THE YOUTH SPORTS EPIDEMIC

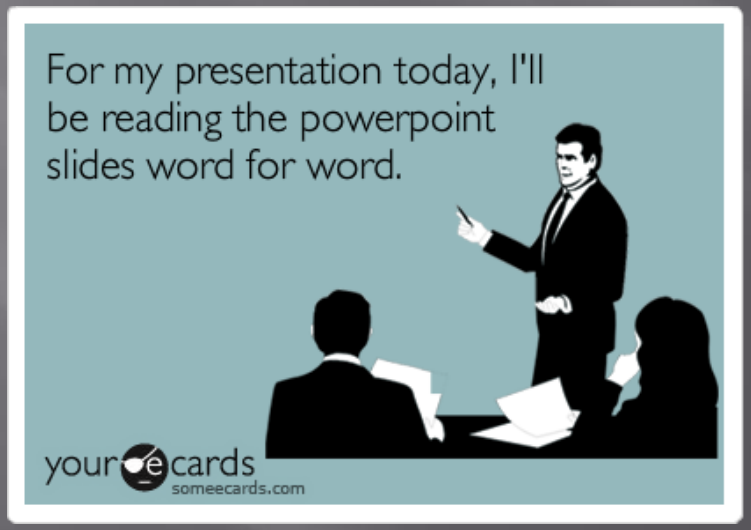
Reed Estes, MD
Chief, Sports Medicine
Team Physician, UAB Athletics
UAB Orthopaedics

Disclosures

- **No relevant disclosures applicable to this presentation**

Objectives

- Evaluation of the youth sports epidemic
- Identify unique concerns relative to skeletally immature athletes
- Learn the importance of developmental age-appropriate activity
- Discussion of sideline diagnosis and management of injuries in pediatric and adolescent athletes



Youth Sports Epidemic

- **Greater than 38 million youth ages 5-18 participate annually (Caine et al, 2015)**

Benefits of Youth Sports Participation

- Source of active recreation and fun
- Promotes healthy mental and physical development
- Forms foundation for personal health and fitness
- Improves flexibility, mobility, strength, coordination
- Weight management
- Improves self esteem
- Decreases likelihood of involvement in risky behaviors
- Reinforces value of teamwork and refines social skills
- Develops coping skills for success and defeat
- Stress management
- Reinforces discipline and goal setting

Balance

- See-saw of inactive versus overactive

Physical Education an Elective?

- Children currently are reported to spend more than 7.5hrs per day in front of a screen (Rideout, Generation M2: Media in the Lives of 8- to 18-year olds 2010)
- Only 1 in 3 children are physically active daily (National Association for Sport and Physical Education, 1999)
- CDC 2012, greater than 12.5 million obese children

Youth Sports Epidemic

- Increasing numbers of "professional-like" injuries in youth and overuse injuries in younger and younger children (example, UCL tears in youth baseball)
- Chronologic age used most commonly for selection of teams and training level
- Winning and competition are overemphasized
- Undertraining
- Overuse injuries remain at the forefront
  - THESE ARE PREVENTABLE

Youth Sports Epidemic

- Youth sports are becoming a source of entertainment for adults (World Series of T-ball)
- Lack of uniform training by youth coaches
- Earlier start into sporting activities with resultant early attrition secondary to burnout
- “Body brokers” promising to sell your son/daughter’s abilities to universities

Youth Sports Epidemic

- Early single sport specialization
- Multiple concomitant sports
- Year round participation
- Loss of balance with family, school, rest, non-sports recreation, community activities

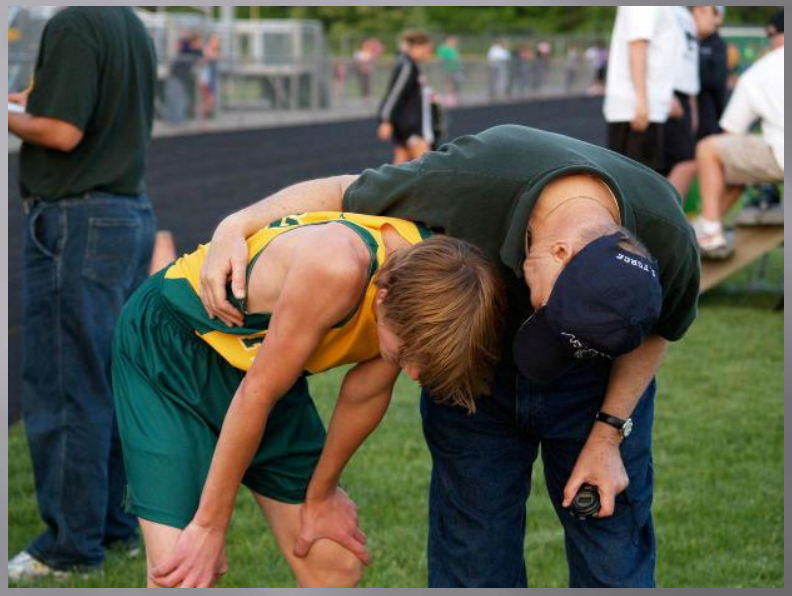
Youth Sports Epidemic

- Childhood goals no longer job-related but focus on sports careers
- Race to the finish mentality

Youth Sports Epidemic

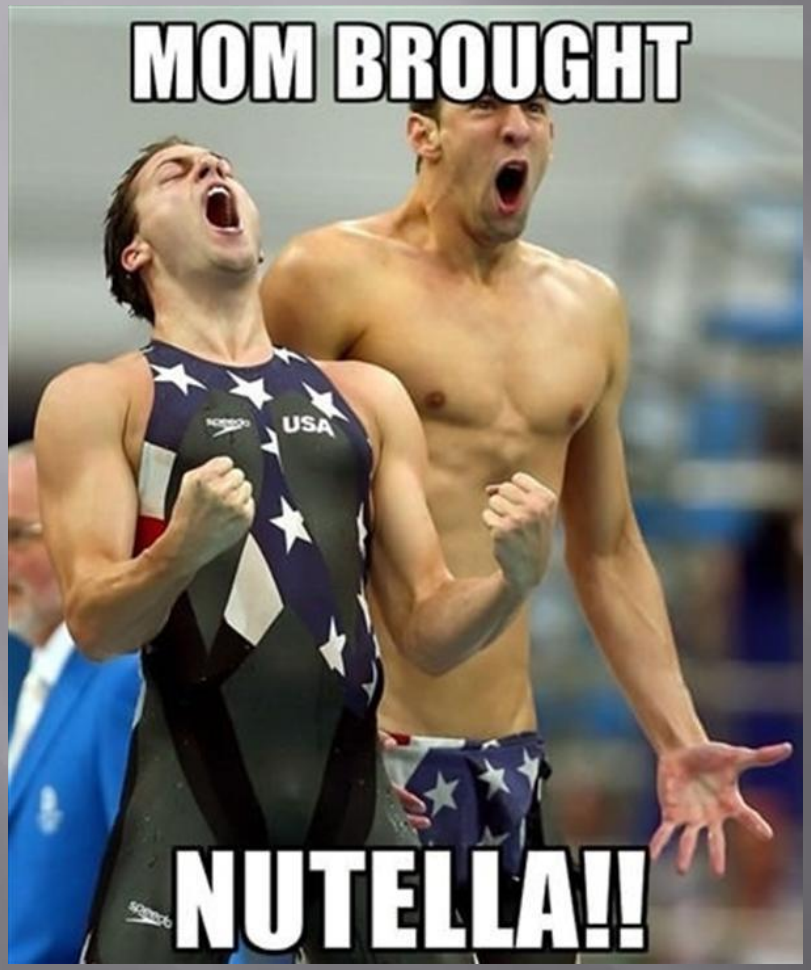
- **Societal norms are not normal anymore and have begun to blur common sense and the ability to follow advice of medical personnel**

Youth Sports Epidemic



- Youth are not typically in a position to protect their best interests (often mentally immature)
  - Responsibility falls on parents, coaches, medical personnel, etc

Youth Sports Epidemic



- Youth often have priorities that focus solely on the “now” and do not take into consideration implications for later in life

Youth Sports Epidemic

- Parents are making decisions for their children based upon their own wishes and desires, often "living it out again"
- Parents become the "enablers" and often feel under pressure to create successful children
  - Must keep up with the "others"

Youth Sports Epidemic

- **By age 13, 70% attrition rate for youth sports (Safe Kids USA Campaign 2009)**
  - **Top cited reasons adults, coaches, parents**

Statement of Need

- **The majority of the 10 million injury-related visits to a primary care physician for children are the result of a sports injury** (Hambridge, Pediatrics 2002)

Statement of Need

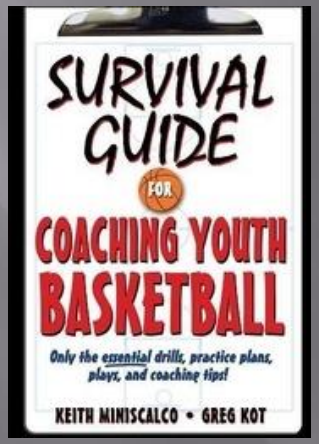
- **Children aged 5-14 account for nearly 40% of all sports related injuries treated in hospitals (AOSSM 2009)**
- **Football related concussions increased by over double from 2000 to 2010 (CDC)**

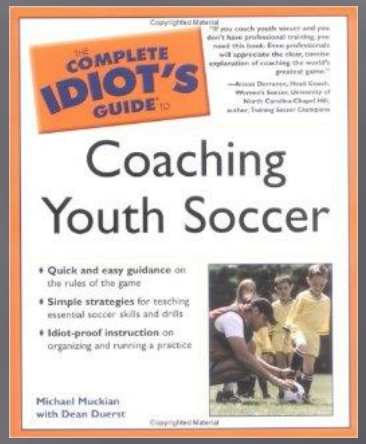
Statement of Need

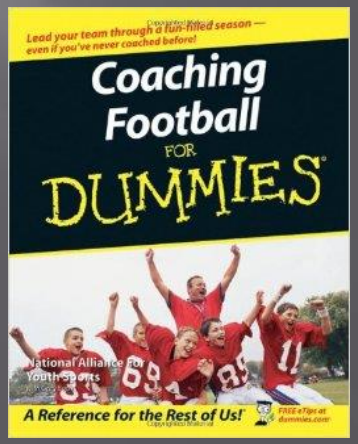
- >4.3 million ED visits for sports related injuries
  - 68% age 5-24 (Burt, Ann Emerg Med 2001)
- Estimated annual cost of $1.8 billion to treat sports related injuries (Adirim, Sports Med 2003)

