

# 40<sup>th</sup> Annual Symposium on Sports Medicine

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## Knee Injuries In The Pediatric Athlete

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### Disclosure

☉ Dr. Travis Murray has no relevant financial relationships with commercial interests to disclose.



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## Goals of Talk

- 1. Improved knowledge of, and recognition of common pediatric knee problems
- 2. Improved ability to initiate treatment of common pediatric knee problems
- 3. Consideration of other conditions that may mimic injuries

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## Adolescent Athletes

- Significant increase in participation
  - 1970 to 2010
  - Males 3.75 to 4.5 million
  - Females 300,000 to 3.25 million
- Trend for shift from "free play" to year-long involvement
- 1996 Cost \$1 Billion



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## American Academy of Pediatrics

- "The AAP recommends that athletes play sports for enjoyment, to improve self-esteem, and to improve athletic skills"
- "If these are not priorities in youth sports, then participation in sports potentially is harmful because it can decrease self-esteem, diminish athletic skills, and discourage additional participation in sports"



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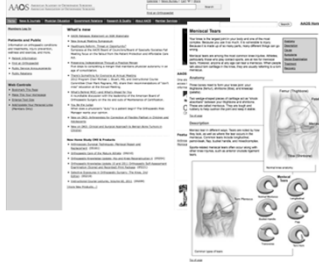
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## General Catagories

- ⊗ Overuse Injuries
- ⊗ Soft Tissue Injuries
- ⊗ Bony Injuries
  
- ⊗ Resources



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## Successful Workup & Treatment

- ⊗ Appropriate History
- ⊗ Thorough Physical Exam
- ⊗ Understanding anatomy
- ⊗ Thoughtful DDX
- ⊗ Evaluation of treatment success
  - ⊗ Reconsider DDX



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## Osgood-Schlatter

- ⊗ Point tenderness over tibial tuberosity
- ⊗ Activity related pain
- ⊗ Free ossicle can persist after maturity
  - ⊗ Consider excision if symptomatic
  
- ⊗ Tx
  - ⊗ Rest
  - ⊗ Ice
  - ⊗ Stretching



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## Infrapatellar Tendonitis/ Sinding-Larsen-Johansson

- ⊗ Symptoms similar to Osgood-Schlatter
- ⊗ Location at inferior pole of patella
- ⊗ Tx:
  - ⊗ Rest
  - ⊗ Ice
  - ⊗ Stretching




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## “Anterior Knee Pain”

- ⊗ Vague, periarticular pain in anterior knee
- ⊗ Otherwise benign physical exam, labs and imaging.
- ⊗ Physical Exam
  - ⊗ Gait
  - ⊗ Mechanical Evaluation
  - ⊗ Core strength assessment
    - ⊗ Single leg squat
  - ⊗ Thorough physical exam of entire lower extremity
- ⊗ Initial Tx:
  - ⊗ Core strengthening
  - ⊗ Pelvis/Quad musculature strengthening
- ⊗ Other Diagnoses seen personally:
  - ⊗ Osteoblastoma
  - ⊗ Femoral antversion
  - ⊗ Tibial torsion
  - ⊗ Plica
  - ⊗ Patellar instability

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## “Knee Sprain”

- ⊗ Periarticular soft tissue injury
- ⊗ Non specific term; could include:
  - ⊗ Collateral ligament
  - ⊗ Cruciate ligament
  - ⊗ Capsular strain
  - ⊗ Hamstring strain
- ⊗ No bony injury
- ⊗ Typically self-limited
- ⊗ Grading
  - ⊗ Grade 1
    - ⊗ Stretch of soft tissue
  - ⊗ Grade 2
    - ⊗ Partial tear
  - ⊗ Grade 3
    - ⊗ Complete tear

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## Physal Fracture

- ⊗ Not a “knee sprain”
- ⊗ Bony tenderness at physis of distal femur, tibia, fibula
- ⊗ Risk for increased injury, growth arrest if missed
- ⊗ Better to treat “knee sprain” as fracture if in doubt
- ⊗ Imaging



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## The Acute Hemearthrosis

- ⊗ Ligament tear
- ⊗ Meniscal tear
- ⊗ Osteochondral Fracture
- ⊗ Fracture/Physal injury
- ⊗ Patellar Dislocation



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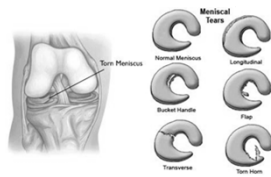
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## Meniscal Tear

- ⊗ Incidence increasing
- ⊗ Improved familiarity
- ⊗ Improved imaging, arthroscopy
- ⊗ Mechanism and symptoms similar to adults
- ⊗ Should attempt to fix



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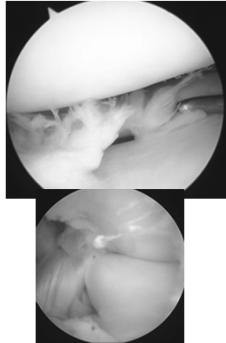
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## Meniscus

- Meniscal Tears
  - Locking
  - Catching
  - Joint line pain
  - Repair vs. Debridement
- Discoid Meniscus
  - Complete
  - Incomplete
  - Hypermobile
  - Saucerization



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## Skeletal Immature ACL Tear

- ⊕ Frequency increasing
  - ⊗ Sports
- ⊕ 10-65% acute hemarthrosis
- ⊕ Risk to further chondral and meniscal injury to knee



