 1 MPa on its concavity

Labelle H, Clin J, Aubin CE, Parent S Spine 2010 1;35(19):E940-710

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Early Intervention Study

- Early intervention treatment with the CBB may reduce progression to full-time bracing threshold.
- This study focused specifically on curve magnitudes between 15-25 degrees in skeletally immature, pre-menarchal females
- 100% of patients in the control group (observation) resulted in curves progressing to standard criteria for full-time bracing
- 29% of patients randomized to night time wear were maintained without curve progression. (Statistically significant)

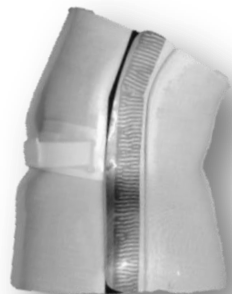
*** Nighttime Bracing Versus Observation for Early Adolescent Idiopathic Scoliosis; Wiemann, Shah, MD, Price; *Pediatr Orthop* Volume 34, Number 6, September 2014**

Charleston: Growth Modulation



- Bending increases pressure on convex vertebral growth centers to reduce growth
- Can be used for high thoracic curves
- Double curves are difficult to brace but can be treated by bending brace

New Evidence. New Solutions.



CBB-Standard	NEW CBB-II	NEW CBB-Lite*
<ul style="list-style-type: none">• Nighttime scoliosis management• Benchmark for 35+ years• Long single curves.	<ul style="list-style-type: none">• Nighttime dynamic treatment for Thoracolumbar Type II curves• Dynamic alignment strap	<ul style="list-style-type: none">• Nighttime wear for early intervention• Cobb angles > 25°• Neuromuscular patients• Weaning transition

Now available: Calculate wearing compliance % with **iO™ Compliance Monitor**.

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