Musculoskeletal Concerns in the Pediatric Athlete

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Dislclosures

Neither I, John Hatzenbuehler nor any family member(s), have any relevant financial relationships to be discussed, directly or indirectly, referred to or illustrated with or without recognition within the presentation.
Objectives

1. Understand the principles specific to trauma in the pediatric athlete.
2. Discuss the workup of the limping child.
3. List the most common overuse disorders in the adolescent athlete.
General Principles

- Kids are not adults
  - Physeal issues
- Sports are the leading cause of injury in adolescents
- CDC estimates that ~50% of injuries are preventable - Overuse
  - Improper technique
  - Training errors
  - Poorly fitting protective equipment
- “Kids break, they don’t sprain”
- Congenital, neurological, oncological issues identified early in life
Traumatic injuries

- Up through adolescence ligaments are stronger than bone
- Acute persistent pain after trauma is fracture until proven otherwise
- Kids protect much better than adults (unless it’s a teenage boy)
- X-ray principles
  - Remember the physes
  - Salter-Harris classifications
  - Xray the contra-lateral side if uncertain
Salter-Harris fracture types

Normal

Type 1 - 5%

Type 2 - 75%

Type 3 - 10%

Type 4 - 10%

Type 5 - uncommon
Salter-Harris fracture types

Type 3 - 10%
Type 4 - 10%
Type 5 - uncommon
Trauma Treatment

- Immobilization works great in kids
- Healing time is MUCH faster in kids
- Salter-Harris I typically a clinical diagnosis
- Likely need more frequent follow ups
- Angulated fractures tend to be more forgiving in kids
- Keep eye out for abuse
  - Fracture <4 yo
  - Hx insufficient to explain injury
  - Hx inconsistent with developmental ability of child
  - Delay in seeking care
  - Hx of substance abuse in caregiver
The Limping Child

➤ Antalgic vs Non-antalgic gait

➤ Antalgic gait – short stance phase to prevent pain

➤ Non-antalgic gait

➤ Steppage gait – hyper flexed hip and foot
  ➤ Neurologic condition causing foot drop

➤ Trendelenberg gait – contralateral hip drop
  ➤ DDH, weak hip abductors

➤ Circumduction gait - knee in hyperextension in stance phase
  ➤ Neurological issue or leg length discrepancy

➤ Equinus gait – walking on toes
  ➤ Club foot, CP, tight achilles, leg length issue, foot pain
Differential Diagnosis – Antalgic gait

- Developmental issues
  - LCP, SCFE
- Neurological
  - Spinal infection, tumor
- Infection
  - Osteomyelitis, Septic hip
- Trauma
  - Fracture, stress fx
- Overuse
  - Apophysitis, OCD lesion

- Inflammatory issues
  - JRA, reactive arthritis, transient synovitis
- Neoplasm
  - Osteoid osteoma, Ewings
- Intra-abdominal issues
  - Appendicitis, psoas abscess
- Hematologic
  - Hemarthrosis, osteonecrosis (sickle cell)
Limping Child Work up

- Historical elements
  - Trauma vs overuse vs insidious
  - Hip vs knee pain
  - Systemic symptoms?
  - Night pain

- Physical exam
  - Abdominal tenderness, back pain, hip ROM, knee ROM, rash, joint swelling, gait

- Imaging
  - Xray – AP hip and frog leg lateral (SCFE – lateral)
  - Young children consider xray entire extremity

- Laboratory testing
  - CBC w/diff, ESR, CRP, ?blood cultures, ?bone biopsy
  - Joint Aspirate (US) — gram stain, culture, cell count
Slipped Capital Femoral Epiphysis (SCFE)

- Posterior/inferior slippage of prox fem epiphysis
- Adolescent obese males
- 25-40% bilateral
- Most cases are idiopathic
- HPI
  - Limp
  - Hip pain – referred to groin, thigh, knee
  - 50/50 insidious/trauma
- Xray
- Treatment – NWB, Ortho referral
Common Dilemmas

➢ Septic Arthritis vs Transient synovitis

➢ TS – afebrile, non-toxic, ROM reduced but not severely

➢ Septic joint

➢ Temp >101.3 F

➢ NWB

➢ ESR > 40

➢ CRP >2.0

➢ WBC >12,000

% LIKELIHOOD SA*
1- 37%
2- 63%
3- 83%
4- 93%
5- 98%

*JBJS 2006;88(6):1251.
Common Dilemmas

Malignancy vs Rheumatologic Disease

- Both have constitutional symptoms
- Non-articular bone pain, bone TTP, night sweats, bruising, severe constitutional symptoms (malignancy
  - Unexplained MSK symptoms*
  - Night pain*
  - Low WBC*
  - Low/low normal PLTS*

