Defining the Scoliosis Problem:
School Screening, Diagnosis and Clinical Implications, Curve Size and Progression

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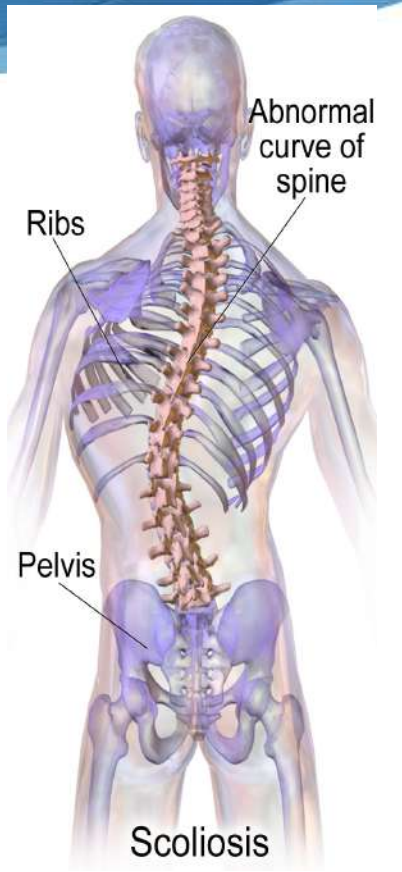
“Communication Breakdown”
Led Zeppelin I
January 1969

Notable Events-1969

- Apollo 11 mission
- Jets over Colts in Super Bowl III (Namath guarantee)
- Lew Alcindor leads UCLA to national championship
- Celtics defeat Lakers in Finals (Bill Russell's last game)
- Hurricane Camille
- Woodstock
- Beatles release "Abbey Road"
- "Frosty the Snowman" premieres

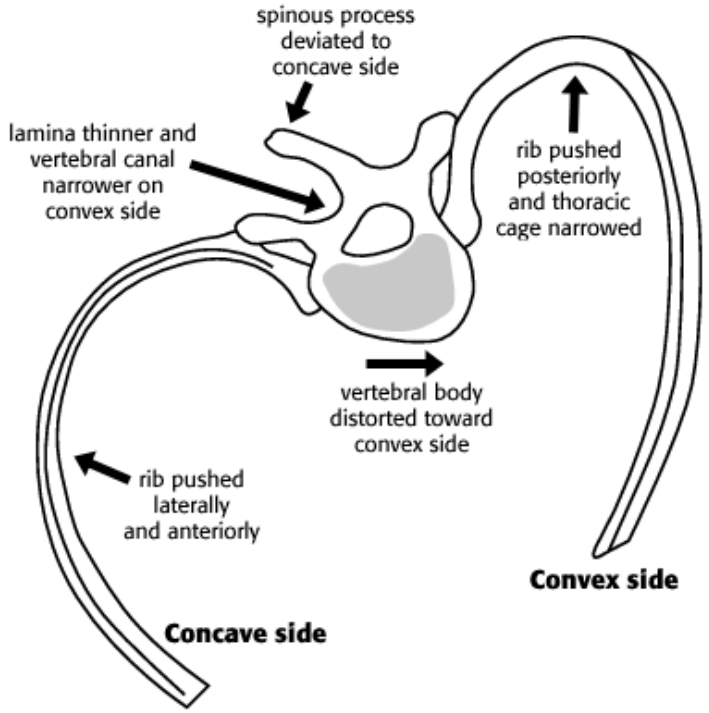
Scoliosis

- Lateral spinal curvature of 10 degrees or greater



Scoliosis

- 3-dimensional deformity
- Lateral and rotational curvature



Types of Scoliosis

- Idiopathic (85%)
- Congenital—vertebral deformities
- Neurologic conditions (cerebral palsy, etc.)
- Muscular disorders (muscular dystrophy, etc.)
- Syndromes (Marfan's, neurofibromatosis, etc.)

