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Adolescent Idiopathic Scoliosis: Comparing and Contrasting Operative Versus Non-Operative Treatment

Ethan Morris PA-S



Abstract

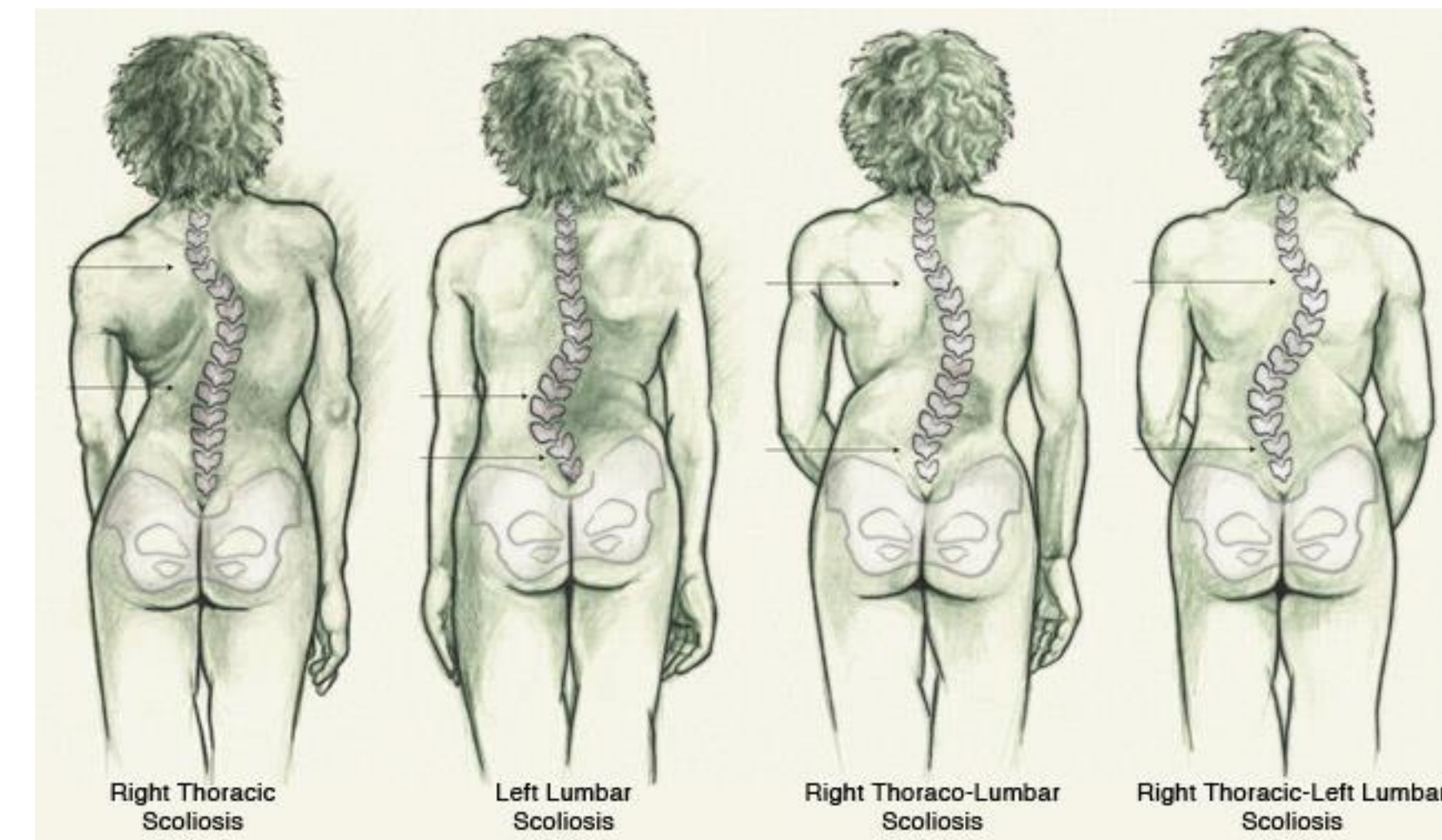
Adolescent idiopathic scoliosis (AIS) is the most common form of scoliosis. It affects 2-4 percent of adolescents aged 10-16 years. Although most adolescents diagnosed with scoliosis will not develop clinical symptoms, ten percent will progress and require medical intervention due to the potential for rib deformity and respiratory compromise as well as significant emotional distress due to aesthetic changes in appearance. Primary care providers should be prepared to evaluate and recommend treatment when idiopathic scoliosis is discovered or addressed by the patient. Three major factors that determine whether scoliosis will progress are patient gender, magnitude of curve on presentation, and patient's growth potential. Treatment options include non-operative, such as observation, exercises, bracing, and electrical stimulation, as well as operative interventions including spinal fusion using a variety of rod implants. The review of literature explores studies that compare the non-operative and operative treatment options for AIS. It was found that non-operative therapy can be used as a comparable and preferable option to surgery for many AIS patients. The findings indicate that the AIS patient outcomes as well as criteria of each treatment option is determined by many factors, including; patient's age, gender, maturity of the bone, presence of secondary complications, location and severity of the curve, psychological implications of a deformity, and the patient's willingness to participate in treatment.

