

Pediatric Sports Medicine

December 7, 2013

Pediatric and Adolescent Sports Injuries?

- Why are they so important and how are they different?



Objectives

- To address the most common sports injuries in the pediatric patient
- To discuss the evaluation and treatment of these injuries
- To understand the mechanism of these injuries

Common Pediatric Injuries/Diagnoses

- Spondy's
- Apophysitis
- Knee Problems
- Hip Problems
- Female Athlete Triad
- Salter Harris Fractures
- Concussions

What is This?

- Where is the defect?



What is this?

- Where is the defect?



What is this?

- There is the defect!



Physical Exam

- ROM with flexion, extension, B/L sidebending and B/L rotation
- Assess for hamstring tightness and straight leg testing
- Stork testing

Spondylosis

- Degenerative arthritis of the disc and facet joints causing compression of the spinal cord and nerve roots.



Spondylosis Symptoms

- Exacerbation of pain with extension
double leg or single leg
- May have distal neurological findings such
as absence of anal reflex
- Limited back motion especially with
extension

Spondylosis Studies

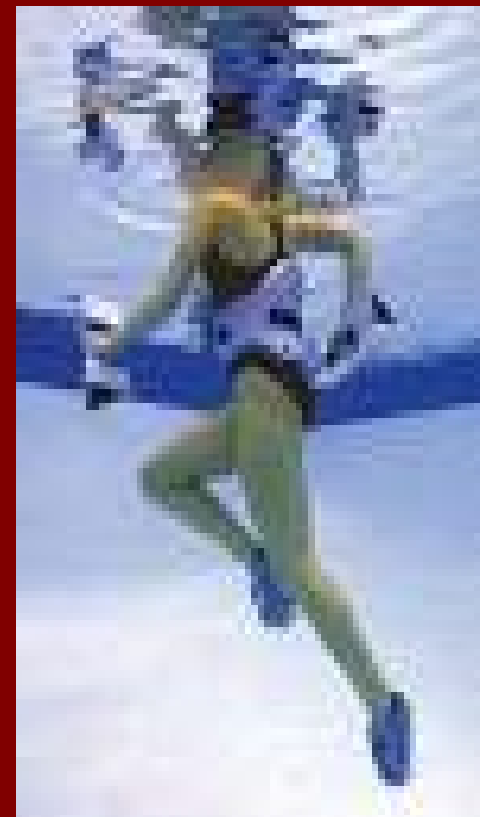
- Lumbar Series: will show osteoarthritis with evidence of spurring, disc narrowing, or neuroforaminal narrowing
- MRI is more definitive with or without contrast
- CT is generally not helpful

Acute Spondylosis Treatment

- Limit standing/extension activities
- If must be on their feet, need to have established rest stops
- NSAID or COX-2 Inhibitor
- Short course Corticosteroids for radiculopathy

Chronic Spondylosis Treatment

- Flexion-based PT and core strengthening
- Cushioned shoes/insoles
- Low impact aerobics
- Bike, stairmaster, aqua-aerobics
- Epidural Steroid Injections



Spondylolisthesis

- Anterior slippage of the spine
- Anterolisthesis involves the anterior movement of the overlying vertebral body on the affected body
- Grade 1 < 25% slippage
- Grade 2 25-50%
- Grade 3 50-75%
- Grade 4 >75%

