



# ACL Graft Choice Options

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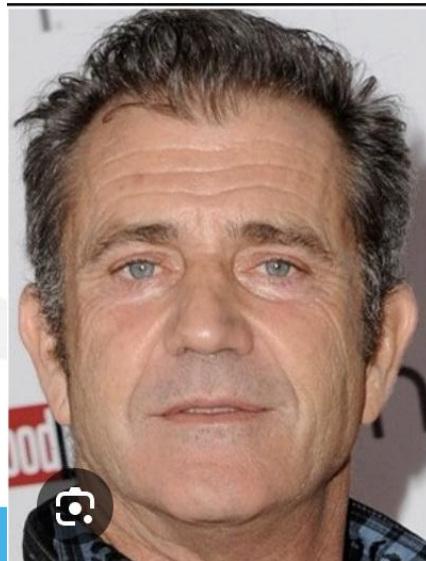
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# Disclosures

- Smith and Nephew: consultant

# ACL Surgery: What determines Success?

- Surgeon: graft choice, meticulous technique, meniscus repair, cartilage, alignment
- Patient: compliance, psychology, grit
- MD/PT/ATC: post op rehab, return to sport testing



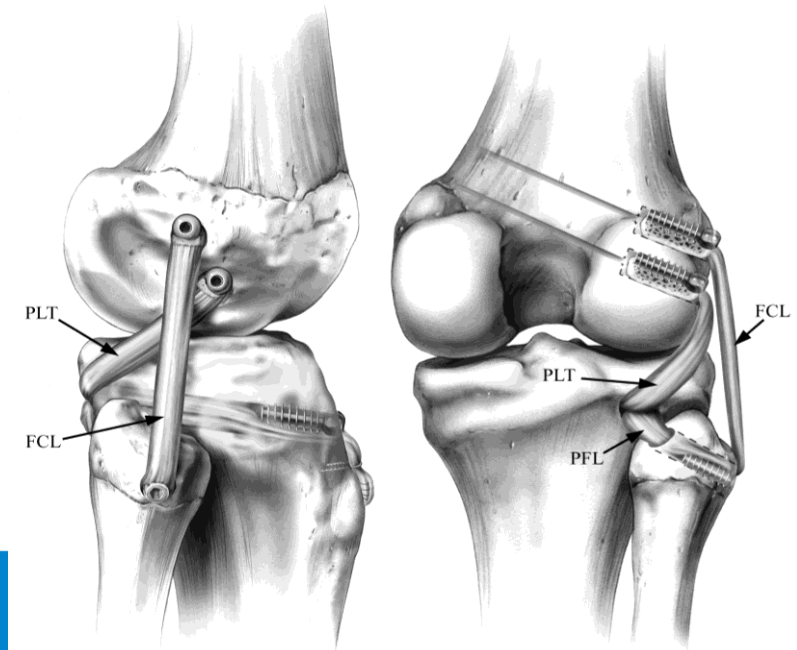
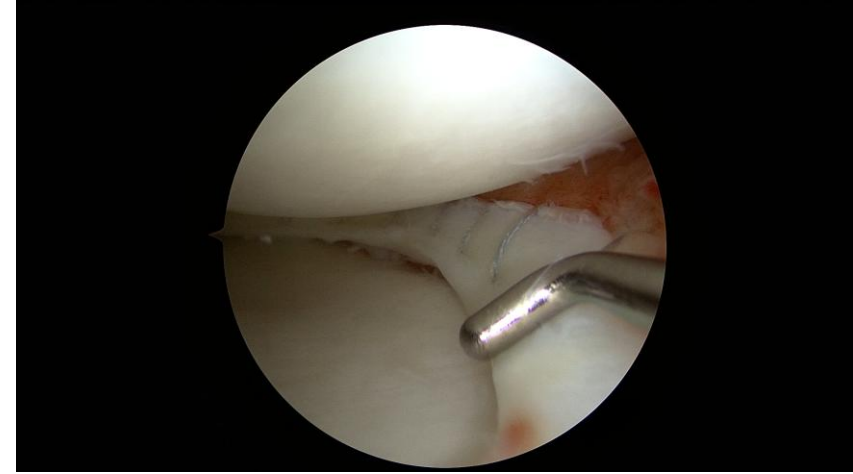
I don't make things complicated,  
that's the way they get all by  
themselves.

