Back Pain in Youth Sports

Matthew McDonnell, M.D.
Sports Injuries: Management Strategies for Pediatricians
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Outline

• Background and General Evaluation
• Strains and Sprains
• Disc Herniation
• Spondylolysis and Spondylolisthesis
• Scoliosis and Kyphosis
• Case based questions
Strains and Sprains

• Sprains – injuries to muscles
• Strains – injuries to ligaments
• When muscles or ligaments are subjected to excessive forces, stretching, repetitive loading or extremes of motion, tearing can occur
Strains and Sprains

- Common cause of low back pain in athletes
- Inflammation = response to such injuries
- Inflammation → pain, muscle spasm
Strains and Sprains

• Evaluation:
• Acute injuries result in pain greatest in first 24 – 48 hrs
• Chronic injuries: more gradual onset, symptoms last for longer duration
Strains and Sprains

- Exam:
  - Muscle spasm
  - Localized tenderness
  - Pain worse with motion
  - NORMAL neurologic exam
- Imaging: generally negative, used to rule out other pathology (fracture)
Strains and Sprains

• Treatment: (usually self limited)
• Brief period of relative rest
• Ice/Heat
• NSAIDs
• Muscle Relaxants
• Physical therapy:
  – Trunk strengthening, education and training on posture and proper mechanics, warm up, conditioning to prevent future strains
Pediatric Disc Herniation

- Symptomatic intervertebral disc herniation is rare in children and adolescents
- Radiculopathy with or without back pain
- Lumbar spine most common
  - Pediatric cervical and thoracic herniations account for <1% of all operative disc diseases
Pediatric Disc Herniation

- **Risk factors**
  - Heavy lifting
  - Activities resulting in falls
- **Suspect if...**
  - History of prior back injury
  - Decreased ROM
  - Poor conditioning
  - Excessive or repetitive axial loading
  - Improper technique
  - Abrupt increases in training

Same risk factors also seen with Spondylolysis which is a more Common condition
Pediatric Disc Herniation

• Teenagers most likely to suffer pediatric disc herniation
• 30 – 60% report trauma or sports-related injury (acute or overuse injury)
• Typically symptoms appear within a few hours of injury
• Ozgen et al found 88% presented with low back pain, whereas 35% reported radicular pain
Pediatric Disc Herniation - Evaluation

• Thorough history
  – Onset, provoking activity, athletic level and amount and intensity of training
  – Location, severity and radiation of pain
  – Worse on flexion or valsalva (disc)
  – Worse on extension (facet injury, spondylolysis)
  – Neurologic symptoms (weakness, numbness, bowel and bladder dysfunction)
  – Response to medications
Pediatric Disc Herniation - Evaluation

• Physical exam:
  – Postural abnormalities, compensatory positioning (reactive scoliosis), gait abnormalities
  – Alignment
  – Neurologic exam (motor, sensory, reflexes)
  – Straight leg raise (positive tension sign)
Pediatric Disc Herniation - Evaluation

- 90% at L4-L5 or L5-S1 levels
- L4-L5:
  - L5 nerve root
  - EHL weakness
  - Numbness top of foot
- L5-S1:
  - S1 nerve root
  - Weak ankle plantar flexion/eversion
  - Numbness lateral foot
  - Achilles reflex

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Pediatric Disc Herniation - Imaging

- Plain radiographs
  - Evaluate for scoliosis, congenital anomalies (AP)
  - Spondylolysis, spondylolisthesis, disc height abnormalities, fractures or defects of pars (Lateral)
  - Instability (flexion/extension)
  - Inadequate to visualize disc herniation

- MRI
  - Standard
  - Excellent resolution of discs, neural elements, soft tissues
Pediatric Disc Herniation - Imaging
Pediatric Disc Herniation – Nonsurgical Management

- Relative rest (1-2 weeks)
- Cessation of sporting activities
- Bed rest NOT encouraged

- Activities can be resumed in 1-2 weeks within the limits of pain
- Avoid prolonged sitting, jumping, spine hyperflexion or extension, and straining → increase intradiscal pressure → aggravate symptoms
Pediatric Disc Herniation – Nonsurgical Management

- Physical Therapy
  - Emphasis on aerobic exercise
  - Core strengthening/stabilization
  - Peripelvic flexibility
  - Conditioning specific to activities or sports of patient
Pediatric Disc Herniation – Nonsurgical Management