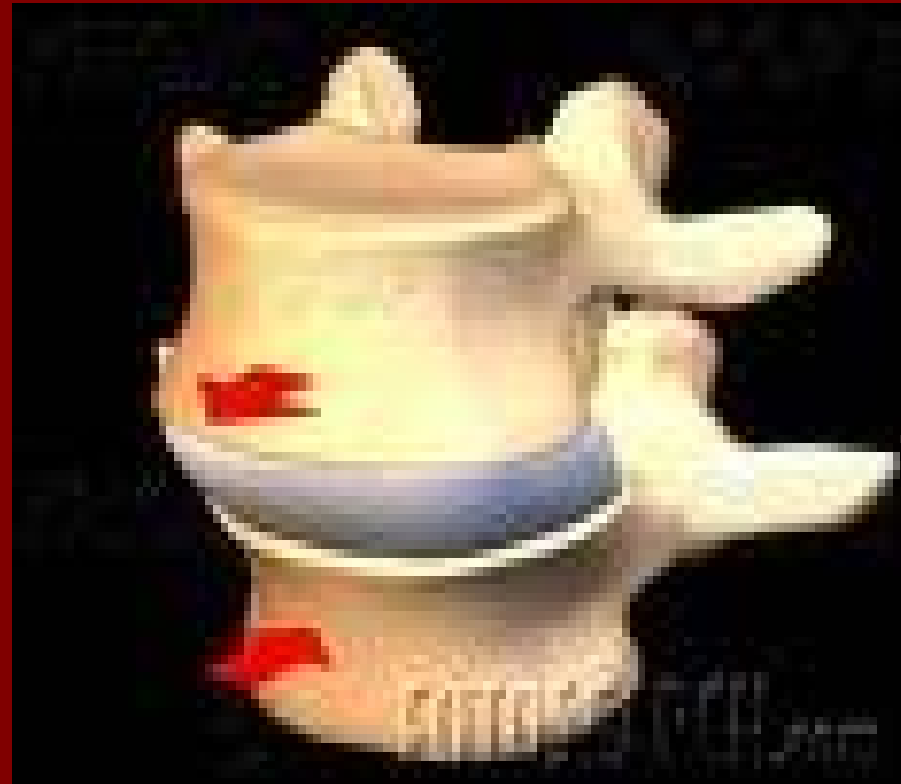


Spondylolisthesis Symptoms

- Pain below the waist aggravated by twisting, extension, or prolonged standing
- Waddling gait
- Hamstring tightness
- Hyperlordosis
- Rarely neurological symptoms

Spondylolisthesis Studies

- Lateral X-Ray



Asymptomatic Spondylolisthesis Treatment

- Grade 1: No restrictions. Lateral X-ray every 6-12 months through growth period
- Grade 2: restriction from collision or high risk activities with hyperextension or high impact
- >50%: Surgical stabilization

Symptomatic Spondylolisthesis Treatment

- Grade 1: activity restriction and pain control; part-time bracing with gradual wean and return to activity
- Grade 2: Rest and bracing as well as counseling against return to activities
- >50%: Surgery

Spondylolysis

- Fracture of the pars interarticularis of the lumbar spine



Spondylolysis Symptoms

- Back pain aggravated by extension, usually without palpable or radicular pain
- Pain with standing single leg hyperextension

Spondylolysis Studies

- Oblique X-Ray demonstrates lucent line in pars (Collar on Scotty Dog)
- Bone Scan may demonstrate focal signal in the pars
- SPECT (single photon emission computed tomography) done with the bone scan is very specific in identifying pars lesion
- MRI may show signal and or fracture of pars
- CT will only show complete fracture

Spondylolysis Treatment

- PT for hamstring flexibility and anterior core strengthening for 3 weeks.
- If no pain on stork testing after 3 weeks of PT, may start back extension strengthening exercises and continue for 3 weeks.
- If symptoms persist or return early, consider extending PT
- If negative stork testing and pain free after 6 weeks, may return to sport without imaging

Spondylolysis Treatment

- Bracing was previously recommended for all patients but this has proven to be ineffective
- Surgical consult for refractory cases
- QUESTIONS?

Apophysitis

- Apophysis: a growth center at the insertion of tendons and ligaments into bone.
- Inflammation at these sites (apophysitis) occurs during a growth spurt secondary to poor flexibility and recurrent traction of the muscle-tendon unit causing microfracture

Osgood-Schlatter Disease

- Inflammation of the apophysis of the tibial tubercle
- Most common knee complaint in children
- Pain at tibial tuberosity with activity, relieved by rest
- Lateral X-ray demonstrates fragmentation or irregular ossification of the tibial tubercle

Osgood-Schlatter Treatment

- Rest from aggravating activities short term
- Ice
- Hamstring and Quadricep stretching
- Cho-Pat brace or other patellar tendon counterforce brace for activity
- Immobilization with crutches for severe pain
- May return to sport as tolerated

Sinding-Larsen-Johanssen

- Apophysitis of the inferior pole of the patella
- Preteen boys
- Pain, swelling and tenderness of the inferior pole of the patella with high impact activities. May also have hamstring tightness
- X-rays may be normal or show calcification or elongation of the inferior pole of the patella or demonstrate bipartite patella.
- Treatment similar to that of Osgood-Schlatter

Sever's Disease

- Apophysitis at the calcaneus, specifically at the insertion of the Achilles tendon
- 9-12 year-olds in high impact sports present with posterior heel pain
- X-rays may show irregular contour of the apophysis and you may need a bone scan or MRI to evaluate for a stress fracture

Sever's Disease Treatment

- Rest, ice, NSAID's PRN
- Heel cord stretching by physical therapist
- Heel cups or shoe inserts

Medial Elbow Apophysitis (Little Leaguer's Elbow)