— Mel Gibson —

AZ QUOTES

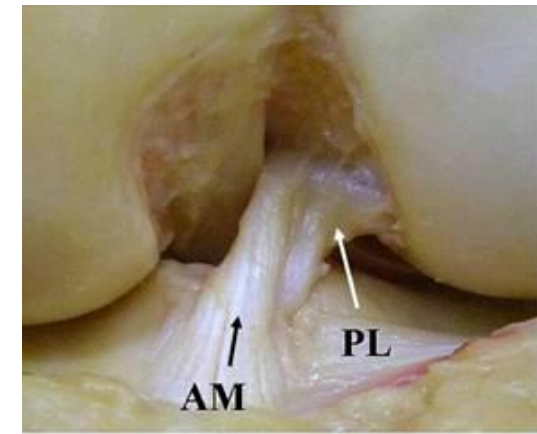
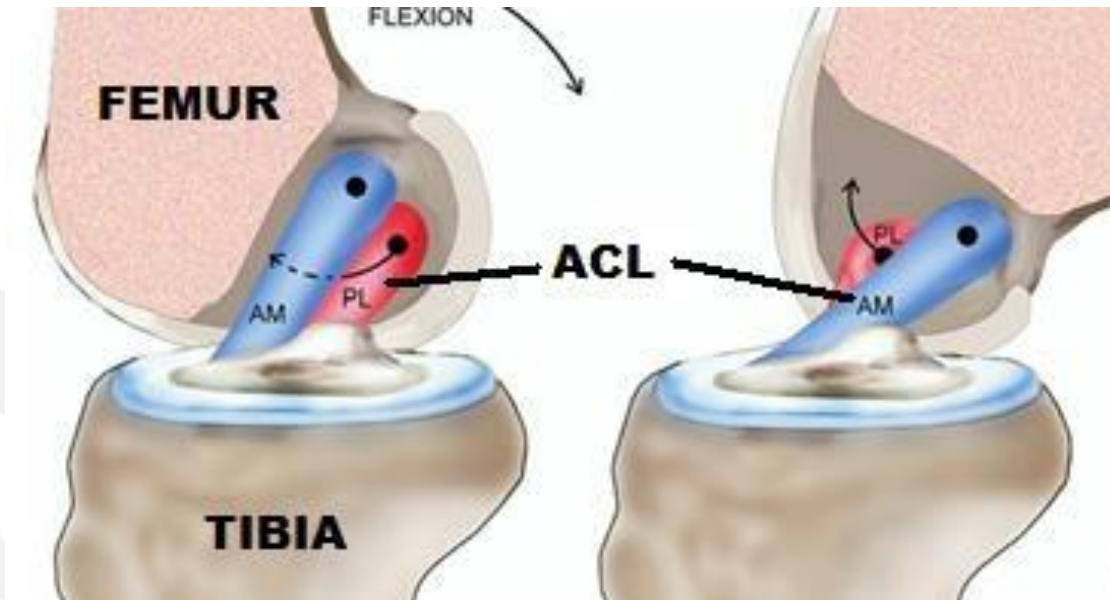
# ACL Surgery: 2025 state-of-the-art

- Meniscus repair
- Recognizing combined injuries
- Extra-articular augmentation



# ACL Structure and Function

- Primary restraint to anterior tibial translation
- 2 bundles-anteromedial and posterolateral to control translation and rotation.





# ACL Tears

- Common athletic injuries
- Anterior instability
- Lateral rotatory instability
- Diagnosis based on history, examination, and imaging
- Treatment
  - Nonop
  - Repair
  - Reconstruction
- Many techniques based on injury pattern, patient factors, activity level/goals



# ACL Tears: History

- Classic pop, swelling
- Improves, but subjective instability persists
- Exam
  - Swollen, quad avoidance, decreased motion
  - Lachman
  - Ant drawer
  - Pivot shift



# ACL Tears: Imaging

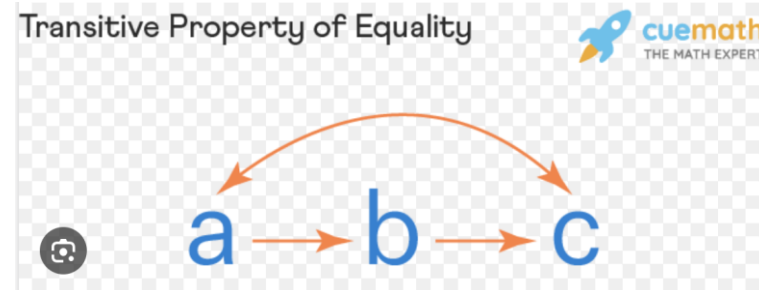
- Plain Radiographs
  - Segond Fracture
- MRI
  - Bone bruise pattern
  - ACL itself
  - Additional injuries
- CT scan, standing alignment
  - Revision cases





# ACL Tears: Treatment Non-Operative

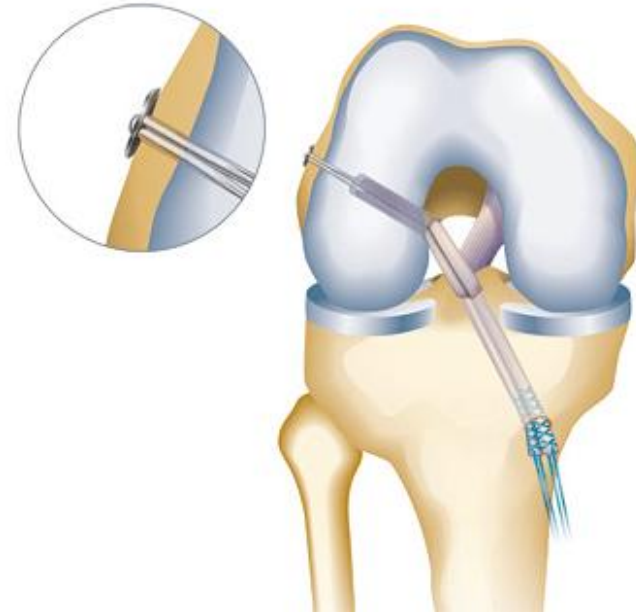
- Lower demand patients
- Contraindications for surgery
- PT, activity modifications
- Bracing
- OA risk does not differ, BUT...
- Risk of damage to cartilage and meniscus does, which then increases OA risk



# ACL Tears: Treatment Operative

## Reconstruction

- Most commonly performed treatment method
- Involves using patient's own tissue or cadaver graft to replace the ACL
  - Graft choice dependent on numerous factors
- High return to sport, return to play/activity
  - Influenced overall by demographic, functional, and psychological factors