• Medication
  – NSAIDs
  – Muscle Relaxants
  – Oral corticosteroids

• Epidural steroid injections
  – Not well studied in pediatric population
Pediatric Disc Herniation – Surgical Management

- Indications:
  - Failed nonsurgical therapy
  - Progressive neurologic deficit
  - Debilitating pain
  - Cauda equina syndrome (rare)

- Posterior lumbar laminotomy and discectomy
Pediatric Disc Herniation – Surgical Management

- Special considerations:
  - Adequate access while preserving spinal stability
  - Avoid iatrogenic fusion or instability

- Unique Challenges:
  - Pediatric discs well hydrated making more difficult to remove
  - Apophyseal bony fragment
Spondylolysis and Spondylolisthesis

• Spondylolysis refers to a defect in the pars interarticularis
• Spondylolisthesis is the forward translation of one vertebral segment over the one beneath it
• Common causes of low back pain in children and adolescents
Spondylolysis and Spondylolisthesis
Spondylolysis and Spondylolisthesis
Wiltse Spondylolisthesis Classification

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Dysplastic</td>
</tr>
<tr>
<td>II</td>
<td>Isthmic — defect in the pars interarticularis</td>
</tr>
<tr>
<td>IIA</td>
<td>Lytic — fatigue fracture of the pars region</td>
</tr>
<tr>
<td>IIB</td>
<td>Elongated but intact pars acute fracture</td>
</tr>
<tr>
<td>IIC</td>
<td>Acute fracture</td>
</tr>
<tr>
<td>III</td>
<td>Degenerative — resulting from long standing intersegmental instability</td>
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<tr>
<td>IV</td>
<td>Posttraumatic — acute fractures in the posterior elements beside the pars region</td>
</tr>
<tr>
<td>V</td>
<td>Pathologic — destruction of the posterior elements form generalized or localized bone</td>
</tr>
<tr>
<td>VI</td>
<td>Postsurgical</td>
</tr>
</tbody>
</table>
Isthmic Spondylolysis and Spondylolisthesis

- Meyerding classification grading spondylolisthesis:

0 0%
1 0-25%
2 26-50%
3 51-75%
4 76-100%
5 complete
Isthmic Spondylolysis and Spondylolisthesis

- Hereditary predisposition?
- Specific sporting activities with repetitive hyperextension and rotational loads applied to the lumbar spine place young athlete at risk
- Incidence as high as 47% in high risk sports (gymnastics, diving, pole vaulting, football, weight lifting, rowing)
Isthmic Spondylolysis and Spondylolisthesis

• Natural History
  – Most patients with isthmic spondylolysis present with some degree of slip
  – < 4% demonstrate slip progression through skeletal maturity into adulthood
  – Diagnosis before adolescent growth spurt, those presenting with > 50% slip → most likely to progress
  – No correlation between slip progression and low back pain
Isthmic Spondylolysis and Spondylolisthesis

- History and Physical Exam
  - Low back pain
    - Worse with activity, particularly extension, rotation
    - Night pain uncommon *concern for infection/malignancy
  - Occasionally radiculopathy to buttock or posterior thigh (generally due to inflammation in region of pars and subsequent irritation of L5 nerve root)
  - Insidious onset more common
  - Acute injury possible
Isthmic Spondylolysis and Spondylolisthesis

- History and Physical Exam
  - Hamstring tightness/contracture
  - Gait with short stride length with flexion hips/knees (due to hamstring contracture)
  - Palpable step-off spinous processes (advanced slip)
  - Limited lumbar flexion/extension; hyperextension elicits pain
  - Neurologic exam generally normal
Isthmic Spondylolysis and Spondylolisthesis

• Diagnostic studies:
  – X-rays (AP, Lateral, Flexion/Extension, oblique)
  – SPECT of lumbar spine
    • Single-photon emission CT
    • Increased radionuclide uptake in an intact pars, lamina or pedicle is consistent with stress reaction
    • Decreased tracer uptake on serial SPECT scans correlated with improvement in symptoms
    • Thin cut CT evaluate degree of cortical disruption, lysis, sclerosis, progressive healing
  – MRI – indicated if neurologic signs and symptoms in conjunction with spondylolysis/spondylolisthesis
Isthmic Spondylolysis and Spondylolisthesis
Isthmic Spondylolysis and Spondylolisthesis
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Isthmic Spondylolysis and Spondylolisthesis

