Pediatric Back Pain

John T. Anderson, MD, FAAP
Children’s Mercy – Kansas City
Division of Orthopaedic Surgery
Disclosures

• Faculty relationship with AAP
• Board member relationship with the Missouri State Orthopaedic Association
• Board member relationship with the Mid-Central States Orthopaedic Society
• Advocacy member relationship with the Pediatric Orthopaedic Society of North America
Objectives

• Develop and approach to evaluating a child with back pain
• Gain a better understanding of the history and examination findings that suggest serious spinal pathology
Facts

- 50% incidence by age 15
- Much more common in females
- 83% in preceding 3 months
- Exhaustive work up not always indicated
- Psychosomatic cause rare in children less than 10

*Don’t blow off kids < 10

- Source of pain found in 22-84%
Facts

• Back pain more common in high stress kids

• Associated with back pain:
  1) older age
  2) morning fatigue
  3) poor eating habits
  4) inadequate parental support
History

- Age
- Location (focal or diffuse)
- Duration
- Quality
- Timing – day or night or both
- Worsens/Improves
- Trauma?
- Sports participation
- Back pack use (controversial)
- Medications (narcotics)
- History of illness
History

- Interference with ADLs or recreation
- Bowel or bladder symptoms
- Leg pain, weakness
- Gynecologic history
- Unexplained weight loss or weight gain
- Abnormal bruising
History

- Factors associated with identifiable cause
  1. Male sex
  2. Constant Pain
  3. Night pain
  4. Brief duration of symptoms

Physical examination

- Patient should be undressed sufficiently
- Look at their skin
  - Dimples
  - Hair patches
  - Cafe’-au-lait spots
- Look for scoliosis and kyphosis
- Neurologic examination
- Body habitus – tall and lanky?
- Gait
- Flexibility – pain with flexion/extension
- Palpation – midline and paraspinal
- Hip motion – FABER
- Abdominal exam and flank percussion
Physical Examination
Physical examination
Physical examination

Sciatic scoliosis
Physical examination

- Fever (98.6°)
- Kyphosis
- Hairy patch
- Sacral dimple
- Cavus foot
- Tight hamstrings
- Pain wakes me up at night
Physical examination
Diagnostic Studies

• Plain films
  - Not always necessary with activity related back pain in children > 10
  - Good idea if < 10
  - Should probably include the entire spine and pelvis
    * Look for subtleties
      - psoas shadow
      - disk heights
      - pedicle shadows
Diagnostic Studies

- **CT**
  - Better look at bone detail

- **MRI**
  - Upper motor neuron findings
  - Radiculopathy, atrophy or weakness
  - Not that good for spondylolysis
Diagnostic Studies

• Labs
  - Infectious process or malignancy
    * Blood cultures
    * CBC with diff ± peripheral smear
    * CRP/ESR
  - Suspected abdominal/renal etiology
    * UA
    * LFTs
    * Amylase/lipase
Causes

• Patients < 10
  - Infection
  - Neoplasm
  - Congenital abnormalities

• Patients > 10
  - Fractures
  - Disc herniation
  - Overuse injuries
  - Spondylolysis/listhesis
  - Deformity (Scheuermann’s kyphosis)
  - Neoplasms
Evaluation of an Algorithmic Approach to Pediatric Back Pain

David S. Feldman, MD, Joseph J. Straight, MD, Mohammad I. Badra, MD, Ahamed Mohaideen, MD, and Sanjeev S. Madan, MD

BACK PAIN
-HISTORY, PHYSICAL EXAM, BLOOD TESTS
NEGATIVE X-RAYS
-INTERMITTENT PAIN ONLY
-NONSPECIFIC BACK PAIN
-TREAT WITH REST, PT, and/or NSAID

-CONSTANT, NIGHT, OR RADICULAR PAIN, and/or ABNORMAL NEUROLOGIC EXAM
-NEGATIVE MRI

-POSITIVE MRI
-SPECIFIC DIAGNOSIS
-TREAT AS DIAGNOSED

-POSITIVE X-RAYS

-POSITIVE MRI
Osteovertebral Diskitis

• Disk is avascular
• Infection probably begins at endplates
• Back and abdominal pain
• Refusal to walk
• Painful limp
• Refusal to bend or sit
• Positive coin test
• Temp > 38 in 25%
• ESR and CRP elevated
• May appear systemically ill
Osteovertebral Diskitis