# ACL Tears: Treatment Operative

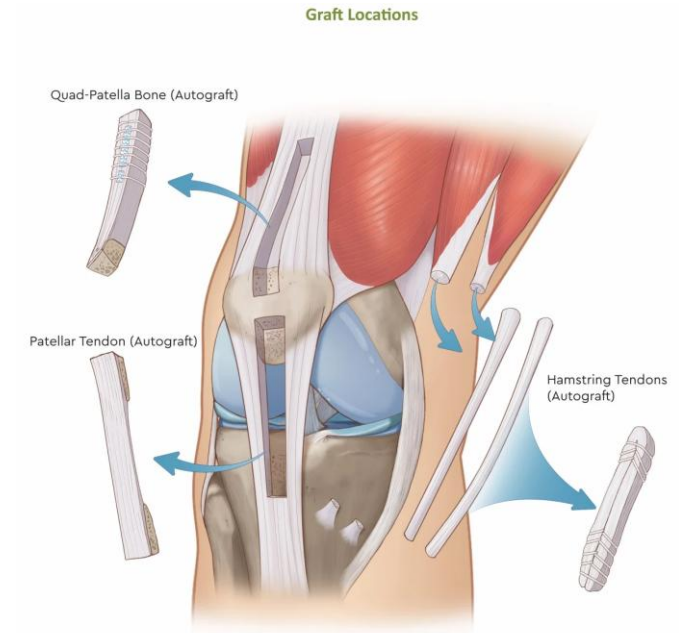
## Additional Injuries

- MCL tear
  - Most heal nonop, assess at time of OR
- Meniscal tears
  - Heal best when fixed at time of ACL
- Cartilage injuries
  - Decreases long term outcome
- PCL/PLC injuries
- Malalignment
  - High tibial osteotomy v DFO



# ACL Tears: Treatment Graft Choice

- Autograft
  - Patient's own tissue
  - THE CHOICE for young patients
  - Faster incorporation
- Allograft
  - Cadaver tissue
  - Many options
  - Perhaps less painful?
  - Over 40 years or so, no difference



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# ACL Tears: Treatment Graft Choice

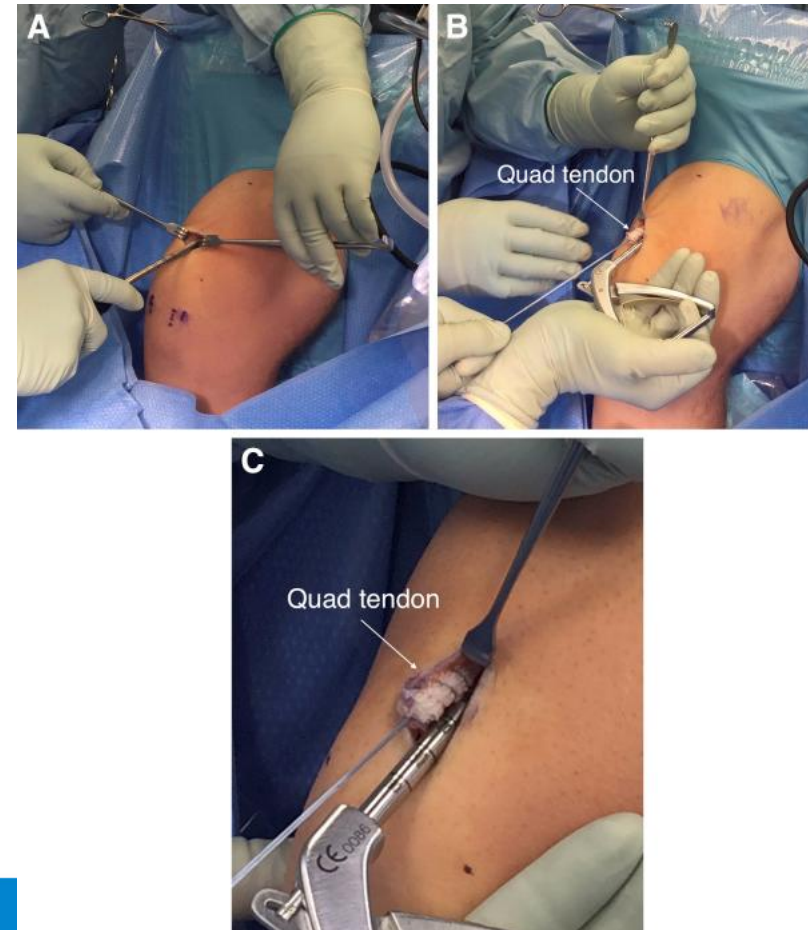
- Bone-Patellar Tendon-Bone (BTB)
  - Longest track record
  - Still considered “gold standard”
  - Bone to bone healing
  - 2600 N load to failure
  - Anterior knee pain?
  - Surgery hurts





# ACL Tears: Treatment Graft Choice

- Quadriceps Tendon Autograft
  - +/- Bone block
  - Avoids tibial tubercle physis
  - 2200 N load to failure
- Hamstring Autograft
  - Flexible technique
  - Quadrupled HS graft v strong (4000N)
  - Concerns
    - Stretch out, especially in females
    - Residual weakness



# ACL Tears: Treatment Operative

## Repair

- What's old is new...
- Strict(er) indications
- Theoretical benefits of keeping own ACL, own cells, "own knee"
- Still requires extended recovery and rehab

The Washington Post  
*Democracy Dies in Darkness*

## J. Richard Steadman, orthopedic guru for elite athletes, dies at 85



By Brian Murphy

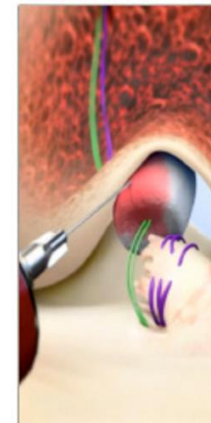
January 24, 2023 at 5:28 p.m. EST



Torn ACL



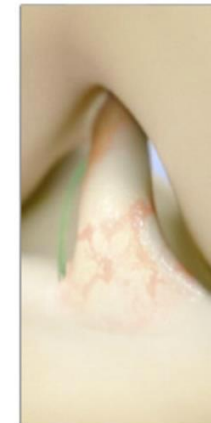
Place BEAR™ implant between torn ACL ends. Add blood.