Statement of Need

- As a general rule, youth sports are not as well organized as high school, collegiate, or professional
  - Coaches often inexperienced or not appropriately trained

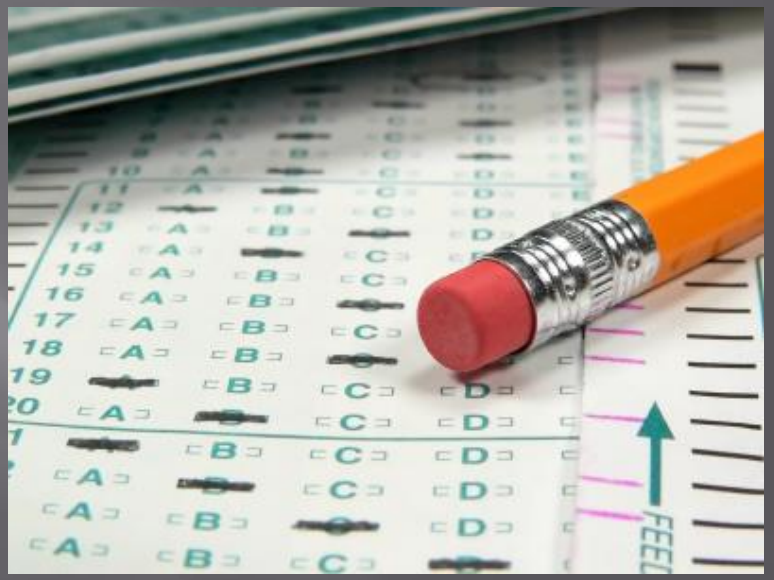






Statement of Need

- Coaching education commonly focuses on rules and technique but does not routinely include emphasis on first aid, sports safety, injury prevention, and emergency preparedness
- Sporadically youth sports coaches obtain (or are required to obtain) basic medical training
  - This should be a requirement



Statement of Need

- Significant variability between leagues in regards to training requirements and certifications
- Emergency Action Plans (EAPs) are not uniform and often do not exist

Available Medical Care

- Salzman et al 2014
  - Surveyed athletic directors and coaches within a California school district
    - 70% did not staff healthcare providers for practice
    - 28% did not staff for home games
    - 30% did not staff for away games
    - 33% of schools did not have an EAP in place
    - Regular checks of athletic equipment and playing surfaces were not routine
    - Conclusion- inadequate care regardless of school region or size

Available Medical Care

- Covering personnel commonly include athletic trainers, orthopaedic surgeons, family practicioners, pediatricians, physical medicine and rehab, emergency physicians

Team Approach

- **Factors involved in the maintenance of a healthy athlete include coaches, parents, friends, athletic trainers, physical therapists, physicians**

Chain of Command

- "Athlete-centered medicine"
  - Pleasing the coach is favorable but treating the athlete is necessary

Team Approach

- Important for the provider to have specific understanding of the unique demands and nuances of actions required by a particular sport
- Equally crucial to understand the unique issues facing skeletally immature athletes

Healthcare Provider Perspective

- Understand expectations of the athlete
- Important to educate athletes, coaches, parents regarding risk to benefit ratio and “healthy” return to play

Healthcare Provider Perspective

- At times there will be opportunity to sway from the gold standard management
  - Important to have a discussion regarding potential short and long term consequences
- Role of the healthcare provider is to ensure the best treatment plan for the circumstances with ultimate decision based upon acute risk and potential long term consequences to the athlete

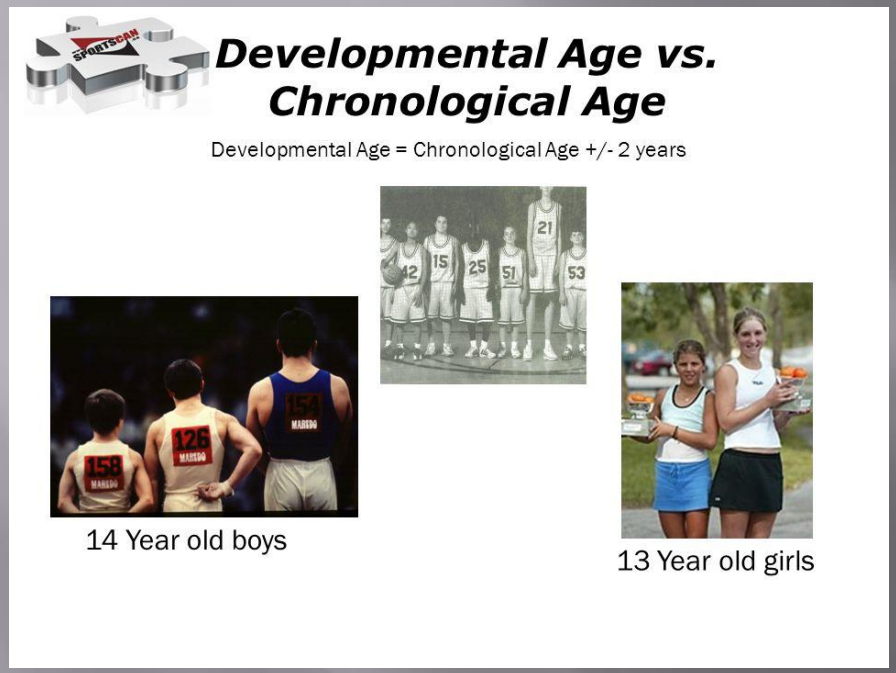
There is no "I" in Team

- Not entirely true
- The athlete is often the best advocate for their own health by regulating their own behaviors through
  - Rest
  - Proper diet/hydration
  - Adjunct training
  - Equipment and shoewear fit
  - Social support
  - Seeking clinical help when needed

Pediatric Athlete

- ? “Small adults”
- Significant variability among athletes in regards to stage of development
  - Differing coordination, endurance, flexibility, pubertal status, body composition, strength, cognitive development

Pediatric Athlete



- Currently athletes are often grouped purely according to chronologic age
  - Does not account for the extreme variability in developmental age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15
2
1

Long Term Athlete Development

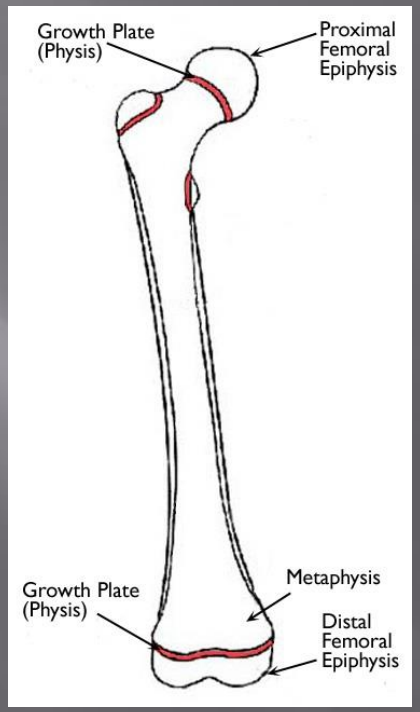
- Program to appropriately develop youth athletes in a uniform fashion
- Starts with fundamentals and develops training skills prior to competitive play
- Sport specific protocols available
- http://canadiansportforlife.ca/learn-about-canadian-sport-life/ltad-stages

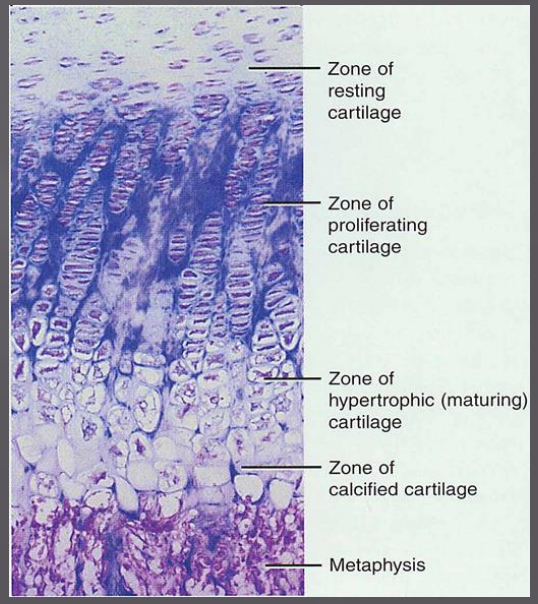
Pediatric Athlete

- **Preteens typically display low levels of perceived risk and overestimate physical abilities**
  (Emery, Clin J Sports Med 2003)

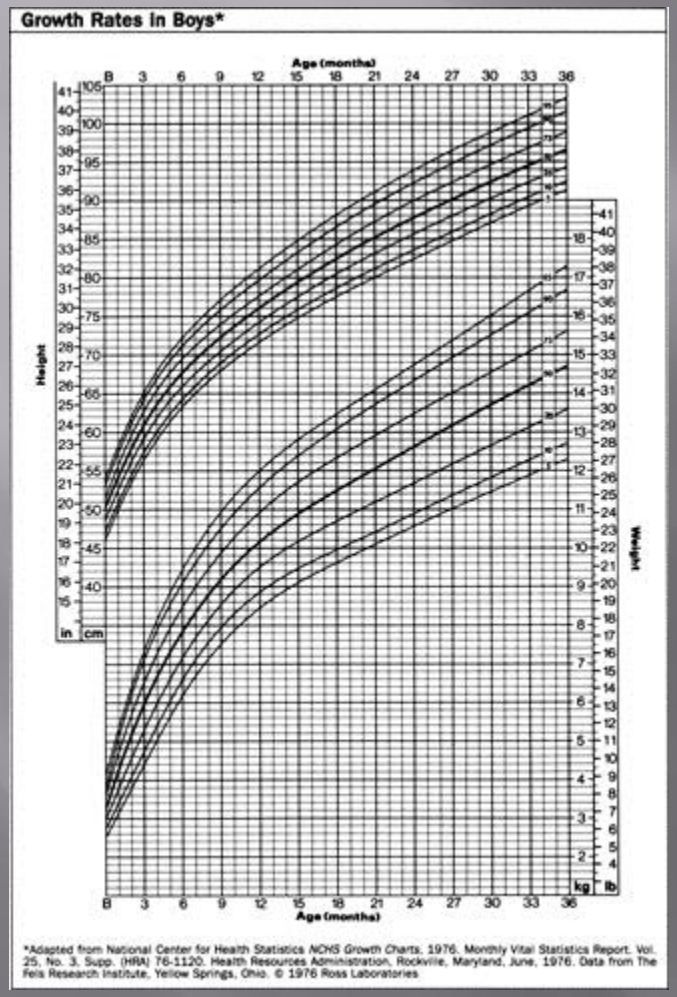
Pediatric Athlete

- **Musculoskeletal system not fully developed**
  - **Physes act as "weak link"**





