Comparing the need for surgery following orthotic treatment for adolescent idiopathic scoliosis when using the Cheneau-type TLSO vs the Original Boston style TLSO.

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Clinical Question: Does the Cheneau-type (RCO) reduce the risk of requiring surgery post-treatment when compared to the Original Boston-style TLSO for treating adolescent idiopathic scoliosis (AIS)?

Background: Scoliosis is a 3-dimensional spinal deformity that affects 1%-3% of adolescents aged 10-16 years of age[1]. AIS is frequently treated with a thoracolumbosacral orthosis (TLSO) with the goal of preventing progression of deformity until the patient is skeletally mature, where there is lower risk of progression. The Original Boston-style TLSO is a common orthosis used to treat scoliosis that uses padding and reliefs to provide ≥ 50% correction while in-brace. Unlike the Original Boston Style TLSO, which is symmetrical in shape, the Cheneau-type (RCO) is an orthosis that is asymmetric in shape and attempts to maximize curve and rotation correction while stabilizing the spine in coronal/sagittal planes. The objective of this CAT is to evaluate current literature and determine if the RCO reduces the risk of requiring surgery post-treatment when compared to the Original Boston-style TLSO

Search Strategy:
Databases Searched: CINAHL and PubMed
Search Terms: ((adolescent idiopathic scoliosis) OR (AIS)) AND ((Orthosis) OR (Orthotic)) AND ((Boston) OR (Cheneau))
Inclusion Criteria: The search was limited to peer reviewed publications within the last 10 years. The literature must have examined the use of either the RCO, Boston Brace, or both and the need for surgical intervention after orthotic treatment.
Exclusion Criteria: Full text not available in English. Articles published prior to 2010.

Synthesis of Results: This CAT examines three studies that fit the inclusion criteria. All the studies were retrospective observational studies that evaluated the success of the orthotic treatment through a long-term follow up.

Minsk et al.[2] compared the effectiveness of the RCO versus the Boston-style TLSO. The authors concluded through their findings that the RCO achieved better results than the Boston-style TLSO because 0% of the RCO group required surgery when compared to 34% of the Boston-style TLSO group. The largest limitation of the study was that the RCO group only had 13 participants when compared to 95 participants in the Boston-style TLSO group.

De Giorgi et al.[3] reviewed the effectiveness of RCO in preventing surgery for AIS patients. The study included 48 participants that were treated with the RCO. 0% of the participants required surgery after orthotic intervention. The largest limitation of this study is the small sample size and lack of a control group. The study also only examined patients who had a single curve.

Lange et al. [4] reviewed the long-term results of treatment with the Boston-style TLSO in patients with AIS and late onset juvenile idiopathic scoliosis. The study found that 9% of the 272 participants required surgical intervention following orthotic treatment with a Boston-style TLSO. The authors did not discuss what curve the participants who received surgery had or by what guidelines they were indicated for surgery.

Clinical Message: There may be some evidence that supports RCO use to minimize risk of surgery following orthotic treatment; however, the literature is limited by small sample sizes and non-uniform guidelines for surgery. These studies also do not take clinical considerations into account such as the necessary equipment, adjustability, or cost. More research is needed to establish if RCO are better than the Boston-style TLSO at reducing the need for surgery.