Pull torn ACL ends into implant with stitches.



Healing ACL tissue replaces BEAR™ implant.



# ACL Repair: What's old is new

- Feagin and Curl, 1972
  - 2 year follow-up: 25 of 30 patients with good to excellent results

0363-5465/82/1002-0103\$02.00/0

THE AMERICAN JOURNAL OF SPORTS MEDICINE, Vol. 10, No. 2

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## **Primary surgical treatment of anterior cruciate ligament lesions\***

JOHN L. MARSHALL,<sup>†</sup> DVM, MD, FACS, RUSSELL F. WARREN,<sup>‡</sup> MD, FACS,  
AND THOMAS L. WICKIEWICZ,<sup>§||</sup> MD

# ACL Repair: Concerning Midterm Results

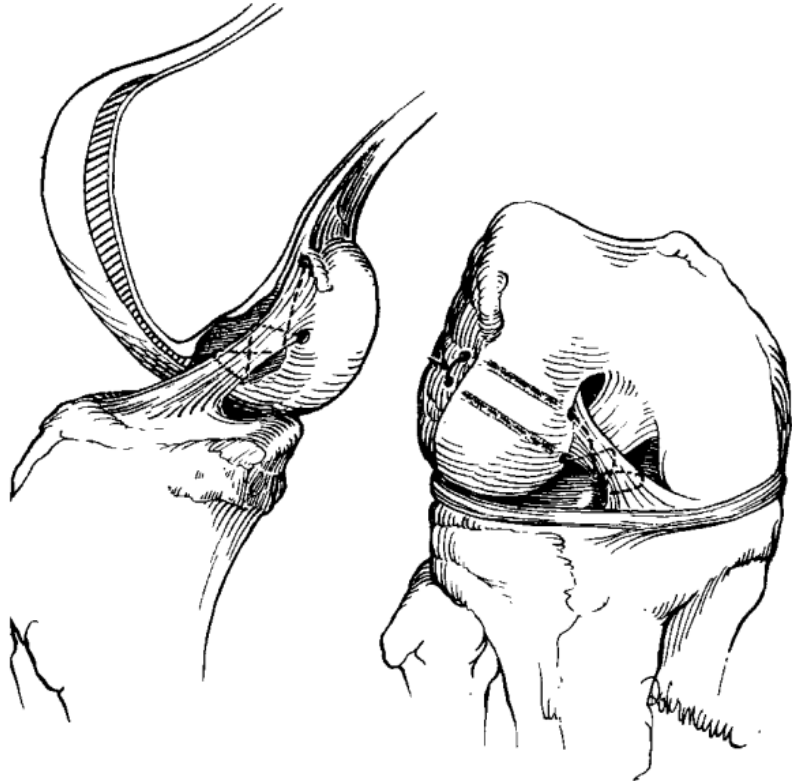


Figure 1—Drawing illustrates method of surgical repair of anterior cruciate ligament. After a figure eight suture is made in the ligament, the suture is passed through drill holes in the lateral condyle and secured.

**TABLE I**      **Functional Evaluation**

Parameter	Cadets affected ( <i>n</i> = 32)
Military duty	
Full duty	22
Ranger airborne	23
Combat duty	16
Athletic endeavors	
Impairment of ordinary activity	24
Ordinary activity	
Impairment	12
Subjective ratings (%)	
Pain	71
Swelling	66
Stiffness	71
Instability	94

# ACL Tears: Treatment Operative

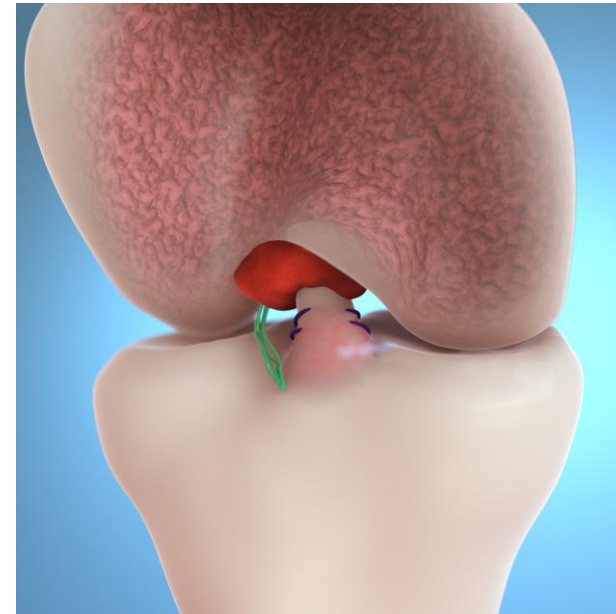
- BEAR ACL Repair

*Winner of the O'Donoghue Award*

## Bridge-Enhanced Anterior Cruciate Ligament Repair Is Not Inferior to Autograft Anterior Cruciate Ligament Reconstruction at 2 Years

### Results of a Prospective Randomized Clinical Trial

Martha M. Murray,\* MD, Braden C. Fleming, PhD, Gary J. Badger, MS, The BEAR Trial Team, Dennis E. Kramer, MD, Lyle J. Micheli, MD, and Yi-Meng Yen, MD, PhD  
*Investigation performed at Boston Children's Hospital, Boston, Massachusetts, USA*





# ACL Tears: Treatment

## Pediatric ACL Tears

- Open physis
  - Physis sparing
  - Trans physeal
  - Partial trans physeal
  - Adult reconstruction
- Bone block v soft tissue?
- BEAR repair?