Pediatric Athlete



- Timing and rate of growth is variable
  - Relates to genetics
  - Good sleep habits, exercise, and nutrition crucial to maximize

Pediatric Athlete

- During periods of rapid growth, the bones grow more rapidly than the surrounding muscles, tendons and ligaments creating growing pains

Pediatric Athlete

- Bone mineral density declines prior to reaching peak height velocity during growth spurts
- Functionally clumsy during this timeframe as the neuromuscular system adapts
  - Growth to strength imbalance

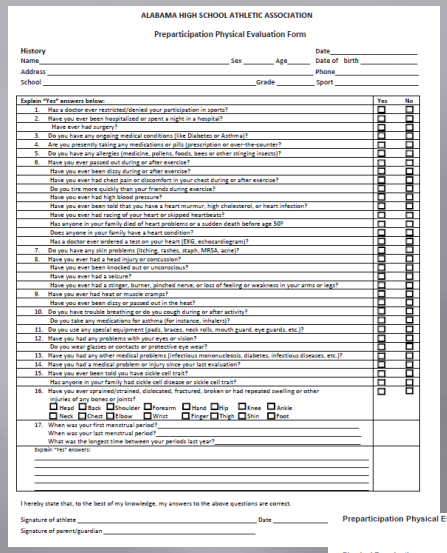
Pediatric Athlete

- **Growth arrest**
  - **Deficient or absent growth at the physis resultant in limb length discrepancy, malalignment, or neurovascular issues**

Conditioning

- Supervised strength training may provide benefit of increased strength but also improvement in bone density, lipid profile, balance, self esteem, and flexibility
- Early start into conditioning may translate to healthier adult lifestyle

Conditioning



ALABAMA HIGH SCHOOL ATHLETIC ASSOCIATION

Preparticipation Physical Evaluation Form

History

Name_____ Sex _____ Age_____ Date_____

Address _____ Date of birth _____

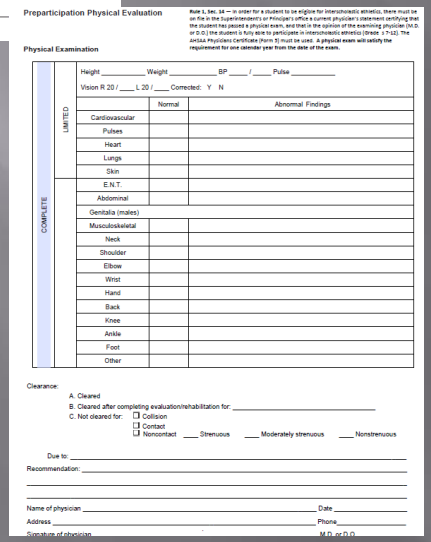
School _____ Grade _____ Sport _____ Phone_____

Explain "Yes" answers below:	Yes	No
1. Has a doctor ever restricted/denied your participation in sports?	☐	☐
2. Have you ever been hospitalized or spent a night in a hospital?	☐	☐
Have ever had surgery?	☐	☐
3. Do you have any ongoing medical conditions (like Diabetes or Asthma)?	☐	☐
4. Are you presently taking any medications or pills (prescription or over-the-counter?	☐	☐
5. Do you have any allergies (medicine, pollens, foods, bees or other stinging insects)?	☐	☐
6. Have you ever passed out during or after exercise?	☐	☐
Have you ever been dizzy during or after exercise?	☐	☐
Have you ever had chest pain or discomfort in your chest during or after exercise?	☐	☐
Do you tire more quickly than your friends during exercise?	☐	☐
Have you ever had high blood pressure?	☐	☐
Have you ever been told that you have a heart murmur, high cholesterol, or heart infection?	☐	☐
Have you ever had racing of your heart or skipped heartbeats?	☐	☐
Has anyone in your family died of heart problems or a sudden death before age 50?	☐	☐
Does anyone in your family have a heart condition?	☐	☐
Has a doctor ever ordered a test on your heart (EKG, echocardiogram)?	☐	☐
7. Do you have any skin problems (itching, rashes, staph, MRSA, acne)?	☐	☐
8. Have you ever had a head injury or concussion?	☐	☐
Have you ever been knocked out or unconscious?	☐	☐
Have you ever had a seizure?	☐	☐
Have you ever had a stinger, burner, pinched nerve, or loss of feeling or weakness in your arms or legs?	☐	☐
9. Have you ever had heat or muscle cramps?	☐	☐
Have you ever been dizzy or passed out in the heat?	☐	☐
10. Do you have trouble breathing or do you cough during or after activity?	☐	☐
Do you take any medications for asthma (for instance, inhalers)?	☐	☐
11. Do you use any special equipment (pads, braces, neck rolls, mouth guard, eye guards, etc.)?	☐	☐
12. Have you had any problems with your eyes or vision?	☐	☐
Do you wear glasses or contacts or protective eye wear?	☐	☐
13. Have you had any other medical problems (infectious mononucleosis, diabetes, infectious diseases, etc.)?	☐	☐
14. Have you had a medical problem or injury since your last evaluation?	☐	☐
15. Have you ever been told you have sickle cell trait?	☐	☐
Has anyone in your family had sickle cell disease or sickle cell trait?	☐	☐
16. Have you ever sprained/strained, dislocated, fractured, broken or had repeated swelling or other injuries of any bones or joints? ☐ Head ☐ Back ☐ Shoulder ☐ Forearm ☐ Hand ☐ Hip ☐ Knee ☐ Ankle ☐ Neck ☐ Chest ☐ Elbow ☐ Wrist ☐ Finger ☐ Thigh ☐ Shin ☐ Foot	☐	☐
17. When was your first menstrual period? _____ When was your last menstrual period? _____ What was the longest time between your periods last year? _____		
Explain "Yes" answers: _____		

I hereby state that, to the best of my knowledge, my answers to the above questions are correct.

Signature of athlete _____ Date _____

Signature of parent/guardian _____



Preparticipation Physical Evaluation

Rule 1, Sec. 14 — In order for a student to be eligible for interscholastic athletics, there must be on file in the Superintendent's or Principal's office a current physician's statement certifying that the student has passed a physical exam, and that in the opinion of the examining physician (M.D. or D.O.) the student is fully able to participate in interscholastic athletics (Grade 7-12). The AHSAA Physicians Certificate (Form 5) must be used. A physical exam will satisfy the requirement for one calendar year from the date of the exam.

Physical Examination

Height _____ Weight _____ BP ____ / ____ Pulse _____

Vision R 20 / ___ L 20 / ___ Corrected: Y N

		Normal	Abnormal Findings
LIMITED	Cardiovascular		
	Pulses		
	Heart		
	Lungs		
	Skin		
COMPLETE	E.N.T.		
	Abdominal		
	Genitalia (males)		
	Musculoskeletal		
	Neck		
	Shoulder		
	Elbow		
	Wrist		
	Hand		
	Back		
	Knee		
	Ankle		
	Foot		
	Other		

Clearance:

A. Cleared

B. Cleared after completing evaluation/rehabilitation for: _____

C. Not cleared for: ☐ Collision ☐ Contact ☐ Noncontact ___ Strenuous ___ Moderately strenuous ___ Nonstrenuous

Due to: _____

Recommendation: _____

_____

_____

Name of physician _____ Date _____

Address _____ Phone_____

Signature of physician _____ M.D. or D.O.

- No minimal age but must be able to adequately follow directions and demonstrate adequate balance and coordination for the exercise at hand
- Pre-participation exam recommended prior to commencing
- Goals should be discussed with athlete and parents

Conditioning

- Resistance training beneficial as young as 8 (Behringer, 2010)
  - Strength gains greater during and after puberty
- Strength gains in children are related to neuronal adaptation rather than muscular hypertrophy

Conditioning

- Weight machines, bands, free weights
- Neuromuscular system underdeveloped in skeletally immature which may increase susceptibility to injury with free weights
- Ultimately equipment and exercise should be individually matched to the athlete

Conditioning

- For new exercise, initiate with no-load repetitions to emphasize form and technique
- Avoid maximal fatigue, ideally being able to accomplish 10-15 reps
- Submaximal loads only
  - AAP does not endorse single max lifts (although no studies to back this)

Conditioning

- **Avoid Olympic-style weight lifting and power lifting until after skeletal maturity**

Conditioning

- **Preventive exercises can be very beneficial to decrease incidence of overuse injures (e.g. scapulothoracic dysfunction in swimmers) and some acute injuries (e.g. ACL tears)**

Specialization

- Hypothesized that early single sport specialization may be detrimental
- Concerns
  - Overuse injury
  - Burnout
  - Inadequate fundamental movement skills
- Recommendations
  - 2 to 3 non-consecutive months off year round from the same sport (NATA, 2011)
  - "sampling" years between ages 6 to 12

Sideline Assessment

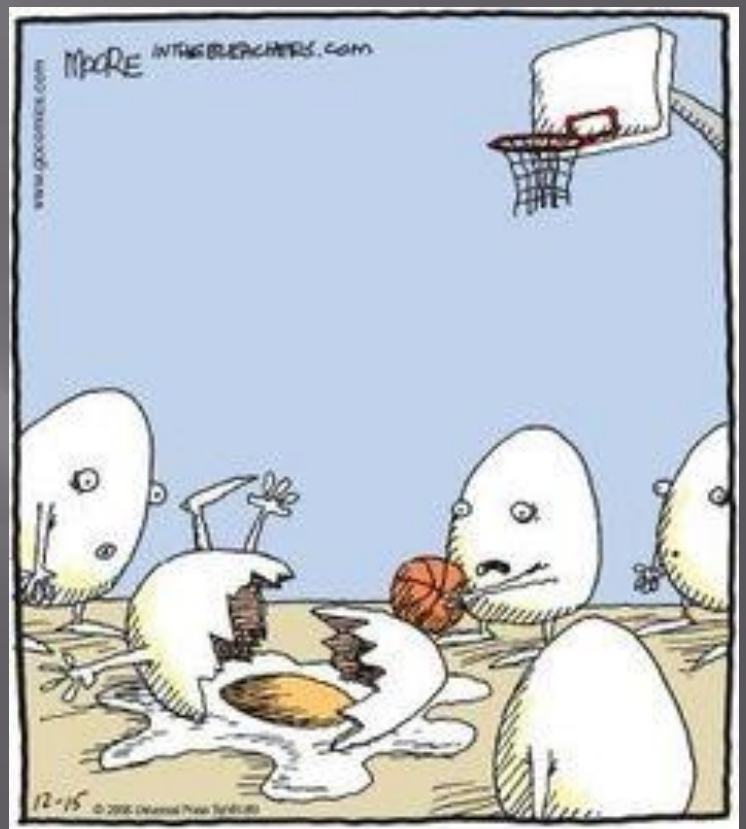
- Initial cursory exam on the field to determine if safe to move the athlete from the playing field to the sideline for a more thorough exam
- Sideline assessment typically allows for initial triage
  - Does the injury need acute intervention?
  - Can the athlete return to play?
  - Are there restrictions/modifications for return to play?
  - Initial plan for definitive care

General Acute Management

- Initial treatment with protection, rest, ice, compression, and elevation during the acute phase
- Knowledge of prior injury history is important as this introduces different variables in regards to increased re-injury risk and modified rehabilitation
- Timely evaluation and treatment

General Acute Management

- Early restoration of motion and stability
- Sport specific rehabilitation
- Supervised return to sport to ensure safety from multiple perspectives
  - Prior to return to unrestricted activity, must be able to demonstrate mastery of rehabilitation techniques and sport specific exercises/movements



"We'll know more once we do an MRI, but, yes, this could be a career-ending injury."

