Non-Surgical Treatment of Athletes with Scoliosis

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By the end of this presentation, the learner will be able to:

• Define Adolescent Idiopathic Scoliosis
• Learn how to screen for scoliosis
• Describe the Schroth Method for the treatment of scoliosis
• Identify general activity restrictions for patients/athletes with scoliosis
• Understand how to modify exercises for the athlete with scoliosis

• The intended audience for this presentation is athletic trainers.
Overview of learning activity

• Define of scoliosis
• Educate how to screen for scoliosis
• Brief Description and history of Schroth Method
• Review a case study
• Discuss exercise modification for the athlete with scoliosis
What is Scoliosis?

- Scoliosis is a complex three-dimensional deformity characterized by lateral and rotational curvature of the spine.

- Adolescent Idiopathic Scoliosis (AIS) is by far the most common type of scoliosis, affecting children between ages 10 to 18; it’s found in as many as 4 in 100 adolescents. In general, AIS curves progress during the rapid growth period of the patient. Curve progression is related to the age of the child and the magnitude of the deformity.

- While most curves slow their progression significantly at the time of skeletal maturity, some, especially curves greater than 60 degrees, continue to progress during adulthood secondary to gravitational forces.

- "Idiopathic" means that the condition has no identifiable causes although significant research is ongoing, including the genetic basis for AIS. Approximately 30% of AIS patients have some family history of scoliosis, which would indicate a genetic connection.

www.SRS.org
Scoliosis Screening

• Screening has been controversial over the years (lack of research, expense, unqualified screeners, radiation exposure) significantly dropping off in 2004.

• January 16, 2016 the American Academy of Orthopaedic Surgeons (AAOS) made a position statement that strongly supports timely screening and appropriate treatment to halt or minimize further curvature of the spine.

• This in part due to the National Institute of Health (NIH) funded study “Bracing in Adolescent Idiopathic Scoliosis Trial” (BrAIST) that found significant success in preventing spinal curve progression and surgery in children who were screened, diagnosed and treated with a custom brace.
The AAOS 2016 position statement recommends:

• Screening exams for spine deformity be a part of medical preventative care visits at the age of 10 and 12 for girls and 13-14 for boys.

• Screening programs have well trained personnel to administer forward bend test, use Scoliometer, identify abnormal spine curvature, and to refer for additional tests/imaging as needed.

• Any imaging tests adhere to the principles of ALARA (as low as reasonably achievable) standards to minimize radiation exposure

• Bracing as an effective non-operative intervention to reduce the risk of progression to surgical treatment.
**Scoliosis signs**

- **Rib "hump"**—A prominence on the back or a rib hump secondary to the rotational aspect of the scoliosis; the most visible sign of scoliosis (figure C).
- **Shoulder height asymmetry**—(figure A).
- **Trunk shift**—A shift of the body to the right or the left can occur. This often appears as some waistline asymmetry in which one hip appears to be higher than the other and may result in one leg appearing longer than the other (figure B).
Scoliosis Screening

The forward bend Adams test with the use of a scoliometer (a specialized inclinometer) was agreed upon by the Scoliosis Research Society (SRS) task force as an effective quantitative measure with five to seven degrees of deformity as a threshold for positive screening.

Documentation of the screening and discussion of a positive screening result with a parent/guardian is important.

After a child has an abnormal scoliosis screening evaluation, a referral to a physician should be made to confirm a possible diagnosis of spinal deformity and consider obtaining a spine radiograph if indicated.

Signs of Scoliosis

- Asymmetry of shoulders, hips, back creases or scapulae
- Prominence on **Adams Forward Bending Test**
  - Standing with feet and knees together
  - Bend forward with palms facing each other
  - Examine from behind, sides, and front
  - Look for asymmetry, rib hump, or spine curve

![Adams Forward Bending Test](image)

Normal Spine  
Scoliosis Deformity
Scoliometer: a specialized inclinometer measuring the angle of spinal rotation.

Have your patient stand with feet hip width apart
Clasp hands together as if they were going to dive
Bend forward which maximizes the spinal curves
Make sure pelvis is level*
Line spinous process up with the notch on the bottom of scoliometer.
Document the maximum angle of rotation of each curve.

*If pelvis is not level, possible leg length deformity/assymetry, test can also be performed sitting down.

5-7 degrees of rotation warrants a referral to a physician in an adolescent. 5 degrees of rotation correlates to 10 degree cobb angle. 10 degree cobb angle is minimum angle for scoliosis diagnosis.
Scoliometer measurements showed good correlation with the Cobb angle, the gold standard measurement.