*ACUTE LYMPHOBLASTIC LEUKEMIA
Selected Reference

Overuse Injuries

- Typical due to physeal stress or apophyseal irritation
- Not “growing pains”
- Localized, insidious onset pain, worse with activity
- Common apophysitis
  - Calcaneal: Sever’s disease
  - Tibial tubercle: Osgood-Schlatter’s disease
  - Inferior patellar pole: Sinding-Larsen-Johansson disease
  - Medial elbow epicondyle: little leaguer’s elbow
  - Proximal humerus: little leaguer’s shoulder
Overuse injuries - Shoulder

- Risk factors for increased injury
  - Excessive throwing (#pitches/game and season)
  - Better pitchers
  - Year round participation
  - MSK deficits in ROM/Strength (GIRD, Scapular dysfunction)
  - Epiphyseal changes occur due to traction/rotational stressors
- Baseball is primary risk, but can happen in other overhead sports (swimming, volleyball, tennis)
Overuse injuries – Shoulder Evaluation

- Hx
  - Pitch count
  - Change in mechanics/when during throwing phase

- PE
  - ROM esp IR/ER
    - Glenohumeral internal rotation deficit (GIRD)
  - Scapular motion/RTC function
  - Core stability/kinetic chain assessment

- Imaging – xrays looking for physeal widening
Overuse injuries – Shoulder Treatment

- Treatment – almost always non-operative
  - Rest/activity modification
  - Rehabilitation focusing on scapula/RTC/kinetic chain

- Prevention
  - Decrease exposure
  - Preserve biomechanical factors
  - Educate parents/coaches/athletes
Overuse injuries – Elbow

- Similar hx and mechanical factors to shoulder
- Increased valgus loads in rapid extension
  - Medial tensile strength (UCL)
  - Posterior shear stress
  - Lateral compression
- Evaluation: Hx of exposure
- PE: ROM, TTP, valgus stress testing
  - Xray: physis widening, if avulsion >2mm ortho ref
- Tx/Prevention: similar to shoulder
Overuse injuries – Knee

- Anterior knee pain most common
  - PFS
  - Apophysitis –OS, SLJ
  - Plica syndrome
  - Patellar instability
  - Hip pathology –SCFE, DDH
- Not responding to conservative measures, consider OCD lesion
Overuse injuries – Knee Evaluation

- **Hx**
  - Location
  - Prior injury
  - ?Referred from hip

- **PE**
  - Patellar tracking/instability
  - Knee stability
  - Hip ROM/strength/flexibility
  - Functional knee strength – single leg squat
Overuse injuries – Knee Treatment

Treatment

- Resolve strength deficits – vmo, glute
- Improve quad/hamstring flexibility
- Apophysitis: rest/ice
- Orthotics/bracing/straps

Prevention

- Mindful of activity levels
- Pre-season strength programs
- ACL prevention programs
Overuse injuries – Spine

- Increased rates of back pain in athletes
  - No increase in BP as adults
- Spondylolysis most common dx in SM clinics
  - Pars interarticularis stress injury
  - L5 most common
- Sports with frequent lumbar flex/ext with rotation
  - Gymnastics, football, soccer, but really any sport
- Progression to spondylolisthesis uncommon
Overuse injuries – Spine Evaluation

- **Hx**
  - Axial LBP with incidious onset (occ traumatic)
  - Worse with activity, better with rest (months)

- **PE**
  - Non-focal exam
  - +stork testing.

- **Imaging**
  - Xrays: AP/Lat views – oblique views not nec
  - Bone/SPECT scan more sensitive than MRI
Overuse injuries – Spine Treatment

- No RCT’s for best treatment recommendations
- Relative rest most commonly recommended
- Timeline depending on symptoms
- Bracing is controversial
- Most improve with conservative treatment
- No solid prevention strategies
Selected References

- ACSM Team Physician Consensus Statement
  Selected Issues for the Adolescent Athlete and the Team Physician: A consensus statement

- AMSSM Position Stand
  Overuse Injuries and Burnout in Youth Sports
  CJSM 2014;24:3-20.
Summary

- Kids are not adults (fortunately)
- Trauma – bone more susceptible until post puberty
- Limping child – large differential
  - Don’t forget the hip
- Physeal injuries common – trauma, overuse
- Most overuse injuries are preventable
- Activity modification/limits essential
Thank You.