Pediatric Deformity – Scoliosis and Kyphosis

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Pediatric Deformity. Scoliosis

Types: 1. Idiopathic-most common. Multifactorial genetic
   - increased familial risks - higher incidence in twins
2. Congenital - due to spinal dysplasia. Hemivertebra, unsegmented bars most common. - high incidence of failure of brace treatment and progression
Pediatric Deformity - scoliosis

- 3. Reactive scoliosis - secondary to pain generator. IE sciatic scoliosis w herniated disc


- 5. Syndromic: Marfans, achondroplasia, onchronosis - often progress

- 6. Thoracogenic: due to fused ribs and chest wall anomalies

- Scoliosis = 3D dimensional deformity primarily in the coronal plane
Pediatric Deformity: Scoliosis

- Prognosis is determined by Age at Presentation and Growth remaining - Risser stage (iliac crest apophyses) or more accurate Hand for skeletal age.

- Classification: etiology/age at presentation/ location of spine involved

- Eg. Idiopathic adolescent thoracic scoliosis
Pediatric Deformity
Idiopathic Scoliosis

- Infantile. 0-5 years. Higher incidence of progression. Common in Great Britain. Brace then temporizing procedures. Bracing often ineffective-EOS


- Adolescent 10-adulthood. Most common. Bracing usually successful. Temporizing procedures in risser 0, 1. Definitive correction and fusion in risser 2-5

Clinical Evaluation of Scoliosis


- Pain is NOT usually due to Scoliosis - Back pain is evaluated separately
SCOLIOSIS: Evaluation

- Physical examination - Gait
- Posture and alignment shoulders and pelvis
- Adams Forward bend test. Scoliometer measures spine rotation
- 7 degrees is criteria for referral and X-ray
- Lower extremity: alignment, Pelvic obliquely Leg lengths (measure medial malleolus side by side)

Scoliosis: Evaluation

- Physical Examination
- Neurological Exam. Mental status and cranial nerves
- Cerebellar signs. Romberg. Finger to nose, tremors
- Motor exam: atrophy, tone, grade 0-5/5
- Sensory exam: light touch, pinprick, position sense
- Reflexes: DTR 0-4/4. Hoffman, UE, Babinski LE, Abdominal reflexes associated with spinal dysraphism
- Clawing of toes - think Possible spinal cord abnormality
Pediatric Scoliosis : Diagnostics

- In general refer to specialist when > 7 degrees of rotation on scoliometer
- XRAY: Initial AP/LAT Whole Spine / Scoliosis
- Shield breasts and gonads. Do not shield iliac crests.
- Standing – measure Cobb angles
- Follow up. Usually just AP for coronal plane deformity / Scoliosis
Pediatric Scoliosis - Risser scale

- Risser = follows iliac crest apophysis from lateral to medial – not 100% accurate – some authors use hand for skeletal bone age – Sanders hand classification gaining popularity

- Stages 0-5
  - 0 = no growth plate, triradiate cartilage open
  - 1- 25% across, 2- 50%, 3- 75%, 4- 100% but not fused, 5- fused
Pediatric Scoliosis: Diagnostics

• MRI: severe back pain with red flag or after 4-6 weeks of PT

• MRI: EOS, long tract signs Eg babinski, neurologic deficit, left thoracic curve. Higher incidence of neuro abnormalities in left thoracic curve

• MRI: rule out dysplasia, cord abnormalities eg. Diastomatomyelia. (split cord) – occurs in 20% of Juvenile/EOS

Pediatric Scoliosis: Diagnostics

• CT scan – in complex cases for surgical planning purposes

• EMG/NCS – to diagnose neuropathies and myopathies rare
Pediatric Scoliosis

• Treatment options: only 3 are supported by literature – Observation/Bracing/Surgery

• No significant evidence for chiropractic, physical therapy, melatonin or vitamins, avoiding back packs etc

Pediatric Scoliosis: Treatment options

• Observation: For Cobb Angles < 25 deg

• Bracing: For Cobb Angles > 25 degrees or a lesser curve with 10 or degrees of progression on serial xray - Risser 0, 1, 2 - not indicated in Risser 3-5
Pediatric Scoliosis: Treatment

- Bracing Options: Milwaukee – Metal bars and straps – not used often

- Boston/TLSO – custom molded plastic clamshell – worn 23 hrs day – effectiveness drops off if <16 hrs day

- Night time bracing: Charleston – supine, brace while sleeping in position of maximal correction – not well tolerated in some – best in flexible single lumbar or L curves smaller than 35 degrees

TLSO – Boston Brace

Thoraco, Lumbar, Sacro, Orthosis
Charleston Brace
Nighttime for Maximum correction
Only for single TL or Lumbar curves less than 35 degrees

Pediatric Scoliosis
:Treatment – Surgery

EOS- Infantile /Juvenile - GOAL – control curve until end of skeletal growth to maximize rib and chest growth for pulmonary function
Surgeries : classified by biomechanics Distractive, Compressive and guided growth
• VEPTR –Vertical Expandable Prosthetic Titanium Rib
  - for thoracogenic scoliosis
• Standard or Magnetic growing rods - younger than 8-10 yrs, >60 deg curve despite bracing or casting
• Vertebral body stapling –unpredictable outcomes
Pediatric Scoliosis
: Treatment – Adolescent
Idiopathic Scoliosis

- Posterior Instrumentation and Arthrodesis (aka Fusion)
- Indicated for progressive curves >45 degrees in growing patients and >50 degrees in skeletally mature
  - Failed brace treatment or noncompliance
- Anterior fusion for thoracolumbar or lumbar curves less commonly done today
Pediatric Kyphosis

- Defined as excessive forward bending in the sagittal plane
- Most common cause requiring treatment is Scheurmann’s Kyphosis
- Other causes are Postural Kyphosis, congenital wedging, post laminectomy, fractures, neuromuscular
Pediatric Kyphosis – Scheurmanns Kyphosis

- Genetic defect in disc endplate development – unknown inheritance pattern - gets worse with growth and stops w maturity – causes asymmetric vertebral body growth due to end plate defect in endochondral ossification

- Defined as three contiguous wedged vertebrae with irregular endplates and schmorls nodes

- Thoracic – usually deformity is primary complaint

- Thoracoolumbar or Lumbar – usually back pain is primary complaint
Scheurmanns Kyphosis

Scheurmanns Kyphosis - Treatment Guidelines

• Normal Thoracic Kyphosis 20-40 degrees
• 40-60 degrees  Observe, f/u q 6 mos for repeat xray until growth ends
• 60-80 degrees  TLSO Brace – sometimes need Cervical extension
• >80 degrees – Surgery  Posterior instrumentation and Arthrodesis – may need Anterior releases or Osteotomy (pedicle subtraction, Smith Petersen etc) for rigid curve
REFERENCES

- Orthopedic Knowledge Update Spine 5 edited by Trummees Eeric Published by NASS/AAOS 2017 Section 5 Spine Deformity, Chapters 21-25 pp 293-370
THANK YOU FOR YOUR ATTENTION