It had good intra- and interrater reliability and was sensitive in detecting curvatures greater than 10º Cobb using a referral criterion of 5º ATR (angle of trunk rotation), indicating its potential for screening individuals with idiopathic scoliosis.

*Braz. J. Phys. Ther. vol.17 no.2 São Carlos Apr. 2013*

Scoliometers run about $50
Goals of conservative treatment of Idiopathic scoliosis:

To stop curve progression at puberty (possibly even reduce it)
To prevent or treat respiratory dysfunction
To prevent or treat spinal pain syndromes
To improve aesthetics via postural correction
Prevent surgery
Improve quality of life
## Scoliosis Treatment Guidelines

<table>
<thead>
<tr>
<th>Cobb angle (Risser 0-3)</th>
<th>SRS guidelines</th>
<th>SOSORT guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-20 degrees</td>
<td>observe, early bracing in cases</td>
<td>educate + early bracing in cases + PSSE</td>
</tr>
<tr>
<td>25 degrees +</td>
<td>brace</td>
<td>brace + educate + PSSE</td>
</tr>
<tr>
<td>45-50 degrees</td>
<td>Surgery based on patient choice/function</td>
<td>surgery based on patient choice/function</td>
</tr>
<tr>
<td>Adult</td>
<td>n/a or surgery</td>
<td>PSSE, optional bracing prior to sx decision</td>
</tr>
</tbody>
</table>

SRS: Scoliosis Research Society
SOSORT: Society of Scoliosis Orthopedic Rehabilitation and Treatment
Bracing

According to the Scoliosis Research Society (SRS), the job of a scoliosis brace is to halt or slow progression of the curve – with an ultimate goal of avoiding a spinal fusion surgery (and the recovery and limitations that go with it). Over the years the design of scoliosis braces has evolved, resulting in greater effectiveness with a lower profile.

A recent study by the U.S. National Institutes of Health provides strong evidence of how bracing effects curve progression. Of patients randomly assigned to wearing a brace, 75% had curves that did not progress to the 50° threshold for surgery at skeletal maturity. Only 42% of patients who did not wear a brace were not surgical candidates. The results of the Bracing in Adolescents with Idiopathic Scoliosis Trial (BrAIST) study were published in The New England Journal of Medicine (Oct. 17, 2013) noting significant results from bracing.

The BrAIST study findings also showed that the amount of time the brace is worn correlates to its effectiveness; patients who wore the brace for less than 6 hours a day had roughly the same success rate as those patients who did not wear the brace at all. Those who wore the brace more than 13+ hours a day had a success rate of 90% or higher. Therefore leading back to the importance of screening, early detection and treatment to halt curve progression and ultimately prevent surgery.
The Society of Scoliosis Orthopedic Rehabilitation and Treatment (SOSORT) was founded in 2004 and promotes and encourages conservative, evidence-based medicine regarding scoliosis and provides education, guidelines and consensus about treatment options to people with scoliosis. Every scoliosis approach or ‘school’ around the world subscribes to SOSORT’s principles and shares a common mission. The shared goal is not simply to look at the spine in the coronal plane but to look at the affected subject and family under a more holistic psychosocial model, where present and future quality of life is the main objective.

The schools are presented in the historical order in which they were developed:
Lyon approach, France
Katharina Schroth Asklepios approach, Germany
Scientific Exercise Approach to Scoliosis (SEAS), Italy
Barcelona Scoliosis Physical Therapy School approach (BSPTS), Spain
Dobomed approach, Poland
Side Shift approach, United Kingdom
Functional Individual Therapy of Scoliosis approach (FITS) from Poland.

Inspired by a balloon, Khatarina Schroth tried to correct by breathing away the deformities of her own trunk by inflating the concavities of her body selectively in front of a mirror.

From 1921 this new form of treatment with specific postural correction, correction of breathing patterns and correction of postural perception was performed with rehabilitation times of 3 months in her own little institute in Meissen, Germany.

After World War II, Katharina Schroth and her daughter Christa Lehnert-Schroth moved to West Germany to open a new institute in Sobernheim, which grew to have 150 in-patients at a time, with treatment lasting 6 weeks.