Statement of the Problem

- Adolescent idiopathic scoliosis adversely affects thousands of children every year.
- Treatment options are limited and must be adequately evaluated in order to optimize patient outcomes.

Research Question

- For patients with adolescent idiopathic scoliosis, when is operative compared to non-operative treatment most efficacious?



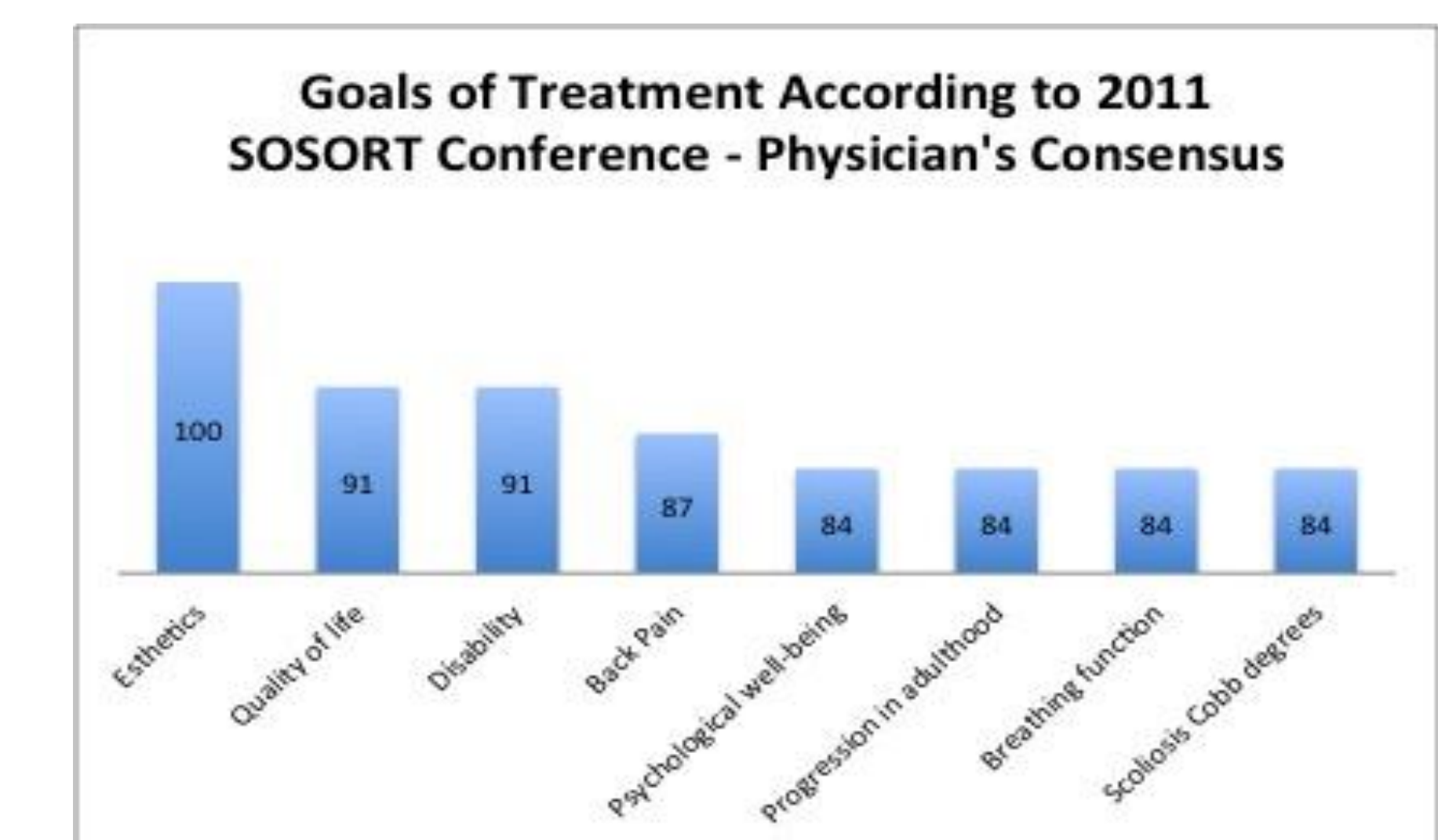
Four Common Curve Patterns Illustrated by Gary Leung

