Pediatric Anterior Cruciate Ligament Injuries- Is non-operative treatment an option?

John F. Lovejoy III, MD
Chair, Department of Orthopaedics and Sports Medicine
Nemours Children’s Hospital

I have no disclosures

What is the anterior cruciate ligament and what is its function?

- **Definition**: An intra-articular ligament of the knee obliquely oriented between the lateral femoral condyle and the medial tibia plateau.

- **Primary Function**
  - Resists anterior translation of tibia
  - Prevents excessive rotation of knee
  - Stabilizes knee with regular ADLs
  - Jumping, cutting, and twisting stress your ACL the greatest
Are all pediatric ACL problems from Trauma?

NO- pediatric knee ACL issues can be congenital

• Proximal focal femoral deficiency
• Congenital knee dislocation
• Congenital thrombocytopenia
• Congenital absence or malformation of the PCL or menisci
• Tibia or Fibular hemimelia

The primary cause, though, is trauma...

• .11 per 10,000 at 8 yo
• 2.42 per 10,000 at 14 yo
• 16 per 1000 in all adolescents
• 80% < 12 associated tibial spine fracture
• Up to 60% of pediatric ACL injuries are partial tears

Are pediatric knee injuries on the rise? Yes!

United States National Electronic Surveillance System (NEISS)

• 2009 569,146 pediatric injuries (<14) basketball, baseball, soccer, football
• 2001 229,298 pediatric (<18) knee injuries
  • Female 90,714
  • Male 134,586
• 2008 234,585 pediatric (<18) knee injuries
  • Female 92,105
  • Male 142,421
• Increasing trend in pediatric knee injuries
• Increasing trend in female knee injuries

What are the common mechanisms of injury?

94% are sports related

Most commonly one or a combination of:

• Hyperextension
• Sudden deceleration
• Valgus force
• Rotational force with foot planted
How do kids ACL injuries present?

- Audible 'pop'
- Pain
- Effusion (Hemarthrosis)
  - 47% preadolescents with a traumatic knee effusion
  - 10-65% adolescents with a traumatic knee effusion
- Knee Instability
- Gait deviations with anterior tibial thrust

Pediatric Knee Injury Imaging

- Plain films
  - Rule out osseous injury
  - Tibial spine fracture, the classic pediatric ACL injury
- MRI
  - Evaluate ACL and possible additional injuries

Treatment-

- To operate or to not operate, that is the question!

What makes taking care of pediatric patients different from adults?

- Parental involvement
  - The patient may not be the decision maker
- Physis
  - Each patient will have varying degrees of growth remaining
- Activity Level
Decision making-
- Decision making begins with the patient and families' expectations:
  - What is the athletic demand of the patient?
  - Can the patient withhold from activities that would put them at risk for additional injuries?
  - Are the parents' expectations for the patient's performance and activity level appropriate for non-operative treatment?
  - Has the family predetermined their treatment?

Non-operative treatment is a good option for...
- Lower activity level kids
  - May require modification to activities
  - May decrease return to sport
  - Lower demand or knee friendly sports (swimming)
  - Non sports participating kids

Non-operative treatment is best for...
- Partial ACL tears
  - <50% ACL fibers torn
  - Clinically no rotational instability (Pivot Shift)
- Kids without any associated injuries (i.e. meniscal tears)

AAOS Appropriate Use Criteria
- Age/Maturity
  - Open vs closed
- Activity level
  - Participation in cutting/pivoting sports
- Meniscal injury
  - Repairable or not
- Non-operative measures
  - Failure or not of non-operative measures

Hand Bone Age film
Non-Operative Therapy

- Bracing
- Physical Therapy
- Potential long term activity modifications

Objective
- Restore normal ROM
- Strength secondary stabilizers
- Minimize rotational instability
- Prevent additional injuries

Outcomes

- Need for future surgery
  - Vavken and Murray 2011
    - Systemic review, 476 patients, 52.2% treated initially non-operatively went on to surgical reconstruction
  - Badwein et al 2013
    - Meta-analysis of non-operative vs operative treatment of pediatric ACL injuries
      - 75% of non-operative patients reported feeling instability
      - None of the non-operative patients returned to play

Future meniscal injuries
- Moksnes et al.
  - Evaluated non-op treated patients
  - 85% returned to all activities
  - 9.5% new meniscal injuries
- Millett et al.
  - Compared % of meniscal tears between acutely reconstructed ACLs vs chronic ACL reconstruction
  - 11% meniscal tears in acute group, 36% meniscal tears in chronic group
- Henry et al.
  - Compared ACLs repaired while patient was skeletally immature vs delayed until skeletal maturity
  - 16% meniscal tears in immature group vs 41% in delayed group

Conclusion

- Patient selection is important for non-operative treatment
- The patient and family must understand the increased risk of further instability and injury
- High likelihood of needing future surgery.
- Decreased return to play.
Bibliography


THANK YOU