Warning Signs

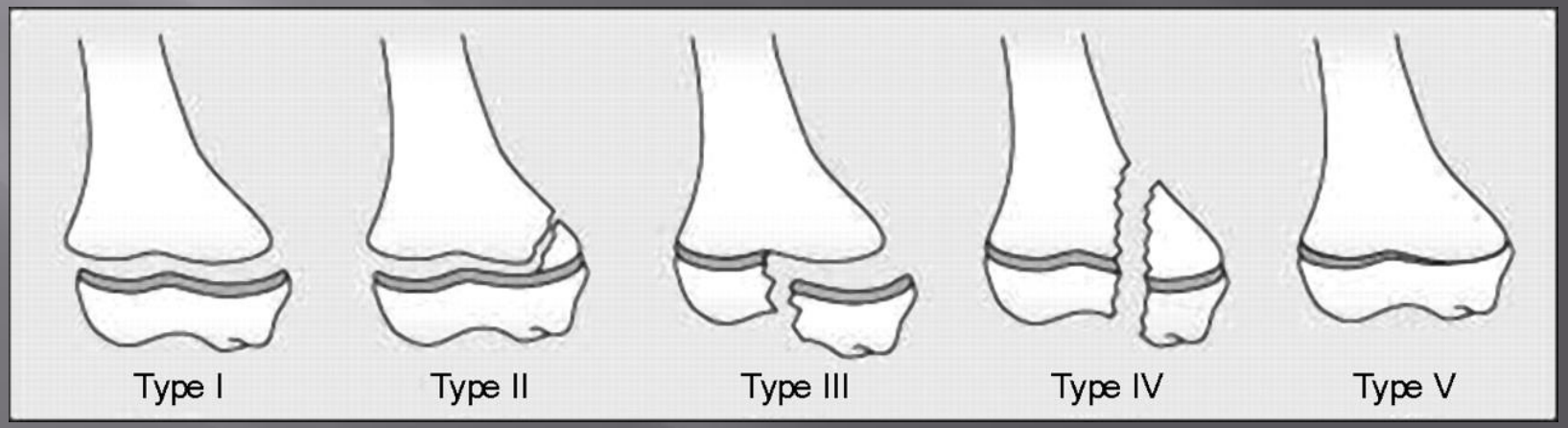
- Progressively worsening pain
- Pain present during particular actions
- Pain becoming more and more pronounced with less and less activity
- Loss of function

Physeal Fracture

- Account for nearly 20% of all skeletal injuries in children
- Potential for complete or partial disruption of physeal growth
  - Leg length discrepancy
  - Angular deformity

Physeal Fracture

- Salter Harris Classification
  - SH I – separation through the physis
  - SH II – fracture line exits the metaphysis
  - SH III – fracture line exits the epiphysis
  - SH IV – fracture line crosses metaphysis and epiphysis
  - SH V – crush injury to the physis



Physeal Fracture

- Bony tenderness typically warrants radiographs
- Initially may be normal in the setting of a Salter Harris I fracture
  - Healing noted on future radiographs

Physeal Fracture

- Treatment variable
  - Immobilization with casting and bracing
  - Surgical fixation

Little Leaguer's Shoulder

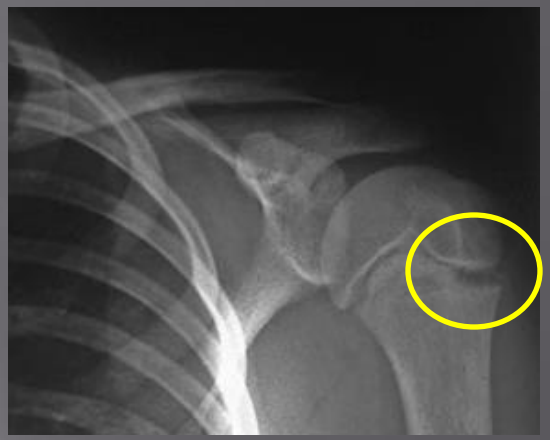
- SH I injury to proximal humeral physis
  - Hypertrophic zone affected
- Adolescent pitchers
- Risk factors
  - High intensity/high frequency pitching
  - Breaking balls
  - Rotational deficits

Little Leaguer's Shoulder

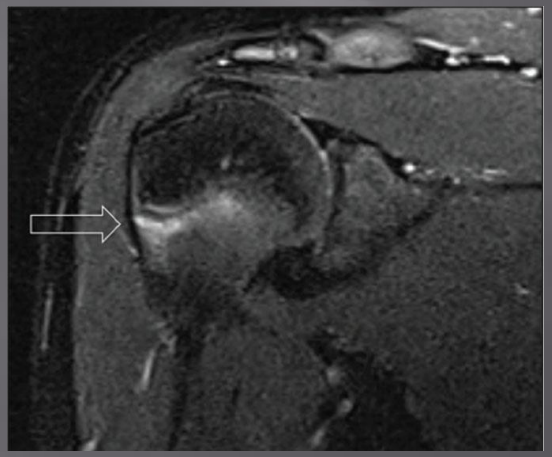
- Presentation
  - Pain with throwing (especially late cocking)
  - Decreased velocity
- Examination
  - Tenderness over proximal humeral physis
  - Reproduction of pain with resisted throwing motion

Little Leaguer's Shoulder

- **Radiographs**
  - May be normal early
  - Physeal widening laterally



- **MRI**
  - Physeal edema



Little Leaguer's Shoulder

- **Non-operative management**
  - Active rest x 6-12 weeks
  - Interval throwing program
  - Education
    - Pitching mechanics
    - Pitch counts
    - Breaking balls

Medial Epicondylitis

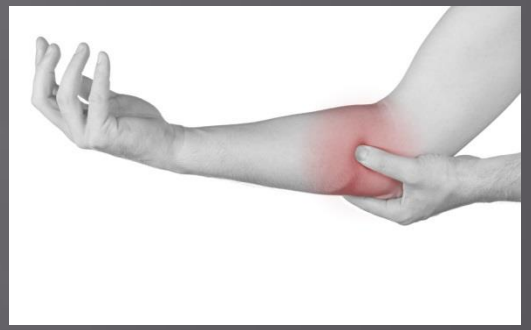
- Skeletally immature athletes are more likely to develop apophyseal injuries than ligamentous injuries
- Resultant from repetitive valgus loading seen with throwing
  - Repetitive microtrauma

Medial Epicondylitis

- **Risk factors**
  - Increased pitch counts
  - Year round throwing
  - High velocity pitches
  - Continued pitching despite arm pain and fatigue

Medial Epicondylitis

- Presentation
  - Medial elbow pain
  - Decreased velocity and accuracy
- Exam
  - Bony tenderness overlying medial epicondyle
  - Pain with valgus stress testing
    - Instability indicates avulsion or ligamentous involvement

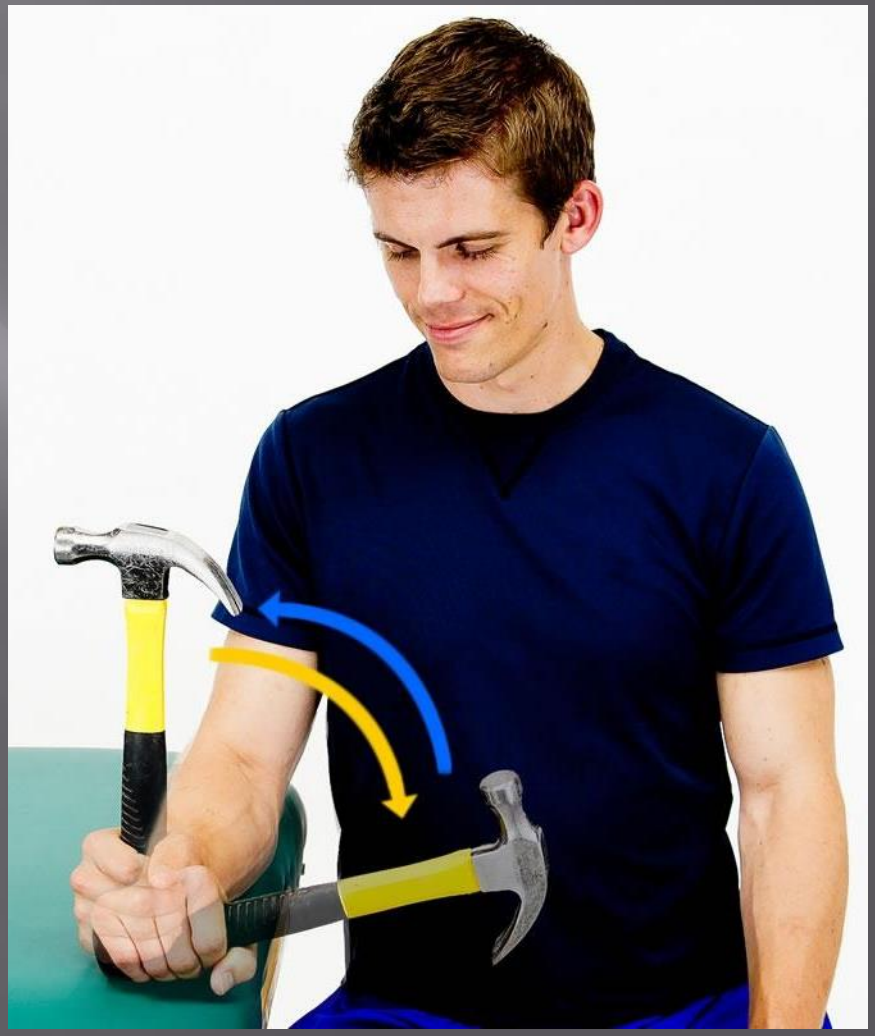


Medial Epicondylitis

- Radiographs
  - May be normal early
  - Physeal widening or fragmentation
- MRI
  - Edema in medial epicondyle apophysis
  - Can be useful if concomitant UCL pathology suspected