- Treatment for **Stress Reaction:**
- Goal: healing
- Activity restriction
- Early TLSO bracing 8–12 weeks
  - Discontinue after pain-free lumbar extension or documented healing with repeat CT (controversial)
- Physical therapy with gradual reintroduction of activities
Isthmic Spondylolysis and Spondylolisthesis

• TLSO brace
Isthmic Spondylolysis and Spondylolisthesis

- Treatment for Isthmic defect +/- low grade spondylolisthesis:
- Goal: alleviation of pain and spinal mobility, not bony healing
- Activity restriction and physical therapy
- TLSO bracing if not responsive to rest and therapy alone
- Resume activity once pain free
- Low risk of slip progression (2 – 6%)
Isthmic Spondylolysis and Spondylolisthesis

• Treatment for Isthmic defect +/- low grade spondylolisthesis:
  • Advise patients and parents not to restrict activity, not to expect an increase in any deformity or to expect a higher likelihood of development on incapacitating pain
  • Exception*: high grade isthmic spondylolisthesis or those with dysplastic spondylolisthesis more likely to remain symptomatic and progress
Isthmic Spondylolysis and Spondylolisthesis

• Indications for surgery:
  – Persistent disabling pain from non-healing stress fracture, spondylolytic defect, or low-grade spondylolisthesis despite minimum of 6 months nonsurgical treatment
  – Symptomatic patients with progressive dysplastic or high grade isthmic spondylolisthesis
    • Those with neurologic deficit
Isthmic Spondylolysis and Spondylolisthesis

- Surgery:
- Stress fracture, isthmic defect, no slip (or minimal slip: Pars repair)

Figure 1

Isthmic Spondylolysis and Spondylolisthesis

- Surgery:
- Stress fracture, isthmic defect, no slip (or minimal slip): Pars repair
Isthmic Spondylolysis and Spondylolisthesis

- Surgery:
- Isthmic defect with slippage
Adolescent Idiopathic Scoliosis and Scheuermann’s Kyphosis

- Often found incidentally in evaluation of back pain. What to do?
Adolescent Idiopathic Scoliosis

- Structural lateral curvature with rotation of the spine that occurs just before and during puberty
- Genetic predisposition – common family history
- 2-3% of adolescents
- Female to male ratio is 4:1
- Females more likely to progress
Adolescent Idiopathic Scoliosis

- Most thoracic curves have apex to the right; apex to the left warrants MRI to rule out other causes (syrinx, tethered cord)
Adolescent Idiopathic Scoliosis

- Curve progression:
  - Directly related to skeletal maturity
    - Immature patients more likely to progress (more growth remaining)
    - Curves < 30 degrees rarely progress after skeletal maturity is reached
  - Other factors:
    - Magnitude of curve
    - Curve patterns
    - Loss of thoracic kyphosis
Adolescent Idiopathic Scoliosis

- Skeletal maturity – Risser Sign
  - Ossification of iliac apophyses = indicator
  - Risser 1 visualized around time of menarche
  - Risser 4 – patient past peak height velocity, near end of spinal growth
Adolescent Idiopathic Scoliosis

• Treatment Principles:

• Observation
  – Minimal asymmetry and curves < 10 degrees can be monitored clinically by primary care physician
  – 10 – 25 degrees: referral to pediatric orthopaedist and monitored with serial exam and x-rays every 6-12 months until skeletal maturity
Adolescent Idiopathic Scoliosis

- Treatment Principles:
- Bracing
  - Prevents progression in growing patient, does not correct existing deformity
  - Curves 30 – 45 degrees and skeletally immature
  - Curves > 25 degrees and documented progression of 5 degrees or more and skeletally immature
  - Worn until skeletal maturity, monitor x-rays every 4-6 months depending on peak growth velocity
Adolescent Idiopathic Scoliosis

- Treatment Principles:
- Surgery
  - Generally considered for curves greater than 45 degrees with progression despite bracing
  - Posterior spinal fusion, anterior spinal fusion, combined approaches
Scheuermann’s Kyphosis