# ACL Tears: Postop Rehab

- Immediate postop
  - Ice, WBAT (isolated ACL), emphasis on early full passive extension
- Early rehab
  - Work on motion and strength
  - Emphasis on closed chain activities
  - Blood flow restriction therapy
- Return to play
  - Various RTP assessments
  - Young? 9 months minimum
  - Big psychologic effect, emerging research



# Roundtable discussion

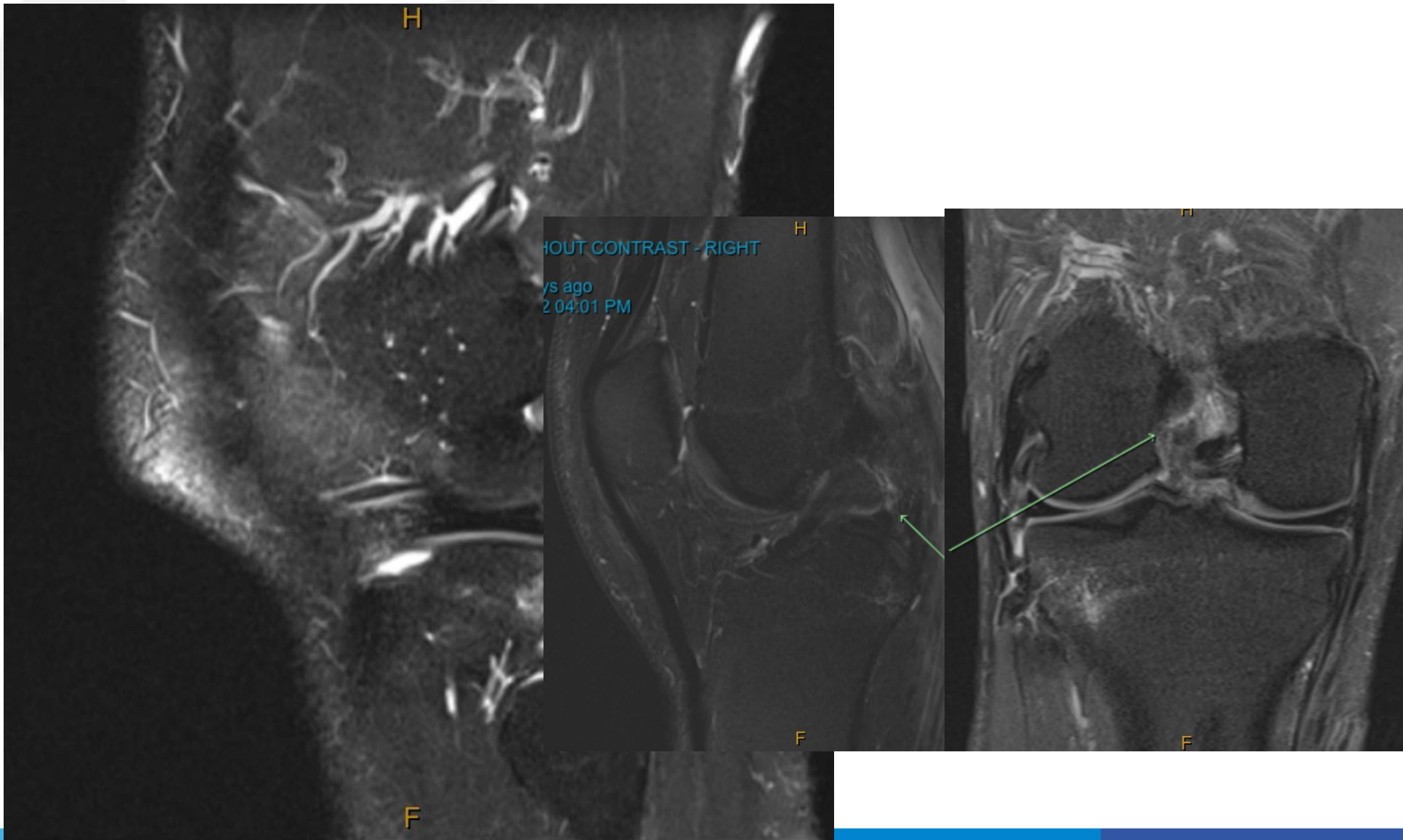
- **Dr.'s Beiro, Buckley, Gatt and Swan**
- **If you have questions, please enter them in the group chat. We will try to address them in the roundtable.**
- **If we do not address them, we will be available after the chat to answer questions in the group chat.**

# Case 1

- 21 yo collegiate wrestler (junior)
- 2B Lachman
- +pivot glide
- Tried to wrestle, feels loose and gives way