Medial Epicondylitis

- Non-operative
  - Active rest 6 – 12 weeks
  - Rehabilitation with focus on flexor pronator mass once pain free
  - Athlete, parent, coach education regarding safe pitch counts and pitching technique



Medial Epicondylitis

- Operative
  - Reduction and fixation of avulsed medial epicondyle fracture
  - Concomitant UCL repair versus reconstruction as indicated

Capitellar OCD

- Males > females
- Risk factors
  - Repetitive valgus overload, particularly in the face of pre-existing medial instability
  - Gymnastics, throwing

Capitellar OCD

- **Capitellum is disadvantaged**
  - **Poor vascular inflow**
  - **Subjected to axial and shear stress**

Capitellar OCD

- Presentation
  - Lateral elbow pain typically activity related
  - Mechanical symptoms late
- Exam
  - Radiocapitellar tenderness
  - Positive radiocapitellar grind test
  - Decreased range of motion
  - Crepitus

Capitellar OCD

- Radiographs
  - Lucency noted in capitellum
- MRI
  - Useful to assess overlying cartilage mantle and subchondral edema

Capitellar OCD

- **Non-operative**
  - **Active rest x 6 – 12 weeks**
  - **Immobilization**

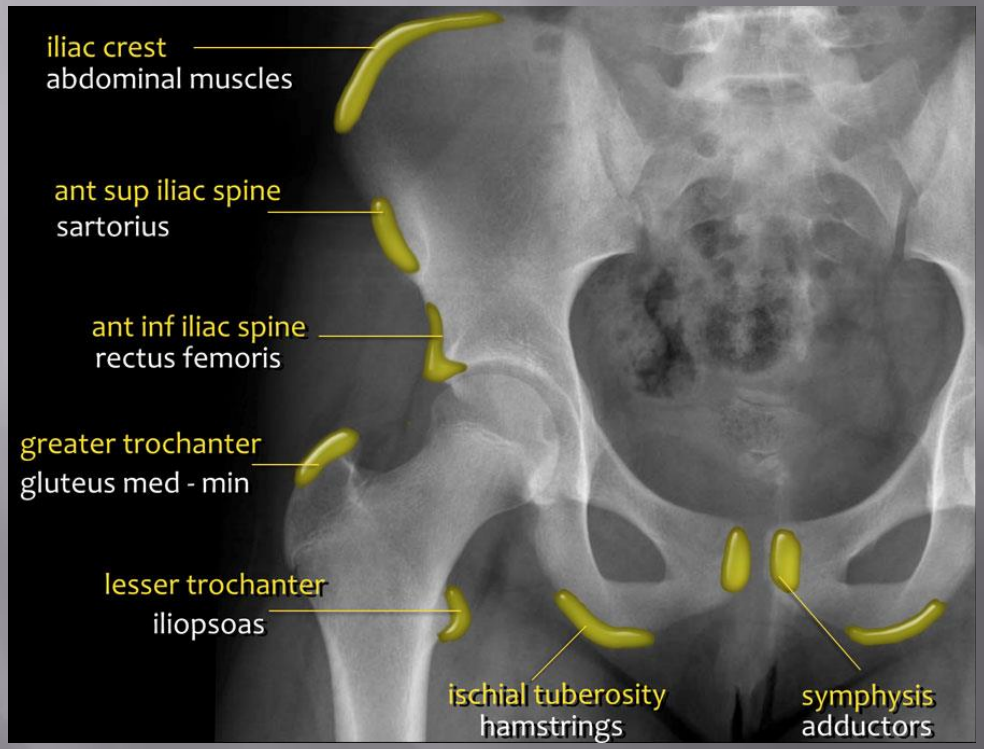
Capitellar OCD

- Operative
  - Arthroscopy and drilling
  - Fixation (arthroscopic or open)
  - Loose body excision and debridement

Pelvic Avulsion Fractures

- Apophyses present point of weakness relative to the surrounding muscles
- Most commonly from indirect mechanism
  - Sudden forceful contraction of muscle against apophysis
  - Over extension of hip causing forceful elongation of muscle
- Sprinters, hurdlers, baseball swing

Pelvic Avulsion Fractures



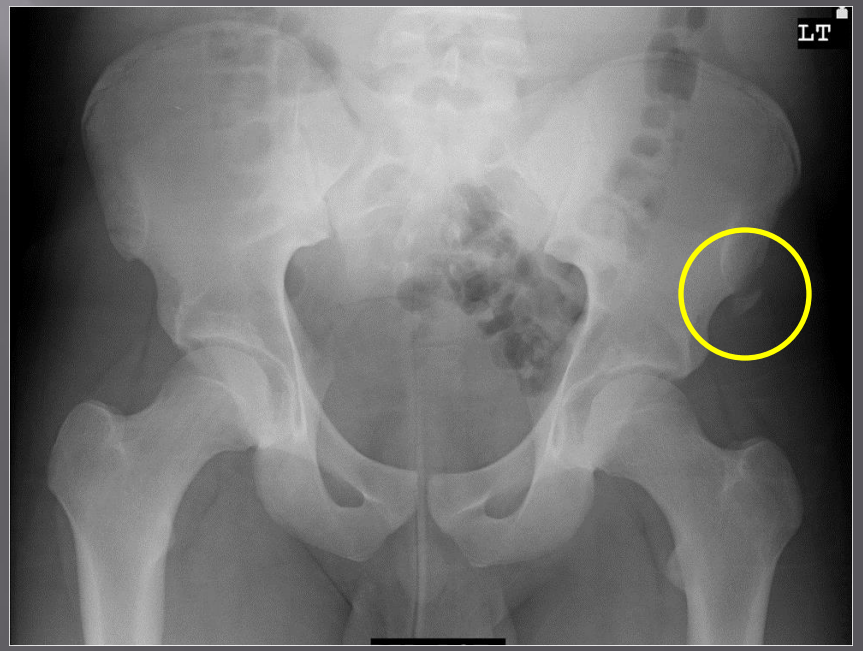
- ASIS – sartorius
- AIIS – rectus femoris
- Ischium – hamstrings
- Lesser trochanter - iliopsoas

Pelvic Avulsion Fractures

- Presentation
  - Acute onset pain with pop
  - Weakness in affected muscle group
- Exam
  - Bony tenderness
  - Muscle weakness

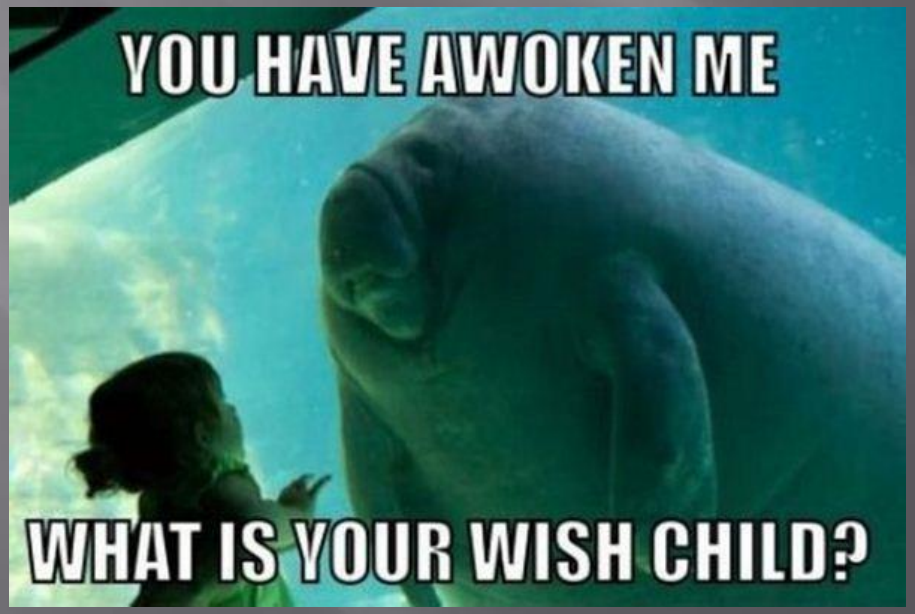
Pelvic Avulsion Fractures

- Radiographs
  - May not be visible if non-displaced or partial avulsion/fragmentation
  - Follow-up radiographs may demonstrate signs of healing



Pelvic Avulsion Fractures

- **Non-operative**
  - Active rest
  - Weight bearing restriction
  - Rehabilitation for early range of motion
  - Compression shorts



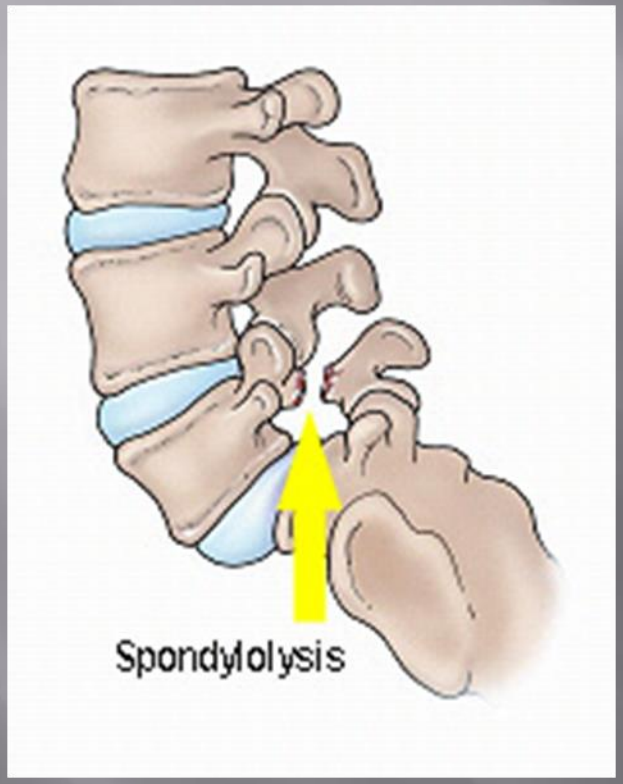
Pelvic Avulsion Fractures

- Operative
  - Indicated for significant displacement or persistent pain with mal-united or non-united fractures

Spondylolysis

- Defect in the pars interarticularis region
- Congenital versus acquired
- Risk factors
  - Repetitive hyperextension
    - Gymnasts, football linemen, power lifters