- Fixed thoracic or thoracolumbar kyphosis
- Prevalence 0.4 – 8% of general population
- Familial predilection
- Usually presents in adolescence during prepubertal growth spurt
- Patients seek care for either pain or cosmetic reasons
Scheuermann’s Kyphosis

• Presentation:
  – Pain worse with sitting, prolonged standing, strenuous exercise
  – Thoracic hyperkyphosis
    • Apex usually around T7-T9
  – Compensatory cervical and lumbar hyperlordosis
  – Hamstring, iliopsoas, shoulder girdle tightness due to increase strain to maintain sagittal balance
Scheuermann’s Kyphosis
Scheuermann’s Kyphosis

• X-ray
  – Anterior wedging greater than 5 degrees in 3 or more adjacent thoracic vertebral bodies
  – End-plate irregularities, narrowing of disc spaces, Schmorl’s nodes, Cobb angle greater than 40 degrees
  – Compensatory hyperlordosis of cervical and lumbar spines

• CT
  – Clearly demonstrates vertebral abnormalities
    • Loss of anterior vertebral body height (wedging), end-plate irregularities, Schmorl’s nodes
  – Indicated if diagnosis unclear on x-ray
  – Differentiates between other causes of kyphosis (congenital anomalies, fractures)

• MRI
  – Not necessary for diagnosis, performed if clinical signs of thoracic disc herniation with spinal cord compression
Scheuermann’s Kyphosis

• Prognosis and Treatment:
  – Paucity of data on natural history and long term outcomes with treatment
  – Major of cases benign, resolution of symptoms on skeletal maturity
  – Kyphosis > 75 degrees more likely to show progression of deformity, degenerative spondylosis, disc herniation and back pain as adults
Scheuermann’s Kyphosis

• Prognosis and Treatment:
  – Mild kyphosis - < 55 degrees:
    • Supportive treatment
    • Analgesics, physical therapy to manage pain and fatigue, strengthen paraspinal muscles, improve flexibility
  – > 55 degrees
    • Analgesics, PT
    • Bracing – deformity correction of 15 degrees or more has favorable prognosis
  – > 70 degrees
    • Surgery indicated for debilitating pain or neurologic deficits
A 12 year old girl presents with one day of activity related low back pain after a slip, twist and fall at soccer practice yesterday. Her pain is relieved by rest. She denies radiation of her pain. Exam reveals mild paraspinal muscle tenderness and spasm. Normal neurologic exam. What is the next best step?

- A. Bedrest
- B. X-ray lumbar spine
- C. MRI lumbar spine
- D. Relative rest, NSAIDs, close observation
- E. Return to soccer later this afternoon
A 16 year old varsity football player presents with 3 weeks of low back pain, pain radiating down the back of his left leg into his calf, mild numbness on the lateral aspect of his left foot. The pain is worse with sitting and with activity. He has been unable to play due to the pain. Exam reveals a positive tension sign (SLR) on the left and can only perform single leg heel rise 5 times until failing due to weakness.
Question 2

• A 16 year old varsity football player...
• X-rays obtained in office = normal
• MRI:
Question 2

- A 16 year old varsity football player...
- What is recommended treatment?
  - A. Relative rest, NSAIDs, physical therapy
  - B. Surgery for L5-S1 microdiscectomy
Question 3

• A 15 year old male presents with 3 months of worsening low back pain of insidious onset. He is a varsity soccer and baseball player. He has tried resting for 4 weeks following the end of soccer season but his pain persists. His low back pain is worsened by extension and twisting. He does not have pain at rest. Pain radiates into his right buttock and posterior thigh. He has a normal neurologic exam.
Question 3

- A 15 year old male presents with 3 months of worsening low back pain of insidious onset...
- You review X-rays and MRI ordered previously by another physician...
Question 3
A 15 year old male presents with 3 months of worsening low back pain of insidious onset...

What is next appropriate study in workup?
- A. Myelogram
- B. Repeat MRI L-spine this time with contrast
- C. SPECT study
Question 3

- A 15 year old male presents with 3 months of worsening low back pain of insidious onset...
- SPECT Results: increased activity bilaterally in region of pars at L5 consistent with developing spondylolysis/stress injury
Question 3

• A 15 year old male presents with 3 months of worsening low back pain of insidious onset...

• Treatment?

• Activity Restriction

• TLSO bracing (12 weeks)
THANK YOU

Questions?