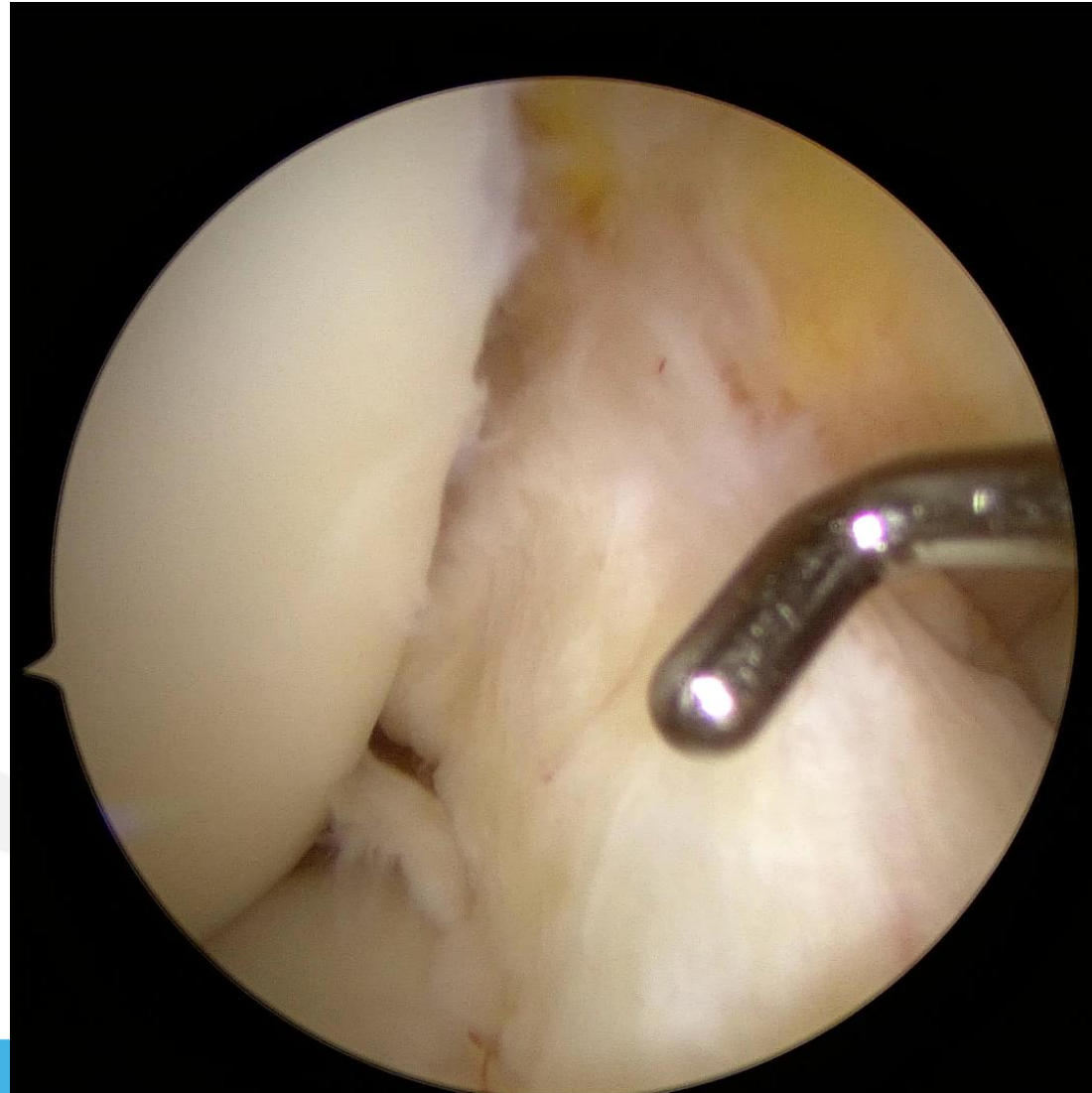


# Case 1-MRI

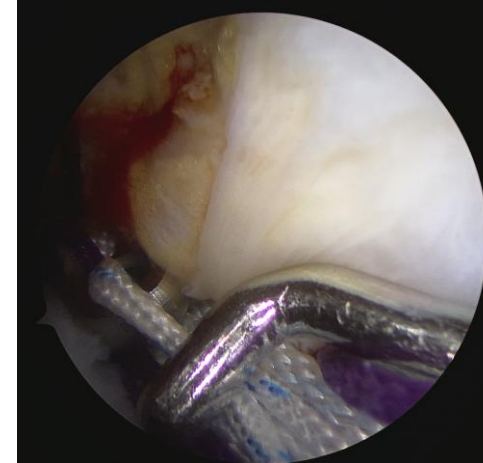
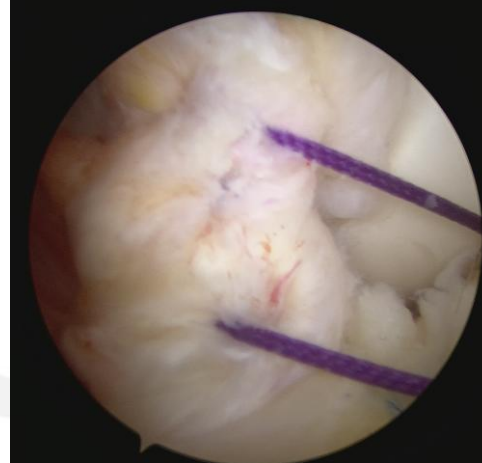
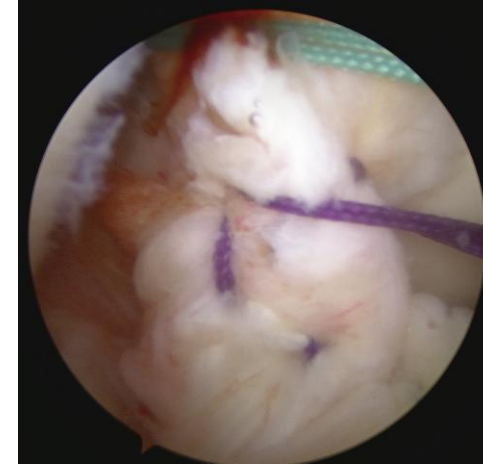




# Case 1- Intraop



# Case 1: BEAR ACL Repair



# Case 1 Follow up

- Vague pain at 7mo
  - MRI normal
  - Normal lachman
- Returned to collegiate wrestling