Spondylolysis



- Spondylolisthesis
  - Often a result of primary spondylolysis
  - Translation of one vertebral body on another
  - Approximately 15% of those with spondylolysis progress to this

Spondylolysis

- **Presentation**
  - Often asymptomatic, incidental findings on imaging
  - Activity related back pain, aggravated with hyperextension
  - +/- nerve symptoms
- **Exam**
  - Palpable step off between spinous processes
  - Pain with hyperextension, particularly with single leg hyperextension (Stork testing)
  - Neuro exam typically normal

Spondylolysis

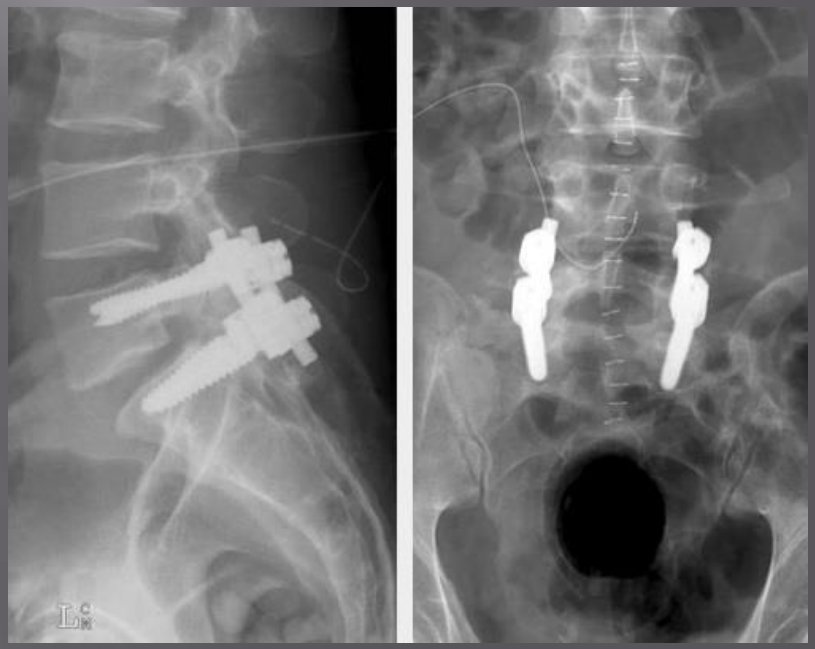
- Radiographs
  - Oblique views crucial to increase sensitivity
    - Scotty dog sign
- SPECT bone scan
  - Most sensitive exam

Spondylolysis

- Non-operative
  - Active rest 4 – 6 months
  - Rehabilitation
    - Emphasize anti-lordotic and peri-pelvic exercises
  - Bracing – Boston Overlap Brace
    - Prevents lordosis
  - Bone stimulator
    - Data mixed

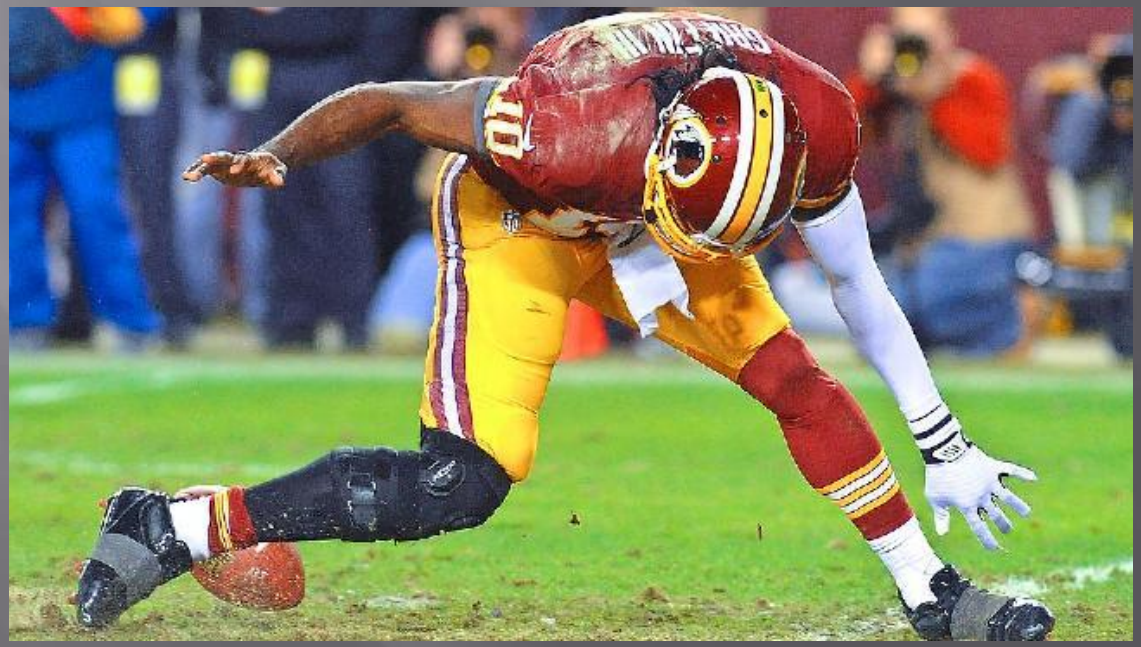
Spondylolysis

- Operative – in cases of failed conservative management
  - Pars interarticularis repair
  - Fusion



ACL tear

- In younger population tibial eminence fractures are more common than ligamentous ACL injury
- Most commonly valgus non-contact injury

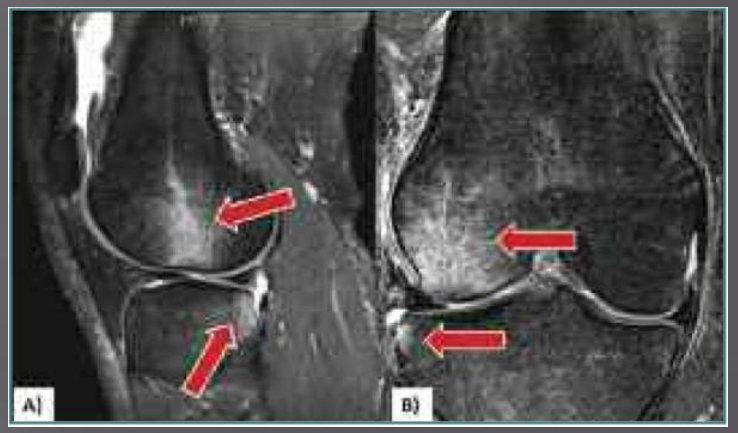


ACL tear

- Presentation
  - Acute onset pain
  - +/- “pop”
  - Subjective instability
- Exam
  - Effusion
  - Discrepant Lachman exam
  - Joint line tenderness

ACL tear

- **Radiographs**
  - **Can be helpful to rule out tibial eminence fracture or associated avulsion**
  - **Assess bone age for determination of treatment options**
- **MRI**
  - **Evaluate for associated articular or meniscal injury**

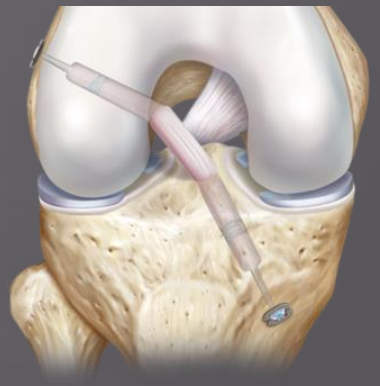


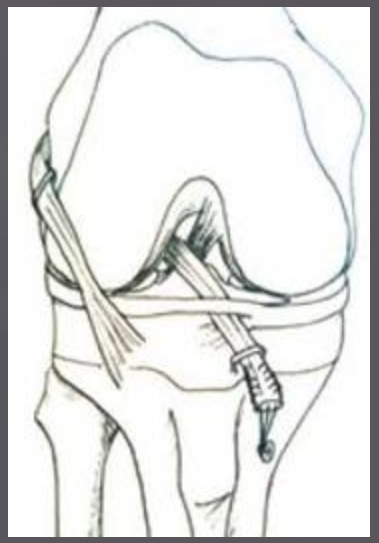
ACL tear

- Non-operative
  - Partial tears in young athletes may be managed with active rest, activity modification, bracing
  - ACL tears in skeletally immature athletes not wishing to have surgery until skeletal maturity may be protected with brace and activity restriction
  - Natural history of an untreated ACL tear is grim
    - Significant risk for early onset osteoarthritis

ACL tear

- Operative
  - Options largely dependent on developmental age
  - "Adult-style" reconstruction
    - Violates physes and risks growth arrest or malalignment
  - "Adolescent-style" reconstruction
    - Variation on "adult-style" with soft tissue graft, more vertical tunnels, and extraphyseal fixation
  - Skeletally immature reconstruction
    - Avoidance of physes



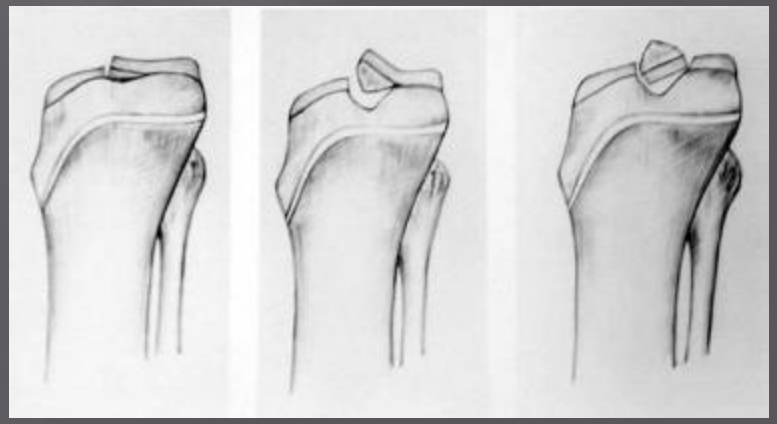


Tibial Eminence Fracture

- Pediatric equivalent of an ACL tear
  - Bony attachments in youth are more vulnerable than the ligaments
- Avulsion of the tibial attachment of the ACL
- Commonly similar mechanism to an "adult" ACL injury
- Beware associated intra-articular injury
  - Meniscal tear
  - Chondral injury

