UNUSUAL ACL CASE:

Tibial Eminence Fracture in a Female Collegiate Basketball Player

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How many of you have done an evaluation of an acute ACL injury??
Initial Evaluation: Personal Data

- 18 y.o. female Division I basketball player
- C/O acute right knee pain when her knee buckled underneath her during a jump stop
- Felt a “pop”
Initial Evaluation: Signs and Symptoms

- Joint effusion within 20 minutes of injury *
- Pain w/ weight bearing *
- Knee held at 20-30° of knee flexion for greatest comfort
- Medial joint line tenderness
Initial Evaluation: Signs and Symptoms

- Lachman’s test (+) for laxity
- Valgus stress test (+) at 0° and 30° of knee flexion
- AROM/PROM painful and limited *
- All neurovascular test negative
Differential Diagnosis:

- Complete anterior cruciate ligament tear
- Partial anterior cruciate ligament tear
- Medial collateral ligament tear
- Avulsion fracture
- Meniscal tear
Initial Diagnostic Testing:

- Radiographs:
  - Anterior-posterior view
  - Merchant view
  - Tunnel view
  - Lateral view

- Magnetic Resonance Imaging
Anterior-Posterior View
Merchant View
Lateral View
Magnetic Resonance Images

Intact vs. Non-Intact
Tibial Eminence Avulsion Fracture
Initial Diagnosis:

- Grade 2 medial collateral ligament tear
- Lateral meniscal tear
- Bone bruise of medial femoral condyle
- Tunnel view and MRI (+) for abnormal bony integrity of tibial eminence
- Anterior cruciate ligament injury w/ **Type 3** avulsion fracture of tibial eminence
Classification of Meyers & McKeever:

**Type 1:** Fractures are minimally displaced (<3mm)

**Type 2:** Fractures have the anterior third to half of eminence elevated and an intact posterior hinge

**Type 3:** Fracture is a complete displacement of the fragment (+) rotation

**Type 4:** Fractures have complete displacement with rotation and comminution
Treatment for Classifications:

**Type 1:** Conservative, immobilize 3-4 weeks and progress w/ therapy

**Type 2:** May also treat conservatively – if appropriate reduction- immobilize 4-6 weeks and progress w/ therapy

**Type 3 and Type 4:** Surgically fixation to maintain anatomic reduction. Complications may follow surgery including arthrofibrosis, extension loss, or fracture malunion/ligament laxity
Surgical Options:

- Re-implant bony fragment w/ intact ACL back into tibial eminence
- Reconstruct ACL (3 different graft options) and remove bony fragment
Initial treatment: Preoperative Rehabilitation Protocol

- Edema control
- Maintenance of muscular strength
- Range of Motion (w/ emphasis on regaining extension)
- Weight bearing as tolerated
Five Weeks Post-Initial Evaluation:

- Very minimal swelling
- Good quadriceps control
- Full knee flexion
- Limited knee extension
  - L knee measured at 5° of hyperextension
  - R knee measured at 1-2° shy of terminal knee extension (0)
Follow-up Treatment:

- Surgery performed almost 6 weeks post injury
- Avulsion of tibial eminence at site of ACL insertion was confirmed arthroscopically
- Old ACL and bony fragment was removed and replaced w/ bone-patellar tendon- bone autograft
Tibial Eminence Avulsion Fracture
Tibial Eminence Avulsion Fracture
Post-operative treatment:

- Athlete was placed on an ACL rehabilitation protocol
- Currently at 8 months and progressing well
Uniqueness:

- More often seen in children than adults
- In children the physeal plates are weaker than the ligaments, therefore site of failure is often at tibial eminence attachment of ACL
- In adults the ACL often fails within ligament due to complete fusion of growth plates
Uniqueness:

- Also more often MOI is due to hyperextension or high impact mechanism (ie. Falling off bicycle or car accident)
- This case the athletes growth plates were fused and the injury occurred during a normal athletic activity in knee flexion
Take Home Message:

- Suspect ACL injury w/ tibial eminence fracture when:
  - Immediate joint effusion
  - Inability to weight bear
  - Lachman’s test (+)
  - Pain w/ movement
Take Home Message:

- R/O tibial eminence fracture w/ thorough radiographs (x-ray 4 views, MRI)
- Treatment is different in children than adults due to open growth plates and will also depend on degree of fracture