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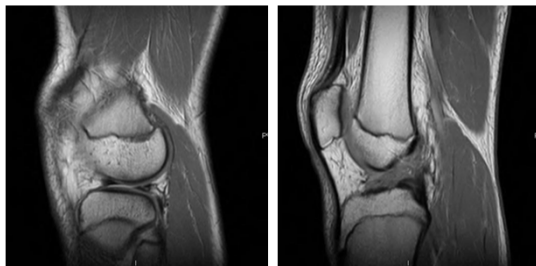
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## Skeletal Immature ACL Tears

- <12 Boys, <11 Girls (Tanner 1-2)
  - Extraphyseal reconstruction
  - Functional bracing
- 12-16 Boys, 12-14 Girls (Tanner 3-4)
  - Soft tissue graft, metaphyseal fixation
- >16 Boys, >14 Girls (Tanner 5)
  - Adult reconstruction of choice

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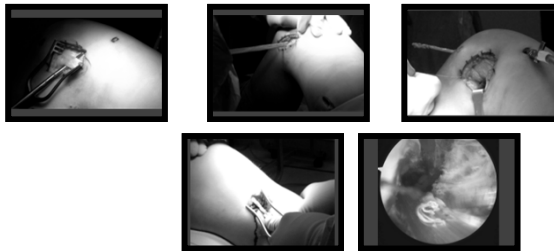
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### Options

Modified Macintosh  
Kocher, et al

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## Tibial Spine Fracture

- ⊗ "Bony ACL"
- ⊗ Dx
  - ⊗ Nondisplaced
  - ⊗ Hinged
  - ⊗ Displaced
- ⊗ Interposed medial meniscus
- ⊗ Be prepared for meniscus tear
- ⊗ Surgery
  - ⊗ Fiberwire vs. Screw



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## Tibial Tuberosity Fracure

- Strong eccentric quad contraction
- Risk for compartment syndrome
- Fix urgently



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## Skeletal Immature PCL Injury



Rare  
Traumatic  
Fall on flexed knee or knee hyperflexion  
  
Femoral origin peeloff  
Tibial insertion bony avulsion



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## Collateral Ligament Injury

- Ligaments typically stronger than physis
- Isolated usually successfully treated with bracing and rehab
- MCL
  - Grade I-II
    - Crutches, hinged brace 1-3 weeks
    - Return when full motion and asymptomatic
  - Grade III
    - Hinged brace 6 weeks then rehab if isolated
- LCL
  - Rare
  - Treatment similar to MCL

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## Osteochondral Fracture

- More common
- Typically associated with patellar dislocations or trauma
- Diagnosis can be challenging
- Treatment
  - Excision vs. Fixation
  - Cartilage restoration



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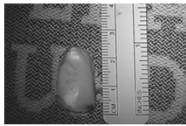
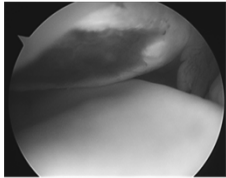
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## Osteochondral Fracture



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## Dislocations

- Patellar Dislocation
  - More common
  - Acute traumatic
  - Recurrent
  
- Knee Dislocation
  - Rare
  - High risk for neurovascular injury



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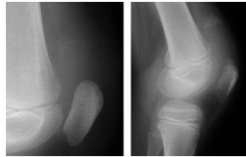
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## Patellar Fractures Patella Sleeve



Rare  
Direct blow vs. Eccentric load

Patellar Sleeve

Assess straight leg raise

Rockwood and Wilkins' Fractures in Children

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## Osteochondritis Dissecans

- ⊗ Unknown etiology
- ⊗ Cause for joint pain
  
- ⊗ Juvenile vs. "Adult"
  
- ⊗ Treatment based on staging, maturity, and exhausting non-operative options



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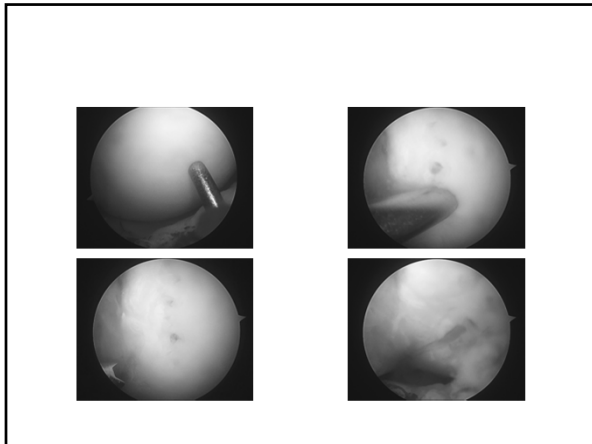
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### Bone Bruise



- ⊗ Deep bone  
confusion/microtrauma
- ⊗ Seen after direct trauma
  - ⊗ Patellar dislocations
  - ⊗ ACL tears
- ⊗ Can take weeks to months  
for symptoms to abate
- ⊗ Typically conservative  
treatment
  - ⊗ Protected weight bearing
  - ⊗ Ice/NSAIDS

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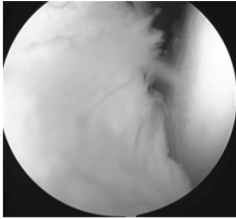
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### Plica Syndrome

- ⊗ Present in 1:3 knees
- ⊗ Infolding of normal knee  
synovial tissue
- ⊗ May become  
symptomatic with direct  
trauma or overuse
- ⊗ Conservative treatment



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## Things Not to Miss

SCFE



Infections/Tumors



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## Thank You



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