Adolescent Idiopathic Scoliosis

- Lateral spinal curvature >10 degrees
- 2-3% of children
- Adolescent onset most common (after age 10)

Etiology

- No obvious cause
- Strong genetic component
- No specific gene identified (multifactorial)

Diagnosis

- Diagnosis is straightforward
- Thorough evaluation to rule out non-idiopathic causes

Presenting Symptoms

- Spinal deformity
- Chest wall or back asymmetry
- Difference in breast sizes (adolescent females)
- Posture imbalance
- Mild back pain

History

- Presenting symptoms
- Age of onset
- Family history
- Recent growth spurt?
- Menarche (girls)

History Red Flags

- Young age of onset (<10 years old)
- Rapid curve progression
- Severe pain, especially localized and worse at night
- Left Thoracic curve

History Red Flags

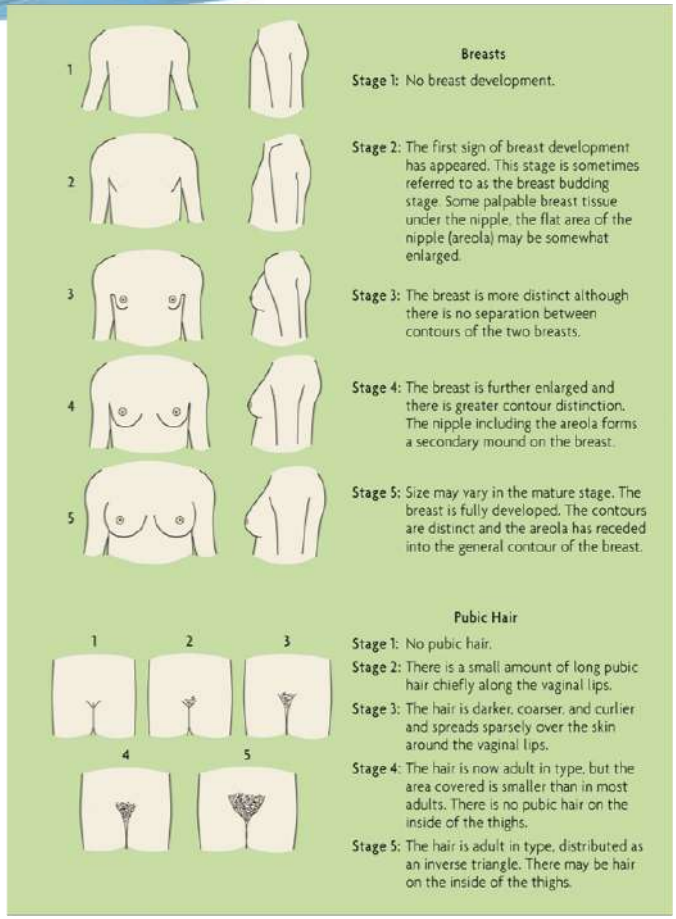
- Neurological symptoms
- Developmental delays
- Hyperlaxity of joints
- Bowel/bladder dysfunction

Physical Examination

- Adam's forward bend test
- Shoulder/hip tilt in upright position
- Height measurement
- Pubertal development

Tanner Stages

- Staging of development for children/adolescents
- Breast development (girls)
- External genitalia (boys)
- Pubic hair (girls and boys)

