Pediatric and Adolescent Sports
ACL Injuries

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Natural History

- More youth organized sports
- Year round training
- Recognition

- Pediatric/Adolescent ACL injuries increasing in numbers

History

• Feel/hear a “pop”
• Knee swelling soon after injury
• Unable to continue playing

1. ACL Injuries
2. Patellar Dislocations
3. Meniscal/cartilage injuries
4. Fractures
ACL Tear

Normal

Torn ACL
Exam

• Full knee exam
• ACL specific findings
  – Lachmans
    • 30 degrees, anterior translation
  – Pivot Shift
    • Tibial IR, slight valgus
    • Extension to flexion
  – Anterior Drawer Test
Studies

• AP and lateral
• Patellar view if able
• +/- MRI

Normal

Torn ACL

Lateral compartment bone bruise
Classic Pediatric ACL-equivalent Injury: Tibial Spine Avulsion

- Fracture of the tibial spine where the ACL attaches
- Ligament is “stronger” than the bone
Tibial Spine Avulsions

- Type I: non-displaced
- Type II: anterior fragment lifted superiorly
- Type III: completely displaced
Tibial Spine Avulsions

- Type I: non-displaced
- Type II: anterior fragment lifted superiorly
- Type III: completely displaced

Extension casting 4-6 weeks

Attempted Reduction in extension
- Reduces=> Casting
- Doesn’t reduce=> Operative Treatment

Operative Treatment
Type II Fractures: Do They Reduce?

- 10 Type II Tibial Spine Fractures
  - MRIs in Both Flexion and Full Extension
- Mean improvement of 0.8mm (p=0.03)
- None reduced below 4mm
Intra-substance ACL Injuries

• Reported with increased frequency
• Skeletally Immature Knee
  – Treatment Dilemma

Non-Operative Treatment

High rate of meniscal and cartilage damage

Operative Treatment

Risk of iatrogenic growth disturbance

References:
Bottom Line

• The treating surgeon must understand:
  – Normal growth and development
  – Outcomes of non-operative vs operative treatment
  – Operative techniques to minimize growth disturbance
  – Issues associated with growth disturbance
Non-Operative Treatment

- Physical Therapy
- Functional ACL brace
- **Activity Modification**

Non-op treatment rarely tolerated
- Continued Instability
- Not Tolerating Desired Activity Level
- High rate of meniscus/cartilage injuries

**SURGERY**
Growth Around the Knee

• Most lower extremity growth comes from the distal femur and proximal tibia

• Iatrogenic growth disturbance
  – Angular
    – Length
Surgical Options

• Physeal sparing procedures
  – Technically more demanding
  – Potentially less anatomic, biomechanically inferior
  – Lower risk of growth disturbance

• Transphyseal procedures
  – Easier to do
  – More anatomic, biomechanically superior
  – Higher risk of growth disturbance
IT Band Reconstruction
(No Drill Tunnels)

Kocher and Micheli, JBJS Am 2005
Epiphyseal Tunnels

Anderson AF, JBJS Am 2003
Surgical Options
Return to Sport After Pediatric Anterior Cruciate Ligament Reconstruction and Its Effect on Subsequent Anterior Cruciate Ligament Injury.

Dekker TJ, Godin JA, Dale KM, Garrett WE, Taylor DC, Riboh JC.

- <18 y.o., Minimum 2 year follow up
  - 19% retear of graft
  - 13% contralateral tear
- Overall prevalence of a 2nd ACL injury 32%
- Earlier return to sport after surgery had higher retear rates

Risk Factors and Predictors of Subsequent ACL Injury in Either Knee After ACL Reconstruction: Prospective Analysis of 2488 Primary ACL Reconstructions From the MOON Cohort.

Kaeding CC, Pedroza AD, Reinke EK, Huston LJ, MOON Consortium, Spindler KP.
ACL/Injury Prevention

- Programs based on neuromuscular control
  - Pre-participation drills
    - Stretching
    - Strengthening
    - Plyometrics
    - Agility
  - 15-20 minutes, 3 x week
Conclusions

• Non-operative treatment is worthwhile although rarely successful without appropriate activity modification.

• Surgical technique should take into consideration the patient’s “age” (growth potential).

• Regardless of technique, the younger the patient, the higher the risk of ACL retear.

• Prevention programs might be helpful in reducing injury.
Just Some Thoughts...

- Why are our children playing sports in the first place?
  - Fun
    - Friends
    - Social circle
    - For thrills and excitement
  - Health
    - Exercise
    - Coordination
  - Life Skills
    - Sportsmanship
    - Rebounding from a loss
    - Dedication to an activity makes you better
Thank You