• Radiographs may be normal initially

• Disk space narrowing and eventual end-plate irregularities will eventually become evident

• Contrast enhanced MRI helpful

• Parenteral anti Staph aureus for 7-10 days followed by several weeks of PO

• Biopsy those with no response in 72 hours
Osteovertebral Diskitis

Think about atypical infections
Causes

• Neoplasms of the spine
  - 0.5% of primary bone tumors
  - Usually benign
• Posterior column
  - osteoid osteoma (most common)
  - osteoblastoma
  - aneurysmal bone cyst
• Anterior column
  - Eosinophilic granuloma (Langerhan’s cell histiocytosis)
Osteoid osteoma

- Night pain relieved with NSAIDs
- Most common cause of painful scoliosis
- Bone scan good screening tool
- CT best
- Trial of NSAIDs appropriate
- Surgical excision
- Radiofrequency ablation
Causes

Aneurysmal bone cyst
Aneurysmal bone cyst
Aneurysmal bone cyst
Causes

Vertebra plana – Langerhan’s cell histiocytosis
Langerhan’s cell histiocytosis

Vertebra plana
Osteoblastoma

- Large lesions
- 40% have scoliosis
- Neurologic symptoms
- Surgical excision
Causes

- Neoplasms
  - Ewing’s – sacrum
  - Osteosarcoma
    * Rarely affects the spine
    * Usually thoracic or lumbar
  - Leukemia (ALL)
    * Most common malignant cause of back pain
- Neuroblastoma
  * Thoracic spine mets in young children
Ewing’s Sarcoma
Adolescents vs Adults

- Spondylolysis – 47% vs 5%
- Discogenic – 11% vs 48%
- Lumbosacral strain – 6% vs 27%

Be cautious when telling parents that their child’s pain is coming from a disc bulge.
Discogenic Pain

• Very controversial
• Young adults with DD on MRI have more low back pain
  - Takatalo et al. Spine 2011; 36: 2180

DD more common in juveniles with LBP but correlated with obesity
Disc bulge

- 16 yo female
- 3 years of LBP
- Worse when bending forward and lying prone
- No radicular symptoms or nerve root tension signs
- Is the disk causing pain?

Children’s Mercy

KANSAS CITY
16 yo male with severe radicular leg pain
Pediatric Disc Herniation

- Longer time to dx (10 months vs. 4)
  - Often dx with hamstring strain
- Change in activity, prior back injury, heavy lifting, poor conditioning, decreased ROM
- Greater change in height and build than peers
- No clear sex predilection
Pediatric Disc Herniation
Pediatric Disc Herniation

- Usually teenagers
- 30-60% with hx of trauma or event
- Global loss of motion
  - Very limited flexion
- Sciatic scoliosis in 18%
  - Lean away from side of HNP
- SLR + commonly
- Back pain common in kids
Treatment

- Non surgical
  - Not as successful in kids
  - Rest, activity limitation
  - Short term narcotics ok (stool softeners)
  - At 2 weeks, activity as tolerated
  - Avoid prolonged bed rest and narcotics
  - PT for peripelvic flexibility, core strengthening, aerobic exercise and sports specific training
Treatment

- ESI benefit unknown in kids
- Beneficial in adults
- Anectodally worth a try in my opinion
- Prefer transforaminal if foraminal or significant lateral recess stenosis
Treatment

• Open discectomy still gold standard
• Technically more difficult than adults
  - Soft disk more difficult to remove
  - May have bone fragments
• Short term results better than adults
• Long term generally unknown
• Adult literature suggests pts do worse after 6 months of symptoms
Spondylolysis

- Fracture through the pars interarticularis
Spondylolisthesis

- Forward slippage of one vertebra on another – usually L5-S1

Napoleon's hat sign
Spondylolisthesis

- Classification
  - Dysplastic (Congenital)
  - Isthmic
  - Degenerative
  - Traumatic
  - Pathologic
  - Iatrogenic