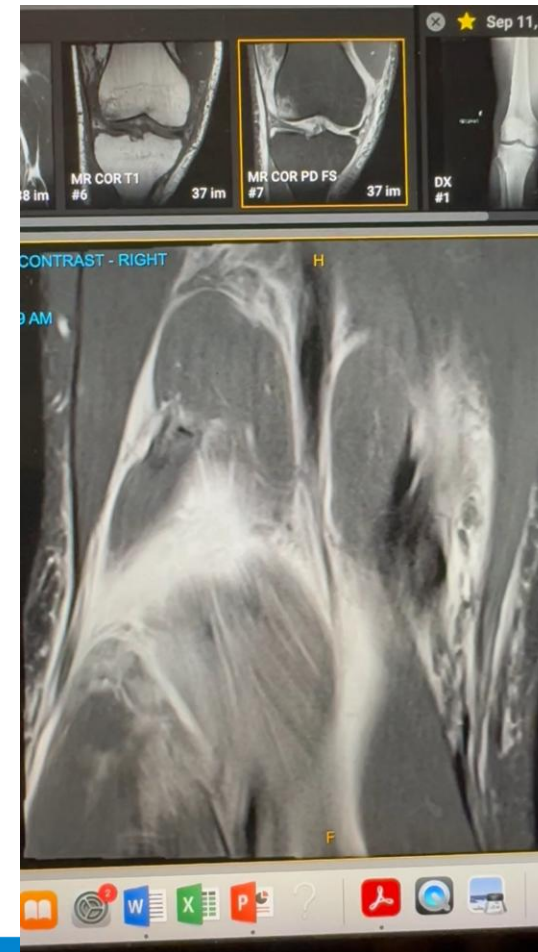
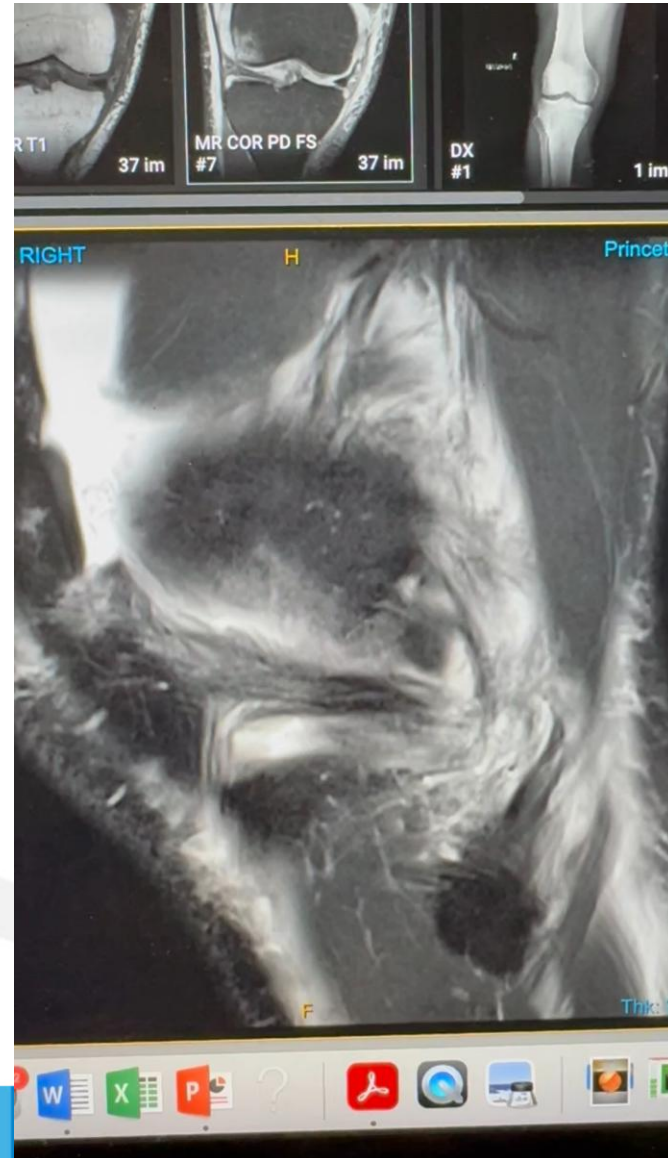




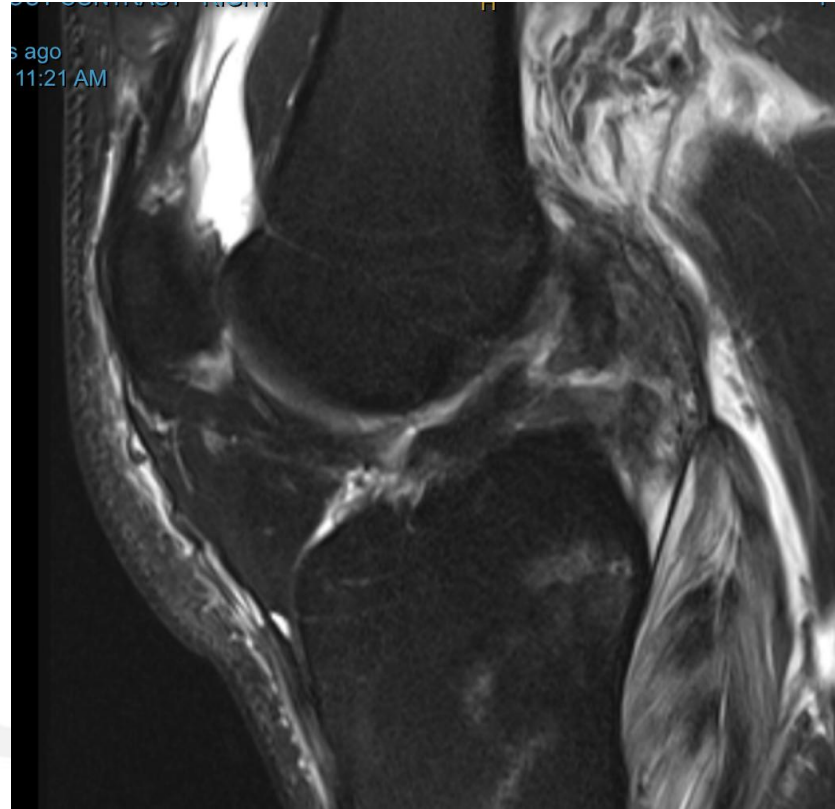
# Case #2

20 yo M collegiate lacrosse player

- Junior, plans to play 5 years
- 2B Lachman, no varus instability
- Family history of ACL
  - Dad, sister x 3



