Scoliosis
Treatment Options and Interventions
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What is scoliosis?

- An abnormal lateral deviation of the spine with a rotational component
- Named according to the shape (C or S), location and convexity of curve
- Usually involving the thoracic and lumbar regions
- Two types of scoliosis:
  - Nonstructural
    - Also known as functional or postural scoliosis
  - Structural
Scoliosis terms

- Concave curve – the inside of the curve
- Convex curve – the outside of the curve
  - A bend to the left has a left convexity
- Apex – the vertebrae within the curve that is the most of centered
  - Peak of curve
  - “Location” of curve
  - Can be more than one apex
Structural scoliosis

Structural
- Irreversible lateral curvature of the spine with fixed rotation of vertebrae
- Rotation is toward convexity of curve
- Posterior rib hump can be seen during forward bending
<table>
<thead>
<tr>
<th>Concave side</th>
<th>Convex side</th>
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</thead>
<tbody>
<tr>
<td>Spinous process deviation</td>
<td>Vertebral body rotation</td>
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<tr>
<td>Posterior rib cage hollow</td>
<td>Posterior rib cage hump</td>
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<tr>
<td>Throacic cage A–P widening</td>
<td>Thoracic cage A–P narrowing</td>
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</table>
Causes of structural scoliosis

- Neuromuscular (15% – 20% of cases)
  - Cerebral palsy, SCI, myelomeningocele (spina bifida), muscular dystrophy, spinal muscle atrophy

- Osteopathic disorders (5% of cases)
  - Congenital – in-utero maldevelopment
    - hemivertebra, congenital bar or block vertebrae
  - Acquired – fracture, osteomalacia, rickets, infection

- Idiopathic (75% – 80% of cases)
  - Adolescent idiopathic scoliosis
    - Epiphyseal disorder
    - Diagnosis of exclusion (all other sources ruled out)
    - Develops during pediatric years
  - Most common form
  - Familial prevalence
Idiopathic scoliosis

Four categories based on age:

- **Infantile** – 3 years old and younger
  - Typically a left thoracic curve
  - More common in boys
  - 80–90% spontaneously resolve however those that don’t can result in a severe deformity
- **Juvenile** – 3–9 years old
  - Typically a right thoracic curve
- **Adolescent** – 10–18 years old
  - Female-to-male ratio is 3.6:1
  - 80% of all cases of idiopathic scoliosis
- **Adult** – after skeletal maturity
Adam’s forward bending test
- Used in elementary school screenings
- Lack of reliability makes it controversial
- The magnitude of the rib hump is quantified using a scoliometer

Risser sign
- Measures the degree of iliac crest ossification
- Determines chronologic bone age
- Risser 1 through 5
  - 1: higher risk
  - 4: 100% ossification
  - 5: Iliac apophysis fused to iliac crest
  - Less reliable indicator in boys
Factors which influence progression

- Risk of progression is higher if:
  - The younger the patient at diagnosis, the greater the risk of progression
  - Double curve patterns
  - Curves with greater magnitude
  - Female vs. male
- One in nine females have some sign of scoliosis
- Scoliosis affects 4% of the general population
Prognosis of scoliosis

- Based on cause, gender, shape, location, degree of curve
  - S curves have a greater risk of progression than C curves
  - Progressive curve is defined as a continued increase of 5° or more on two or more consecutive exams at 4 or 6 month intervals
Curves that are 10° –20°
Generally asymptomatic
Respond to conservative treatments
Treatments address:
  ◦ Flexibility
  ◦ Strength
  ◦ Muscle imbalance of: trunk, shoulder girdle, pelvic girdle
Interventions for mild scoliosis

- Stretching
  - Stretch muscles on concave side
- Respiratory exercises for thoracic mobility
  - Deep breathing
- Postural stabilization/alignment
- Reduce back pain
- Strengthening, particularly abdominals
  - Strengthen muscles on convex side
- Asymmetric exercise promotes symmetry
- Movement programs such as yoga, pilates and tai chi may be helpful
Mild scoliosis exercises

- Upper extremity diagonal reaching
- Posterior pelvic tilts
- Prone sidebending
- Prone reach
- Heel sitting stretch
  - Stretch arms away from concave side of curve
- Sidelying stretch (convex side down)
- Stability ball exercises
- Sidelying sit–up
Exercises

Posterior pelvic tilt

Sit up with pelvic tilt
Exercises

Hamstring stretch

Back stretch
Exercises

Back strengthening

Spine extension
Exercises

Push up with pelvis tilted

Side stretch
Exercises

Child’s pose with sidebending

Bicycle (strengthening)
Strengthening Exercises

Abdominal strengthening

Back strengthening
Strengthening Exercises

Back strengthening

Back strengthening
Treatment for moderate scoliosis

- Curves that are 25°–40°
- Musculoskeletal pain
- Cosmetic issues
- Bracing utilized
  - To halt progression
  - Gain permanent correction
  - Allow for spinal growth
  - Industry standard is custom molded TLSO
  - Requires strict compliance (23 hours per day)
- Exercises can be done while wearing a brace
Types of Braces

- Boston Brace
- Charleston Bending Brace
- Milwaukee Brace
Surgical correction for curves that are more than 45°–50°
- Compromise cardiovascular–pulmonary function
- Impair musculoskeletal function
- Chronic, persistent pain

Surgical intervention includes:
- Spinal fusion
  - Internal fixation with Luque rods or Harrington rods
  - Post-operative bracing may be needed
- Video-assisted thoracoscopic anterior spine fusion
  - Newer approach
  - Less invasive

Up to 38% of patients still have occasional back pain
Interventions after surgery

- Deep breathing exercises to increase vital capacity
- Vibration with assisted coughing
- Toe, ankle and upper extremity movements within the pain tolerance
- Position changes

After medical clearance:
- Full passive range of motion of hip and knee
- Active movements as tolerated
- Transfers: rolling, sitting, standing
- Gait training with parallel bars, crutches or cane

All without excessive pressure on spine
Nonstructural scoliosis

- Also known as functional or postural scoliosis
- Reversible
- Can be changed with forward or side bending, positional changes
- Causes can include:
  - Leg-length discrepancy
  - Muscle guarding or spasm
  - Muscle disuse or overuse
  - Habitual or asymmetrical postures
Treatment for nonstructural scoliosis

- Directed at the cause
- Postural re-education
- Treatment of back pain and tone issues
- Treatment of muscular imbalances
- Compensation for a bony LLD
  - Shoe lift
  - Foot orthosis
  - Surgical osteotomy
  - Long bone lengthening procedure
Resources for additional information

- Medtronic: iscoliosis http://www.iscoliosis.com/
- National Scoliosis Foundation http://www.scoliosis.org/
- Pain Relief Center http://www.prcstudiocity.com/scoliosis.html