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	Minsk, 2017[2]	De Giorgi, 2013[3]	Lange, 2011[4]	Zaborowska-Sapeta, 2011[5]	Maruyama, 2014[6]
Population	108 patients (93 girls) 12.5±1.3 years. Met the following criteria. - Diagnosis of AIS -Risser 0-2 -Major curve between 25-40 degrees -no previous treatment for scoliosis -prescribed full-time brace treatment -follow-up until skeletal maturity or surgery	48 AIS with an age range of 11.3±2.0 years at the beginning of treatment. Met the following criteria. -Cobb angle between 20-45 degrees -no previous brace treatment -Risser 4 or more at final evaluation -minimum 2 years follow-up wearing the brace -All patients had a single curve (8 thoracic, 28 thoracolumbar, and 12 lumbar)	-272 (251 women) patients with AIS or late onset JIS -Major scoliotic curve ≥ 20 degrees with an observed progression ≥ 5 degrees after 4 months and Risser ≤ 4. -Mean age at follow-up was 40.4 years of age -Treated with Boston TLSO	79 patients (58 girls and 21 boys) who met the following criteria -Progressive idiopathic scoliosis -treated with Cheneau Brace -Cobb angle between 20-45 degrees -no previous brace treatment -Risser 4 or more at final evaluation -minimum 1 year follow-up after brace weaning	33 patients (27 females and 6 males) -Average age was 11.9 years -Average cobb angle was 30.8 -13 patients had riser 0, 5 had riser 1, 15 had riser 2 -13 thoracic curves, 14 thoracolumbar, 6 double curves
Study Design	Retrospective Observational Study	Retrospective Observational study	Retrospective Observational Study	Retrospective Observational Study	Retrospective Observational Study
Intervention	AIS patients were treated with either RCOs or Boston-style TLSOs	All patients were treated with an RCO	All patients were treated with a Boston TLSO	All Patients were treated with a Cheneau style orthosis	All Patients were treated with a RCO
Comparison	The authors compared the outcomes of patients treated with RCOs versus the Boston-style TLSO	The study examined the number of patients that were treated with a RCO who required surgery after treatment	The authors evaluated the progression of the scoliotic curve and Health Related Quality of Life (HRQL) after treatment with the Boston Brace	The authors examined the percentage of people that required surgery after orthotic treatment with a Cheneau brace for AIS	The authors examined the effectiveness of bracing in treating AIS
Methodology	The authors examined the following outcome variables -difference in major curve from baseline to follow-up -percent change in major curve	-Standing out-of-brace frontal Cobb angle was measured before treatment -Cobb angle was measured at the end of treatment -Cobb angle was measured at a follow-up (avg 5	-At the follow-up, all patients completed a standardized questionnaire comprised of validated measures of pain, disability, quality of life, and work	The study relied on the SOSORT and SRS criteria for brace studies -the databases were examined until they were left with patients that fit the following criteria	Retrospectively reviewed prospective database that started in 2007 -AIS patients with age of 10 years or older -Risser 0-2 -premenarchal or less than 1-

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	-progression to spinal surgery -progression of curve to 45 degrees or more after bracing -major curve progression of 6 degrees or more -major curve improvement of 6 degrees or more	years and 5 months)	-The patients were also examined clinically and radiographically for progression of their curve	Progressive idiopathic scoliosis -treated with Cheneau Brace -Cobb angle between 20-45 degrees -no previous brace treatment -Risser 4 or more at final evaluation -minimum 1 year follow-up after brace weaning	year post-menarche, curve magnitude 25-40 before brace treatment -no prior brace treatment -All patients were treated with the Rigo-Cheneau type brace
Outcomes	-No patients from the RCO group progressed to surgery -the percent changes in major curves from baseline to follow-up were 0.0%±30.5% for RCO group and 21.3%±38.8% for the TLSO group. -15% of RCO patients had a final major curve of 45 degrees or greater compared to 38% of the TLSO group -Major curves improved by 6% or more in 31% of RCO group compared to 13% of the TLSO group	-No patient needed surgery -The average curve angle measured in Cobb degrees passed from 27 degree ± 6.7 degrees at the beginning (T0), to 7.6 ± 7.4 degrees in brace (T1) -It then went from 8.5 ± 8.6 degrees at the end of treatment (T2), to 11 ± 7.4 degrees at the final follow-up	-25 patients (9%) received surgical correction -Success rate of ≤ 6 degrees progression at time of weaning was 89% and 69% at long term -The authors did not find a difference in socio-demographic characteristics and HRQL-scores at the long term of patients with late onset-JIS and AIS -The authors did not find a difference in HRQL-scores in patients with a thoracic, thoraco-lumbar, or lumbar major curve. -Results in males were not different from females	-79 patients met the inclusion criteria At the follow-up -20 (25.3%) improved (>6 degree decrease in cobb angle) -18 (22.8%) patients were stable (no more than 5 degrees of progression or improvement -31 (39.2%) patients progressed below 50 degrees -10 (12.7%) patients progressed beyond 50 degrees	-initial correction rate of the total curves were 53.8% -8 improved in more than 6 degrees -17 patients progressed less than 6 degrees -8 patients progressed more than 6 degrees -4 curves exceeded 45 degrees -1 patient required surgery
Key Findings	Patients treated with RCOs had lower rates of spinal surgery when compared to	Treatment with RCO was effective for halting progression of	HRQL was slightly worse in patients who received surgery	Management of progressive idiopathic scoliosis with corrective bracing	Better results were predicted for patients with smaller hump degrees

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	patients treated with Boston-style TLSOs	scoliosis in 100% of patients		alters the natural history of the disease	or with better initial correction rates
Study Limitations	Only 13 of the 108 patients were treated with the RCO	The study only included patients who had a single curve.	-Lack of a control group and randomized design -The authors did not specify the curve type of the patients who underwent surgery -The authors did not list uniform guidelines for surgical intervention	-Compliance of patients to wear the orthosis the prescribed amount of time -Lack of control group and randomized design -Did not specify curve type of patients	-Patient compliance -Lack of control group and randomized design -Small sample size

References

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