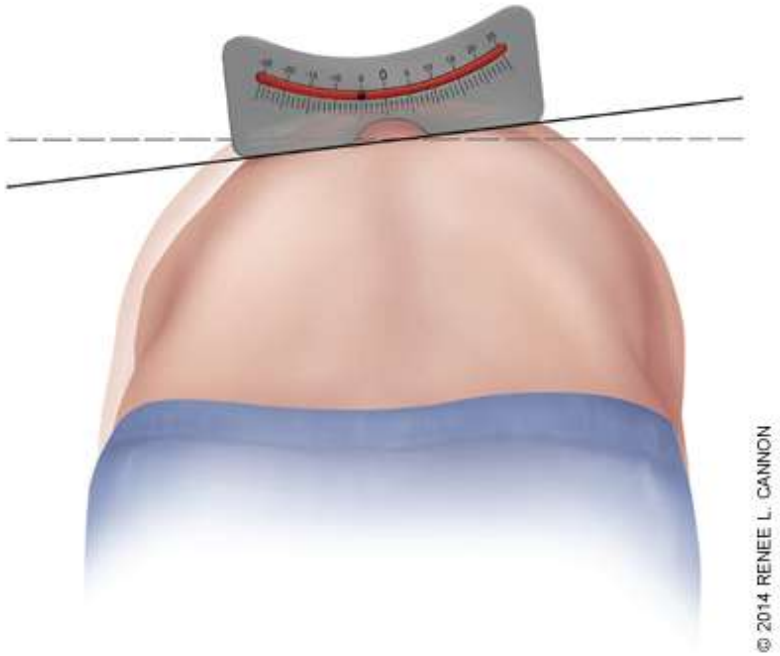


Physical Exam Red Flags

- Tall with long fingers/arm span, etc. (Marfan's)
- Joint and skin hyperlaxity (connective tissue disorder)
- Café-au-lait spots, axillary freckles (Neurofibromatosis)
- Weakness/neurological deficits
- Left-sided curve (Charcot Marie Tooth, tethered cord, syrinx)
- Hairy patch/dimpling in back (Myelomeningocele)

In-Office Evaluation

- Scoliometer test
- Measures trunk rotation
- Helps determine need for x-ray

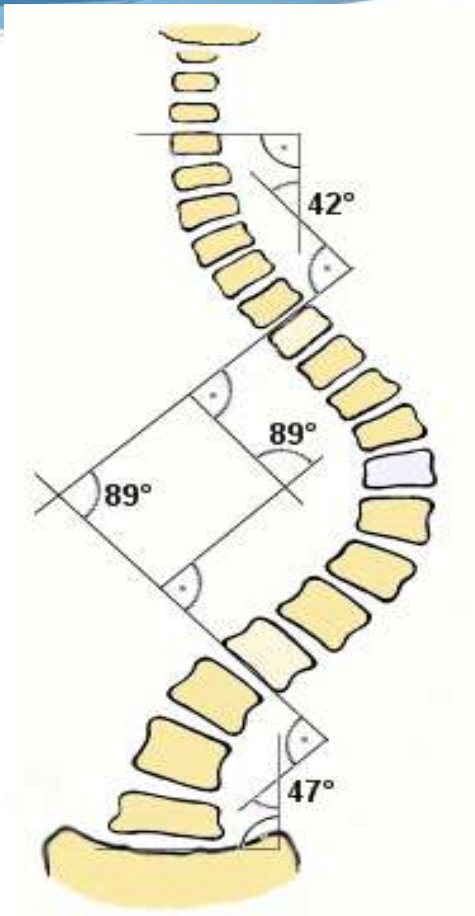


Radiographs

- Standing posterior-anterior radiographs
- Determine degree of lateral curvature
- Type of curve (right vs. left, etc.)
- Bone lesions