Discussion

- The general consensus of the research is that non-operative treatment is an important and beneficial intervention and operative therapy is effective with significant curve progression or when non-operative therapy is ineffective.
- Overall, it is found that the appropriately selected operative and non-operative therapy can decrease probability of curve progression, increase flexibility and mobility of the spine, decreased psychological stress of physical deformity, increase respiratory and cardiac function and ultimately provide better quality of life.
- Observation only is effective for patients with Cobb angles of less than 25° (Cassella, 1991).
- The SOSORT recommends Physiotherapeutic Specific Exercises (PSE), with or without bracing, for Cobb angles of 10° to 30°.
- El-Hawary (2014) recommends brace treatment for Cobb angles between 25° and 45° and operative therapy for Cobb angles greater than 45°.
- With regards to non-operative therapy, the 2011 International Scientific Society on Scoliosis Orthopaedic and Rehabilitation Treatment (SOSORT) guidelines provide the most comprehensive CTIS recommendations, however the Strength of Evidence is generally low and none are level I.

Clinical Applicability

- While, in 2004, the U.S. Preventive Services Task Force gave a D recommendation for routine scoliosis screening in juveniles and adolescents, other organizations such as the SOSORT have B recommendations for routine screening.
- Regardless of which guidelines are followed, all clinicians should be prepared to evaluate and recommend treatment when idiopathic scoliosis is discovered incidentally or addressed by the patient.
- The three primary factors that determine whether scoliosis will progress are patient gender, magnitude of curve on presentation, and patient's growth potential.
- Females are 5 to 10 times more likely than males to progress and require treatment (Horne, 2014). Patients with significant curves, especially those with greatest growth potential, are at highest risk for curve progression.
- The currently employed AIS treatment options are observation, PSE, bracing and surgery.
- The goal for primary care providers is the early identification of AIS patients and to determine the necessity for further evaluation and referral.



Introduction

- Adolescent idiopathic scoliosis (AIS) is the most common form of scoliosis and the most common spinal deformity seen by orthopedists (Weiss, 2013).
- AIS is defined as scoliosis presenting after the age of 10 and has an incidence rate of 2-4% (Horne, 2014).
- Scoliosis is defined as greater than 10° lateral curvature of the spine with rotation; up to 90% are idiopathic, having no known cause (Weiss, 2003).
- While most adolescents diagnosed with scoliosis will not develop clinical symptoms, progression of the curve cannot be predicted (Cassella, 1991).
- Ten percent of AIS patients will progress and require medical intervention (Weiss, 2013) due to the potential for rib deformity and respiratory compromise as well as significant emotional distress due to aesthetic changes in appearance.
- AIS has a strong gender bias with the female-to-male ratio increasing with increased curve magnitude (Hawary, 2014), and as a result, females are 5-10 times more likely to progress and require treatment (Horne, 2014).
- The goal for primary care providers is the early identification of AIS patients and the necessity for further evaluation and referral.

Literature Review

- The literature review evaluates selected studies from the databases Medline, PubMed and The Cochran Library.
- The studies selected contain information on diagnosis and treatment options for AIS including operative and non-operative treatments and the resulting outcomes.
- Adolescent Idiopathic Scoliosis (AIS) affects thousands of children every year.
- Physicians have created guidelines for treatment using the research available, however, the options are limited.
- The currently employed options are observation, physical therapy, bracing and surgery.
- Operative therapy is effective with significant curve progression or when physical therapy treatments may require large investments of patient time, money and other resources or when poor compliance of adolescents may limit the effectiveness of physical therapy.
- No research has found the therapies discussed to cause scoliosis to worsen, however evidence-based practice is limited by lack of quality research.
- There is a significant lack of research on Conservative Treatment of Idiopathic Scoliosis (CTIS) and studies differ on the long-term efficacy of operative therapy.