In the 90’s Dr. Manuel Rigo, based in Barcelona, improved many parts of the original program achieving significant postural improvements and began a training program for professionals. Dr. Rigo is one of the most important international instructors. His interest is to distribute the knowledge worldwide. Schroth method training started in the US in 2005. Founded the Barcelona Scoliosis Physical Therapy School 2009 and was the first President of SOSORT.
The Schroth Method for scoliosis is a conservative exercise in a three dimensional approach to elongate the trunk and correct imbalances of the spine. The goal is to develop the inner muscles of the rib cage through breath and expansion techniques to change the shape of the upper trunk and correct spinal abnormalities.

It is highly specific and curve dependent with the aim to reduce muscular imbalances and establish new and improved movement patterns in the body that are geared towards reducing scoliosis curvatures.

A scoliosis of the spine is far more than just a side-to-side deviation of the spine the curvatures are actually has a rotational component much like a corkscrew.
The Schroth Method was the first exercise program to recognize that scoliosis is a three dimensional problem that requires a three dimensional solution.

Kwan et al 2017 study found that Schroth exercises in conjunction with bracing was superior to bracing alone with improved Cobb angles, trunk rotation, and QOL scores.

Physiotherapeutic scoliosis specific exercise (PSSE) goals:
- Auto correction in 3D
- Stabilizing corrected posture
- Patient education
- ADL training
BSPTS Curve Classification

Neutral spinal mechanics: side bending occurs with rotation to the opposite side.

- **Side bending right** would further compensate the lumbar curve causing increased lumbar right side bending and left rotation.
- **Side bending to the left** would cause stress at transition point (transitional segment or joint space between the 2 curves) and further left side bend and right rotate the thoracic curve. Movement will follow the path of least resistance.
- **Left rotation**, for this curve type, would work towards increasing the left rotation at the lumbar spine.
- **Right trunk rotation** will occur and further enhance the deformity at the thoracic spine since it is already rotated right. Right rotation will also put stress upon the transition point since the lumbar spine is rotated in the opposite direction.
Neutral spine mechanics

Right rotation

flexion

right side bending
Non-neutral spinal mechanics

A right thoracic curve that is side bent left and rotated right skew the axis for all motion.

Closed packed left facets inhibiting typical motion in the sagittal, frontal and horizontal planes causing motion to continue in a rotational path, the path of least resistance causing further compensation of the curve.
Case presentation

18 year old
Right 4C
Left lumbar
Right lower thoracic
Left upper thoracic
No bracing
12/22/16
upper thoracic 22 degrees
Lower thoracic 23 degrees
Risser 0

5/12/18
upper thoracic 20 degrees
lower thoracic 32 degrees
lumbar 19 degrees
Risser 2-3
Schroth Exercises
Improper mechanics

improved: ½ kneel with hip hinge

body mechanics training
Treatment guidelines for the athlete with scoliosis

Educate patient on flexion precautions with exercise and ADLs
Discontinue pelvic tilts, sit ups, Pilates roll ups, forward folds, seated hamstring stretches, cat backs, standing activities that pull pelvis into posterior pelvic tilt such as kick boxing, barre activities

Minimize Side bending, rotation. (modify yoga, Pilates or other activities, modify existing HEP)

Support lumbar spine in sitting
assess sitting at home, office, car, couch

Teach hip hinge (disassociate hip motion from pelvic motion)
Needed for sit to stand, bend/lifting, squat, sports’ “ready position”
Treatment continued..

Untrain, d/c posterior pelvic tilt: (may be occurring with core work, squat, sit to stand)

Emphasize Lumbar neutral core stability

Assess/address hip strength and mobility restrictions: hip flexors and extensors, internal and external rotators

Look for signs of leg length discrepancy and foot hyperpronation

Assess/address shoulder strength and mobility restrictions
  latissimus tightness, pectoralis tightness, scapular weakness

Optimize sagittal alignment
  Postural training
Treatment continued…

Educate pivot and minimize trunk rotation
Golf swing, tennis stroke, volleyball serve

Think stability at the trunk rather than mobility

Gait assessment
Adequate hip motion? Excessive pelvic rotation or tilt?
Disassociate hip and lumbopelvic motion.

Axial elongation for all positions and activities
Offset gravitational effects on curve
Exercise modifications for the athlete with scoliosis
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• Moramarco M et al. Cobb Angle Reduction in a nearly skeletally mature adolescent (Rlsser 4) after pattern-specific scoliosis rehabilitation (PSSR) Open Orthop J 2017 Dec 29;11: 1490-1499

• Rigo et al. A specific scoliosis classification correlating with brace treatment: description and reliability Scoliosis 2010 5:1

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Thank You

Question and discussion period