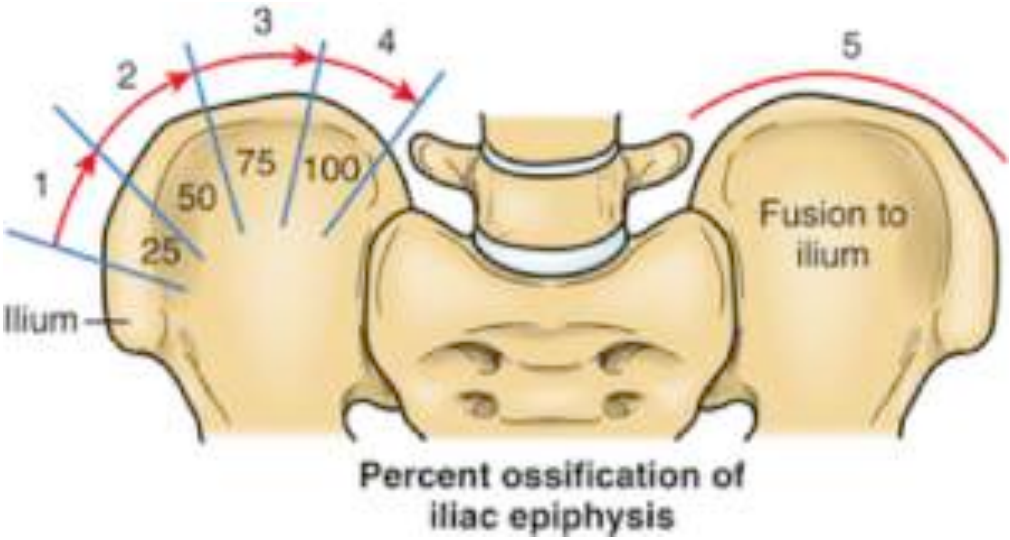
Cobb Angle

- Technique of measuring angle of spine curvature



Risser Grade

- More accurate determination of growth potential



Percent ossification of iliac epiphysis

Natural History

- Most curves stop progressing at skeletal maturity
- Greatest curve change--Early Adolescence
- Most do not develop clinical symptoms

Why is this important?

- Risk of progressing to > 50 degrees of curvature
- Most curves >50 degrees continue to progress AFTER skeletal maturity
- Curves <30 degrees do not progress

Why is this important?

- Severe curves (>90 degrees)—increased risk for:

- Cor pulmonale

- Right heart failure

- Impaired pulmonary function

- Back pain (slight increase)

- Psychosocial issues?

Risk for Curve Progression

1. Age
2. Skeletal Maturity
3. Gender
4. Magnitude of Curve on Presentation

1. Age

- Age <10 at diagnosis—rule out non-idiopathic causes
- Younger age means more time until skeletal maturity

2. Skeletal Maturity

- Physical examination
- Menarche (girls)
- Risser grade
- Tanner-Whitehouse 3 assessments

Risser Grade

- Easily determined on scoliosis radiographs

Tanner Whitehouse 3 Method

- Evaluation of epiphyses in hand and wrist
- Skeletal scoring system

3. Gender

- Boys=Girls for mild scoliosis (around 10 degrees)
- Girls 5-10 times more likely to progress to more severe disease

4. Magnitude of Curve at Presentation

- High degree of curvature at early stage of maturation corresponds to high risk

Who is at Risk?

- Tabulate risk factors to predict those at greatest risk of progression
- Who to treat

Screening for Scoliosis

- Routinely done in schools for decades
- Now more controversial

Screening for Scoliosis

- 2004—U.S. Preventive Services Task Force (USPSTF) recommended against routine screening (AAFP agreed)
- Rationale:

- Low predictive value of screening

- Treatment reduces pain & disability in relatively few patients

- Possibility of unnecessary treatments

Screening for Scoliosis

- 2007—task force formed to review evidence on screening
- Represented by Scoliosis Research Society (SRS), American Academy of Orthopedic Surgeons (AAOS), Pediatric Orthopedic Society of North America (POSNA), and the American Academy of Pediatrics (AAP)
- Concluded that benefits of early treatment is substantial, thus screening is beneficial

SRS, AAOS, POSNA, AAP Position Statement

- Updated 2015
- Screening for girls at age 10 and 12
- Boys screened once at age 13

SRS, AAOS, POSNA, AAP Position Statement

- Need well trained screening personnel to utilize forward bending tests and scoliometer measurements to appropriately refer individuals for further investigation.
- Limit diagnostic imaging to decrease radiation exposure.
- Non-operative treatments can decrease the likelihood of curve progression to the point of needing surgery.

Thank You!