- Usually will have medial epicondyle fragmentation and avulsion or delayed or accelerated apophyseal growth
- Little League Elbow is a blanket term that also includes Osteochondritis Dissecans of the Capitellum, Osteochondrosis of the Radial Head, Flexion Contracture of the Elbow, and Olecranon Stress Fractures

Medial Elbow Apophysitis

- Usually pitchers that present with medial elbow pain, but also occurs in gymnasts
- Assess for ROM and strength at the elbow, wrist, shoulder and back
- Assess for laxity or pain at the elbow and compare it to the other side
- Tinel's test will help discover an ulnar nerve subluxation
- X-rays need to be done bilaterally for comparison
- May need CT to evaluate for loose bodies

Medial Elbow Apophysitis

Treatment

- Send it to someone who knows how to treat it and treats it often!
- 4-6 weeks of rest with no throwing
- A strengthening and light throwing program may begin after 6-8 weeks of rest

Other Pediatric Knee problems

Patellofemoral Pain Syndrome

- Most common cause of anterior knee pain in the young athlete
- Caused by overuse secondary to malalignment and VMO weakness



Patellofemoral Pain Syndrome

- Symptoms are worse with stairs, running or sitting with knee flexed for extended period of time
- Subpatellar crepitus, snapping, popping or grinding are often described
- Diagnosis by positive patellar grind test and lateralization and patellar tilt on X-ray
- Treatment with Physical Therapy to strengthen and stretch VMO, quadriceps, hamstrings and iliotibial band usually successful within 3-4 weeks

Osteochondritis Dessecans of the Knee

- Males:Females 2:1
- Ages 13-21 most commonly
- Partial or complete separation of a segment of hyaline cartilage

Osteochondritis Dessecans

- Stage 1: Compression Fracture, normal X-ray
- Stage 2: Partially detached, osteochondral fragment
- Stage 3: Defect is detached but within underlying cartilage
- Stage 4: Detached defect with migration



Osteochondritis Desiccans

- Symptoms include vague, diffuse knee pain that is worse with activity and may produce an effusion
- Loose bodies may produce locking, popping and instability
- If X-rays are indeterminate, MRI or Bone Scan may be helpful
- Stage 1 and 2 may do well with immobilization, whereas Stage 3 and 4 need to see orthopedics

Pediatric Hip Problems

- SCFE (Slipped Capital Femoral Epiphysis)
- Legg-Calve-Perthes
- Avulsion Fractures
- Toxic Synovitis



SCFE

- Male: female 2:1
- 9-16 y.o. obese or tall and thin
- Shearing failure of proximal femoral epiphysis usually from impact activity
- Painful weight-bearing or limp with pain in anterior groin, thigh or knee with limited internal rotation

SCFE

- X-rays: AP and frog-leg lateral with contralateral comparison views
- Treat with non-weight-bearing and referral to orthopedics for pinning
- Return to sport after months of inactivity, hardware removal and most often physeal closure

Legg-Calve-Perthes

- 4-8 y.o., males > females
- Interrupted blood supply to femoral epiphysis
- Patient will have a limp and pain from anterior groin to knee
- X-rays and possibly bone scan or MRI

Legg-Calve-Perthes

- Refer to Orthopedics
- Treatment options include observation, bed rest, bracing or casting and surgery
- Return individualized decided by Orthopedics

Avulsion Fractures

- ASIS---Sartorius and tensor fascia lata
- AHS--- Rectus Femoris
- Ischial Tuberosity---Hamstrings, most likely Biceps Femoris
- Lesser Trochanter---Iliopsoas

Avulsion Fractures

- Usually caused at an apophysis from a forceful muscle contraction
- Football linemen from pushing off
- Soccer players on plant foot while kicking
- Weight lifters
- Runners
- Treatment is non-weight bearing for 4 weeks, then repeat X-ray, re-evaluate and consider PT



FIGURE 1. Fracture of the anterior inferior iliac spine in a 13-year-old boy



Toxic (Transient) Synovitis

- Male: female 2:1
- Most common cause of hip pain in children <10 years old
- Symptoms include recent URI, low-grade fever and painful limp or inability to walk
- ESR and WBC count may be slightly elevated
- Self-limiting with rest and NSAID's

Female Athlete Triad

Menstrual Disturbances/Amenorrhea



Female
Athlete
Triad

Bone Loss/Osteoporosis

Energy Deficit
Disordered Eating

Female Athlete Triad



Female Athlete Triad

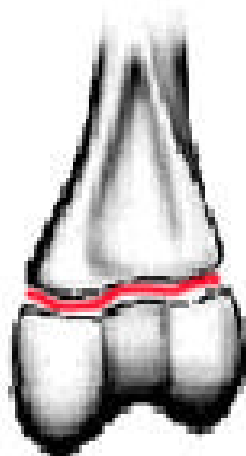
- Need to obtain PMHx, menstrual history, psychosocial history, exercise history, nutritional assessment, current medications and physical exam
- May need consultation with psychiatrist or psychologist, gynecologist, orthopedic surgeon, sports nutritionist, cardiologist and if available athletic trainer