Pertain to children
Spondylolysis

- Common in sports requiring repetitive extension of the lumbar spine
Spondylolysis/listhesis

- Other predisposing factors
  1) First degree relative
  2) Scoliosis
  3) Scheuermann’s kyphosis
  4) Spina bifida occulta
    - 70% with pars defect vs. 20% w/o
  5) Increased Pelvic Incidence
Spina bifida occulta
Spondylolysis/listhesis

- Insidious onset of dull, aching low back pain
- Worse with activity
- May radiate into the buttocks or posterior thigh
Spondylolysis/listhesis

- May have tight hamstrings
- Pain worse with hyperextension of low-back
- Generally feel fine flexing their trunk
- Neurologic deficits rare
  - High grade listhesis
Spondylolisthesis

Phalen-Dickson Sign
Imaging

• AP and lateral standing L-spine x-rays
• Obliques and coned down L5-S1 (Rarely helpful)
Imaging

• X-rays may be unreliable in cases of occult fractures, unilateral defects or “stress reactions”

• Options:
  1) Bone scan
  2) SPECT scan
  3) CT

• Bone scan more prone to false negatives
Spondylololisthesis

Myerding Classification

Grade I: 0-25%
Grade II: 26-50%
Grade III: 51-75%
Grade IV: 76-100%
Grade V - spondyloptosis
Treatment

• Spondylolysis
  - Nothing if incidental finding
  - If symptomatic (no gold standard)
    1) Rest until asymptomatic
    2) Antilordotic bracing
    3) PT focusing on extension avoiding exercises, pelvic and hamstring flexibility (William’s flexion exercises)

• Fusion vs pars repair for those with persistent pain
Treatment

• Spondylolisthesis\textsuperscript{25}
  - Grade I
    - Asymptomatic: observation
      * F/U Q6 months if < 10
    - Symptomatic: same as lysis
      * Pars repair vs fusion
  - Grade II – as above but avoidance of contact sports or hyperextension
  - Grade III-V – surgical stabilization and fusion
Case

- 14 yo gymnast with chronic low back pain
- Pain worse when upright
- Occasional left leg pain
- Neuro normal
Treatment

- Spondylolisthesis - fusion

L4-S1 posterolateral fusion and instrumentation
TLIF L5-S1
Apophyseal Ring Fracture

- Presentation similar to herniated disc – radicular pain
- Separation of the partially ossified rim of the posterior vertebral apophysis at its osteocartilaginous junction
- Extreme flexion with rotation
- Caudal L4 or cephalad S1
- Males more common
Apophyseal Ring Fracture

Takata & Epstein

Tachdjian’s Pediatric Orthopaedics, 3rd ed
The Pediatric Spine, 2nd ed
Imaging

- Lateral x-ray sometimes will show small fragment of avulsed bone
- CT or CT myelo imaging of choice
- If you see a pediatric patient with a large central disk herniation on MRI, get a CT with cuts in the area of interest to R/O a ring avulsion
Apophyseal Ring Fracture

• Treatment
  - Nonoperative if neurologically intact and minimally symptomatic
  - Surgical tx involves a much larger exposure than is usually necessary for a disc excision
  - Be prepared to do bilateral laminotomies
Apophyseal Ring Injury
Apophyseal Ring Injury
Scheuermann Kyphosis

- Anterior wedging of 3 consecutive vertebrae with kyphotic deformity > 50°
- Schmorl’s nodes
- Pain over apex of deformity
- Treatment:
  1. Extension exercises
  2. Stretching and abdominal strengthening
  3. Bracing if adequate growth remains
  4. Surgery:
     - deformity > 70°, recalcitrant pain

Schmorl’s nodes
Back packs

- Controversial topic
- Mixed findings published

Skaggs et al. J Ped Orthop 2006; 26: 358
van Gent et al. Spine 2003; 28: 916
Sheir-Neiss et al. Spine 2003; 28: 922
Shyman et al. Spine 2014; 39: 243

- Review of literature suggested 15-20% of body weight as maximum
Thanks
Change in practice

• Develop a systematic approach to back pain
• Don’t always depend on the radiologist to interpret the imaging
• Review cases with an orthopaedic friend