Table 1 Practical Approach Scheme (PAS) for an Evidence Based Clinical Practice approach to Idiopathic Scoliosis (Strength of Evidence VI-Strength of Recommendation B).

	Cobb degrees	0-10 + hump									
		11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	Over 50	
Infantile	Min	Ob6	Ob6	Ob3	SSB	SSB	SSB	SSB	SSB	PTRB	FTRB
	Max	Ob3	PTRB	FTRB	FTRB	FTRB	FTRB	FTRB	FTRB	Su	Su
Juvenile	Min	Ob3	Ob3	Ob3	SSB	SSB	SSB	PTRB	PTRB	PTRB	FTRB
	Max	PSE	PSE	PTRB	FTRB	FTRB	FTRB	FTRB	FTRB	Su	Su
Adolescent	Risser 0	Min	Ob6	Ob6	Ob3	PSE	PSE	SSB	PTRB	PTRB	FTRB
	Max	Ob3	PSE	PTRB	FTRB	FTRB	FTRB	FTRB	FTRB	Su	Su
Risser 1	Min	Ob6	Ob6	Ob3	PSE	PSE	SSB	PTRB	PTRB	PTRB	FTRB
	Max	Ob3	PSE	PTRB	FTRB	FTRB	FTRB	FTRB	FTRB	Su	Su
Risser 2	Min	Ob8	Ob6	Ob3	PSE	PSE	SSB	SSB	SSB	SSB	FTRB
	Max	Ob6	PSE	PTRB	FTRB	FTRB	FTRB	FTRB	FTRB	Su	Su
Risser 3	Min	Ob12	Ob6	Ob6	Ob6	PSE	SSB	SSB	SSB	SSB	FTRB
	Max	Ob6	PSE	PTRB	FTRB	FTRB	FTRB	FTRB	FTRB	Su	Su
Risser 4	Min	No	Ob6	Ob6	Ob6	Ob6	Ob6	Ob6	Ob6	SSB	FTRB
	Max	Ob12	PSE	PTRB	FTRB	FTRB	FTRB	FTRB	FTRB	Su	Su
Risser 4-5	Min	No	Ob6	Ob6	Ob6	Ob6	Ob6	Ob6	Ob6	SSB	FTRB
	Max	Ob12	PSE	PTRB	FTRB	FTRB	FTRB	FTRB	FTRB	Su	Su
Adult	No pain	Min	No	No	No	No	No	No	No	Ob12	Ob12
	Max	Ob12	Ob12	Ob12	Ob12	Ob12	Ob12	Ob12	Ob12	Ob6	Ob6
Chronic Pain	Min	No	PSE	PSE	PSE	PSE	PSE	PSE	PSE	PSE	PSE
	Max	PTRB	PTRB	PTRB	PTRB	PTRB	PTRB	PTRB	PTRB	Su	Su
Elderly	No pain	Min	No	No	No	No	No	No	No	Ob12	Ob12
	Max	Ob12	Ob12	Ob12	Ob12	Ob12	Ob12	Ob12	Ob12	Ob6	Ob6
Chronic Pain	Min	No	PSE	PSE	PSE	PSE	PSE	PSE	PSE	PSE	PSE
	Max	PTRB	PTRB	PTRB	PTRB	PTRB	PTRB	PTRB	PTRB	Su	Su
Decompensation	Min	No	No	PSE	PSE	PSE	PSE	PSE	PSE	PSE	PSE
	Max	PTRB	PTRB	PTRB	PTRB	PTRB	PTRB	PTRB	PTRB	Su	Su

For each single clinical situation reported in any single cell, a minimum and a maximum strength of treatment is listed. The graduation of strength of treatments have been reported in the Strength of Treatment Scheme in Table 8. Consequently, all treatments included between the minimum and maximum can be considered for that specific clinical situation.
 Obs 30/12/6/6/4: Observation every 30/12/6/6/4 months; PSE: Physiotherapeutic Specific Exercises; NTRB: Night-time Rigid Bracing (8-12 hours); SIR: Inpatient externalization; SR: Soft bracing; PTRB: Part-time Rigid Bracing (12-20 hours); FTRB: Full-time Rigid Bracing (20-24 hours) or cast; Su: Surgery.
 Table 1. SOSORT Evidence Based Clinical Practice approach to AIS (Negrini, 2012)

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