Tibial Eminence Fracture

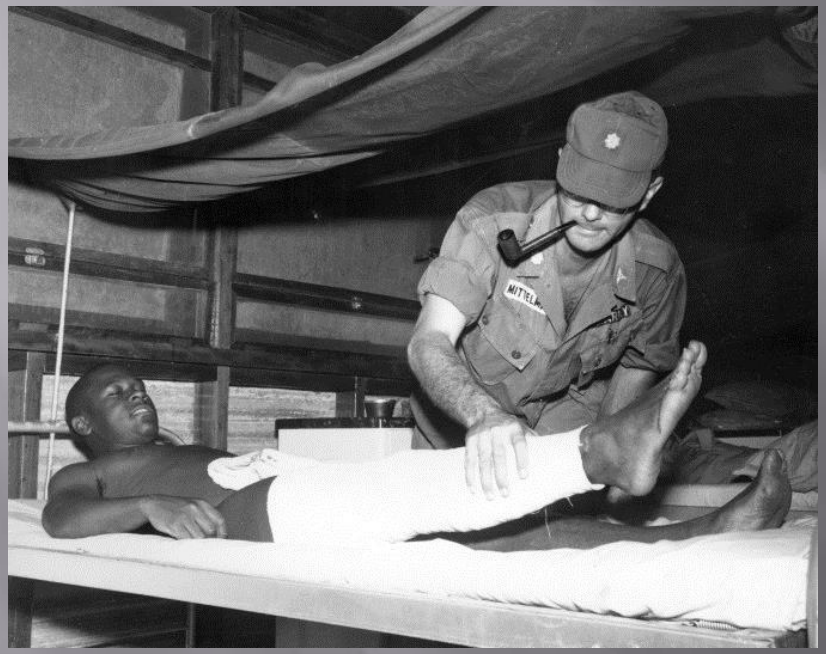
- Presentation
  - Similar to ACL tear
- Exam
  - Effusion
  - Painful and/or limited range of motion
  - Unstable Lachman exam



Tibial Eminence Fracture

- Radiographs
  - Allows quantification of displacement
- MRI
  - Helpful to rule out associated internal derangement

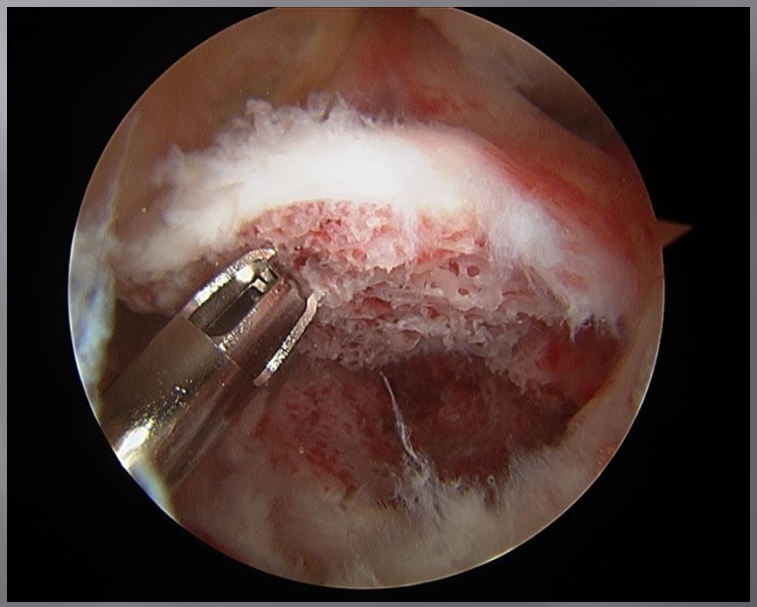
Tibial Eminence Fracture

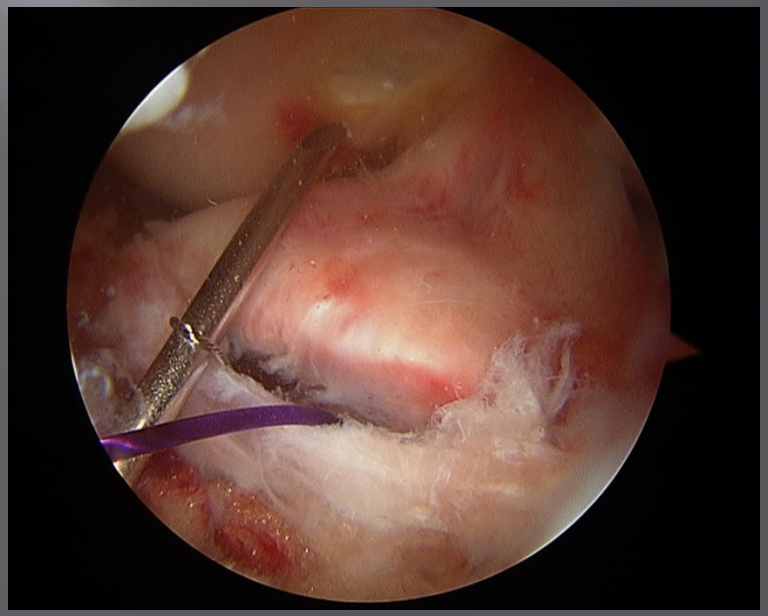


- Non-operative
  - For non-displaced or minimally displaced fractures
  - Attempted reduction with aspiration of effusion and immobilization in minimal flexion (0-20 degrees most commonly)

Tibial Eminence Fracture

- Operative
  - Open versus arthroscopic
  - Varying types of fixation
- Beware post-operative stiffness





Patellar Sleeve Fracture

- Osteochondral avulsion of the distal end of the patella
- Resultant from forceful contraction of quadriceps muscle against a static patellar tendon (typically flexed knee)
- Avulsed fragment may include a portion of the articular surface

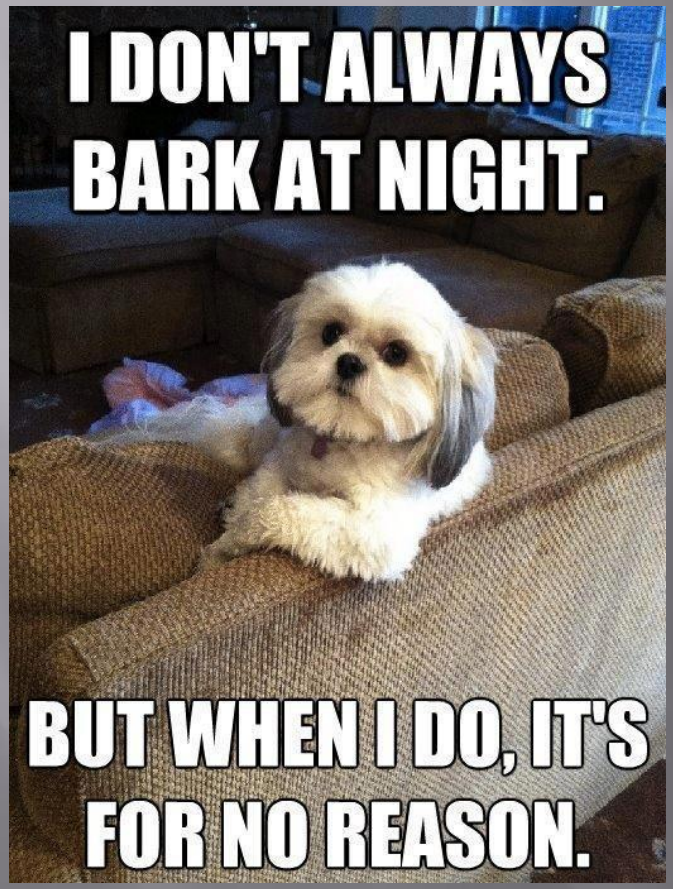
Patellar Sleeve Fracture

- Presentation
  - Indirect injury typically
    - Landing from a jump
- Exam
  - Tenderness overlying distal patella and proximal patellar tendon
  - Patella alta
  - Extensor mechanism incompetent
  - Effusion

Patellar Sleeve Fracture

- Radiographs
  - Findings may be very subtle with small fleck of bone (cartilage component may be large however)
  - Patella alta
- MRI
  - Useful to further discern in cases of equivocal radiographs
  - Helps to quantify size of cartilage component and articular surface involvement

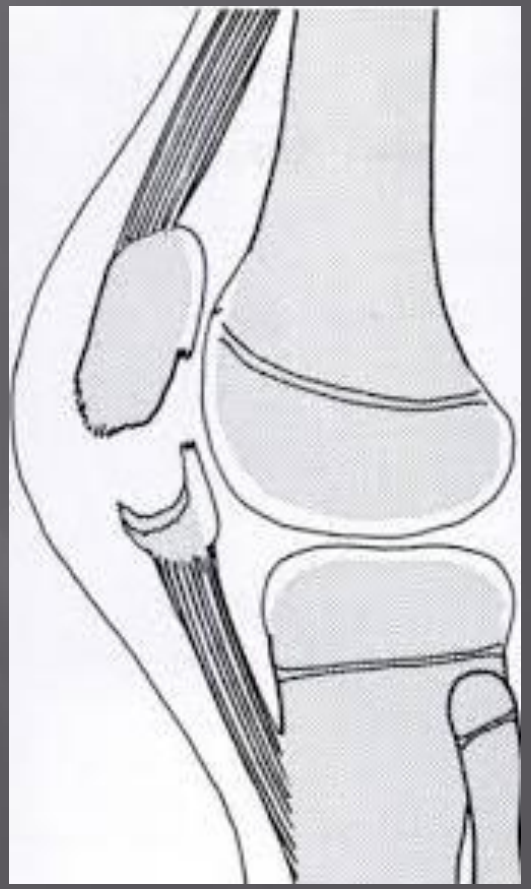
Patellar Sleeve Fracture



- Non-operative
  - Immobilization in limited flexion (0-20 deg) up to six weeks
    - Cylinder cast

Patellar Sleeve Fracture

- Operative
  - Open reduction and fixation
  - Varying fixation methods
  - Restoration of articular surface



Tibial Tubercle Fracture

- Males > Females
- Near skeletal maturity
- Forceful quadriceps contraction against flexed knee
  - Basketball

Tibial Tubercle Fracture

- Presentation
  - Acute onset
  - Often after jumping or sprinting
- Exam
  - Deficient extensor mechanism
  - Important to evaluate anterior compartment
    - Tear of recurrent branch of anterior tibial artery

Tibial Tubercle Fracture

- **Radiographs**
  - **Contralateral view may be helpful if minimally displaced**
  - **Patella alta**