Female Athlete Triad

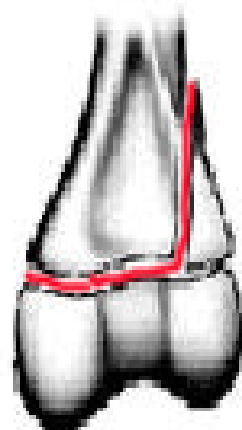
- Laboratory studies include pregnancy test, UA, CBC, ESR, CMP, thyroid panel, FSH, LH, prolactin, testosterone, DHEAS, and direct estradiol
- DEXA scan and EKG depending on severity
- Treatment includes possibly consulting everyone mentioned earlier

Salter Harris Fracture Classification

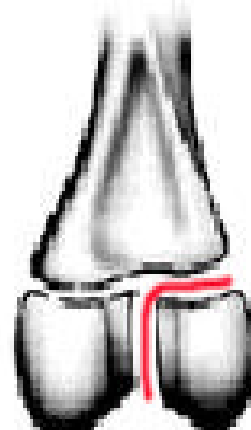
The Salter-Harris Classification of Growth Plate Injuries



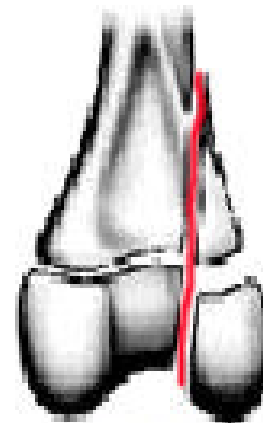
I



II



III



IV



V

Salter Harris Mnemonic

- In relation to the growth plate

S-Type 1---Same

A-Type 2---Above

L-Type 3---Lower

T-Type 4---Through

E-Type 5---Everywhere

Salter Harris 1 Fractures

- Difficult to diagnose with X-rays alone
- Diagnose by tenderness over the growth plate
- Immobilize for 3-4 weeks, then re-evaluate

Concussions

- Too broad for this lecture...but, a few tips
- Most commonly caused by bicycle accidents in pediatrics!
- When in doubt, sit them out!
- Grading system no longer used
- Meet with athletic trainers , coaches and E.M.T.'s that cover your teams prior to season and discuss return to play protocol and everyone's role. Everyone must be on the same page or there will be conflict.

Concussions

- IMPACT Testing
 - Measures player symptoms
 - Computer administered
 - Can be administered on a lap-top for easy access and administration
 - Assists physicians and athletic trainers in making difficult return-to-play decisions
 - Permits individual and group administration
 - Provides reliable baseline test information
 - Results can be E-mailed or Faxed for fast consultation by a Neuropsychologist
 - Produces comprehensive report of test results
 - Automatically stores data from repeat testing
 - Measures attention, memory, processing speed and reaction time
 - Reaction time measured to 1/100th of second

References

- Brukner, Peter, and Karim Khan. *Clinical Sports Medicine: Third Edition*. Australia: McGraw-Hill, 2006: 201-6, 371-2, 384-5, 522-4, 532-3, 729-30, 733-4, 756.
- Butcher, Janus D., and Thomas M. Howard. *The Little Black Book of Sports Medicine: Second Edition*. Massachusetts: Jones and Bartlett's, 2006: 165, 204, 270-1, 283-304, 325-29.
- Eiff, M. Patrice, Robert L. Hatch and Walter L. Calmbach. *Fracture Management for Primary Care: Second Edition*. Philadelphia: Saunders, 2003: 26-38, 232-35, 268.
- Magee, David J. *Orthopedic Physical Assessment: Second Edition*. Philadelphia: Saunders, 1992: 273-4, 334.
- Mellion, Morris B., W. Michael Walsh, Christopher Madden, Margot Putukian and Guy Shelton. *Team Physician's Handbook: Third Edition*. Philadelphia: Hanley & Belfus, Inc., 2002: 66, 77-83, 354-61, 469-72, 488-9, 491, 504-5, 670-6.
- IMPACT Test slides taken from <http://www.impacttest.com>
- Pictures taken from <http://www.learningradiology.com>, <http://hopkintopediatricdental.com>, <http://www.cityhospital.org>





GOOD LUCK!