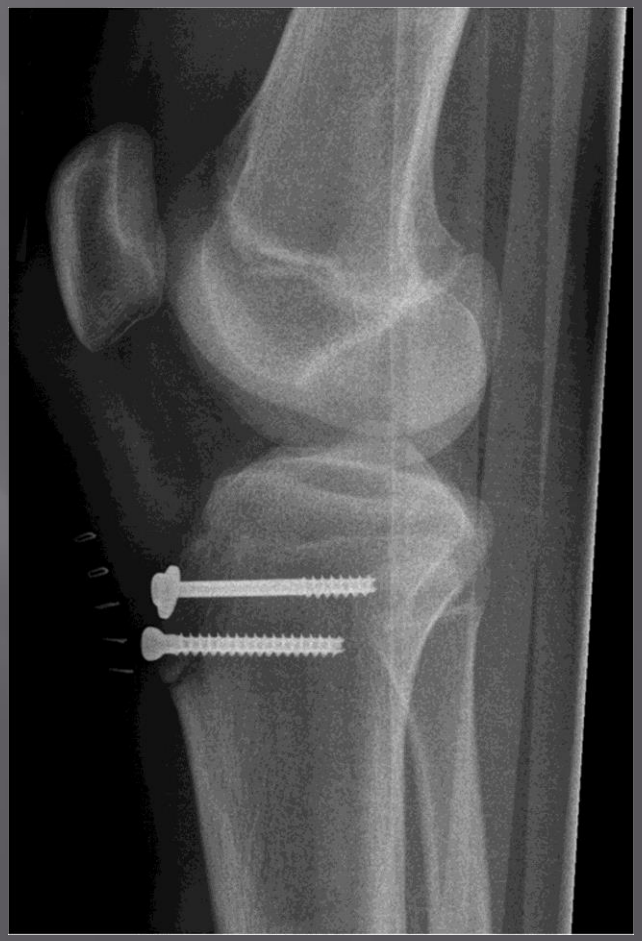
- **MRI**
  - **Helpful to rule out internal derangement in fractures extending through epiphysis**

Tibial Tubercle Fracture

- **Non-operative**
  - **Reduce in extension and hold with long leg cast**

Tibial Tubercle Fracture

- Operative
  - Reduction and fixation
  - +/- prophylactic compartment release



Osgood Schlatter's Disease

- Traction apophysitis of the tibial tubercle
- Males > Females
- Risk factors
  - Jumping sports
- Self-limiting
  - Typically resolves with closure of growth plates

Osgood Schlatter's Disease

- Presentation
  - Tibial tubercle pain aggravated by activity or direct contact
- Exam
  - Prominent tibial tubercle
  - Tenderness
  - Pain with resisted knee extension

Osgood Schlatter's Disease

- **Radiographs**
  - **Irregularity, +/- widening**
  - **Persistent osteochondral ossicle**

Osgood Schlatter's Disease

- **Non-operative**
  - **Active rest**
  - **PT**
  - **Anti-inflammatories**
  - **Patellar tendon straps/Prewrap proximal to tibial tubercle**

Osgood Schlatter's Disease

- Operative
  - Skeletally mature patients only
  - Recalcitrant cases
  - Ossicle excision

Osteochondritis Dissecans

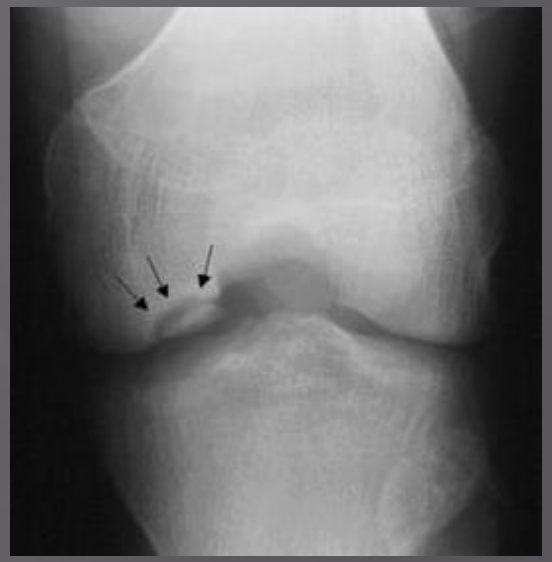
- Softening of subchondral bone with deformation of cartilage typically related to overuse
- Males > females

Osteochondritis Dissecans

- Presentation
  - Pain, swelling, mechanical symptoms
- Exam
  - Wilson's sign- pain with extension from a fully flexed and internally rotated position
  - Point tenderness over femoral condyle

Osteochondritis Dissecans

- **Radiographs**
  - **Subchondral lucency, fragmentation**



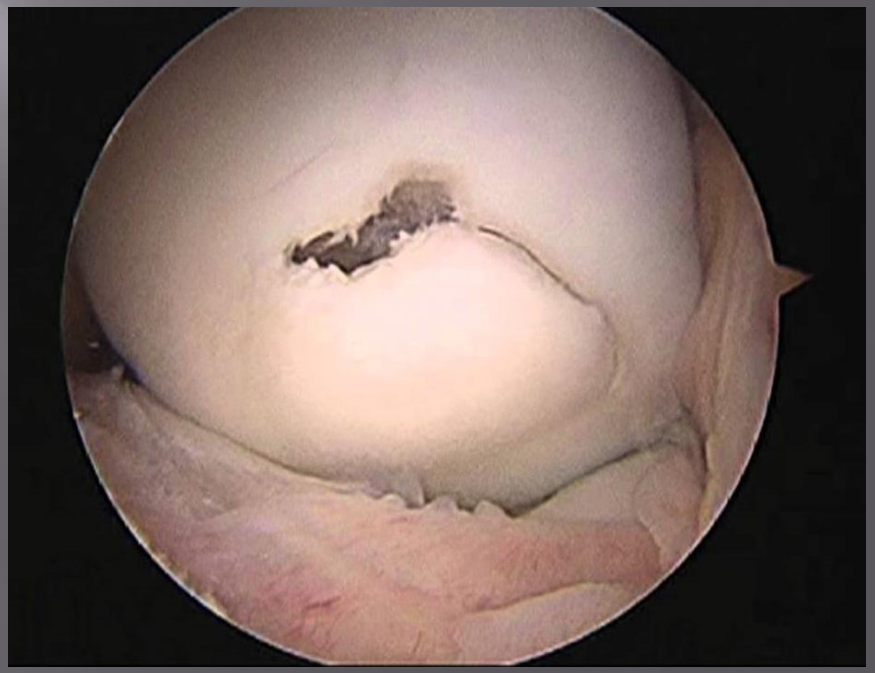
- **MRI**
  - **Assess overlying cartilage mantle**

Osteochondritis Dissecans

- **Non-operative**
  - **Activity restriction**
  - **Bracing**
  - **Weight bearing restriction**

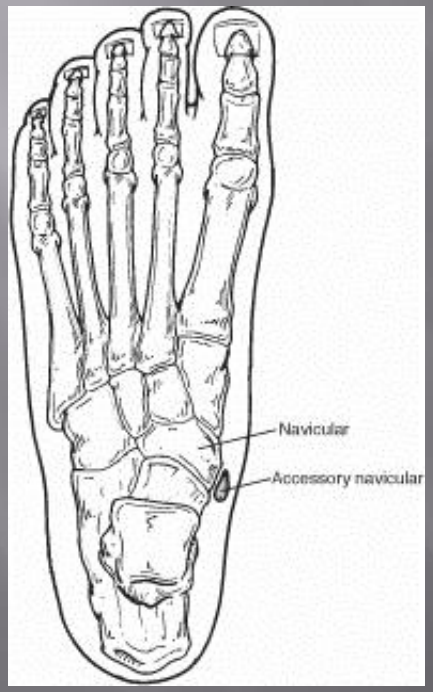
Osteochondritis Dissecans

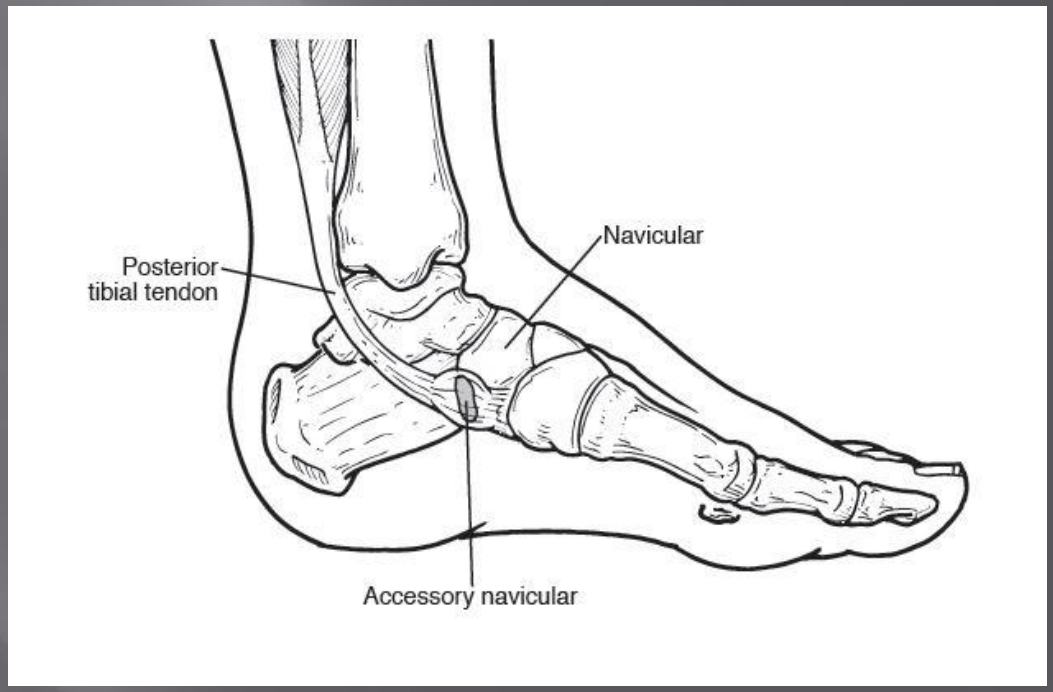
- Operative
  - Drilling and/or fixation
  - OATs procedure



Accessory Navicular

- Often noted incidentally
- Symptoms more common in females
- Insertion point of posterior tibialis tendon





Accessory Navicular

- **Presentation**
  - **Medial midfoot pain**
- **Exam**
  - **Prominence**
  - **Tenderness**
  - **Pes planus**

Accessory Navicular

- **Radiographs**
  - **Navicular enlargement or accessory fragment**
- **MRI**
  - **Adjunct to evaluate distal posterior tibialis tendon**

Accessory Navicular

- Non-operative
  - Active rest
  - Orthotics or shoewear modification
  - Anti-inflammatories
  - Immobilization if recalcitrant

Accessory Navicular

- Operative
  - Excision of accessory bone with reattachment of posterior tibialis tendon


Questions?