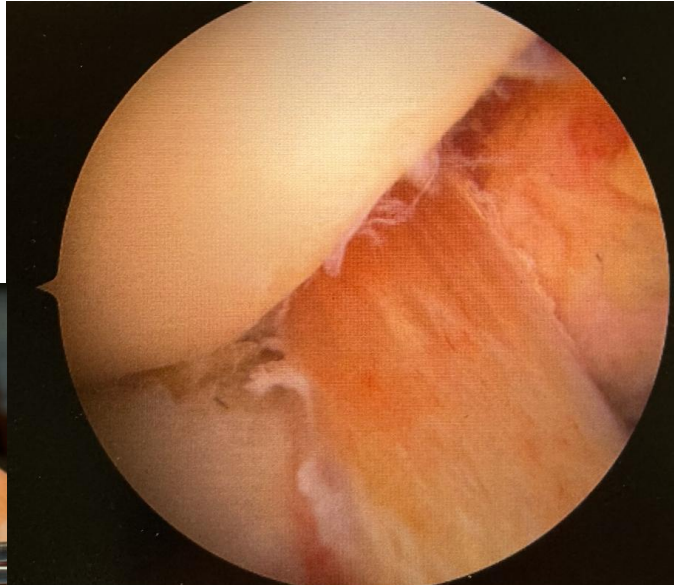
ACL, proximal MCL, LM tear,  
intact PLC but edematous





# Case #2

- Surgery at 4 weeks
- ACL Reconstruction
  - BTB Auto
  - LM repair
  - LET



# Case #2

- Did great, doing return to sport testing now
- Plans to play 2 more years of collegiate lacrosse

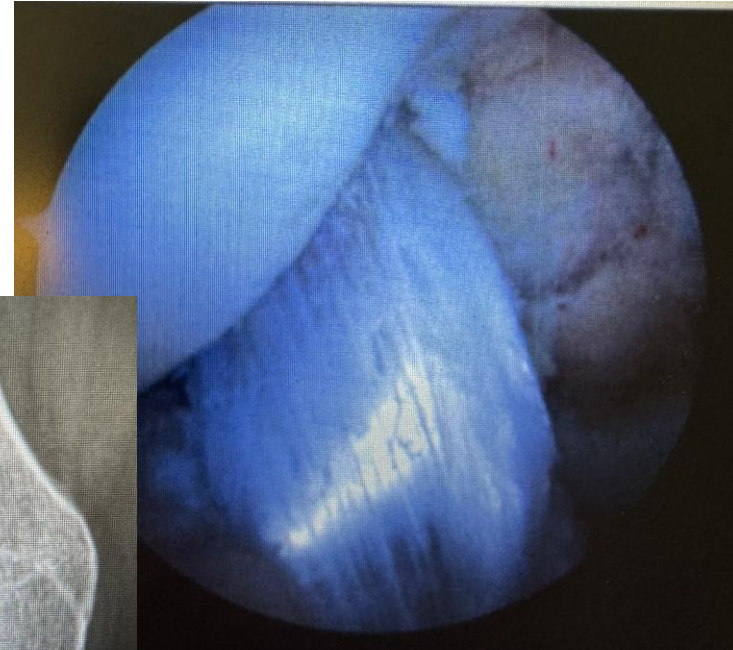
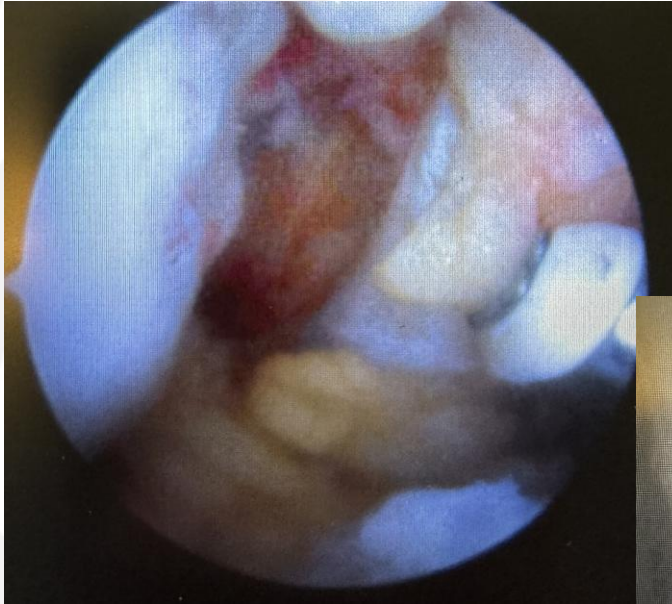


## Case #3

- 43 yo pediatrician
- Recreational tennis
- Injury 2 years ago, tried PT x 1 yr
- Feels loose with sports, chasing kids
- ACL and medial meniscus tear



# Allograft ACL recon, MM repair



# Case #4

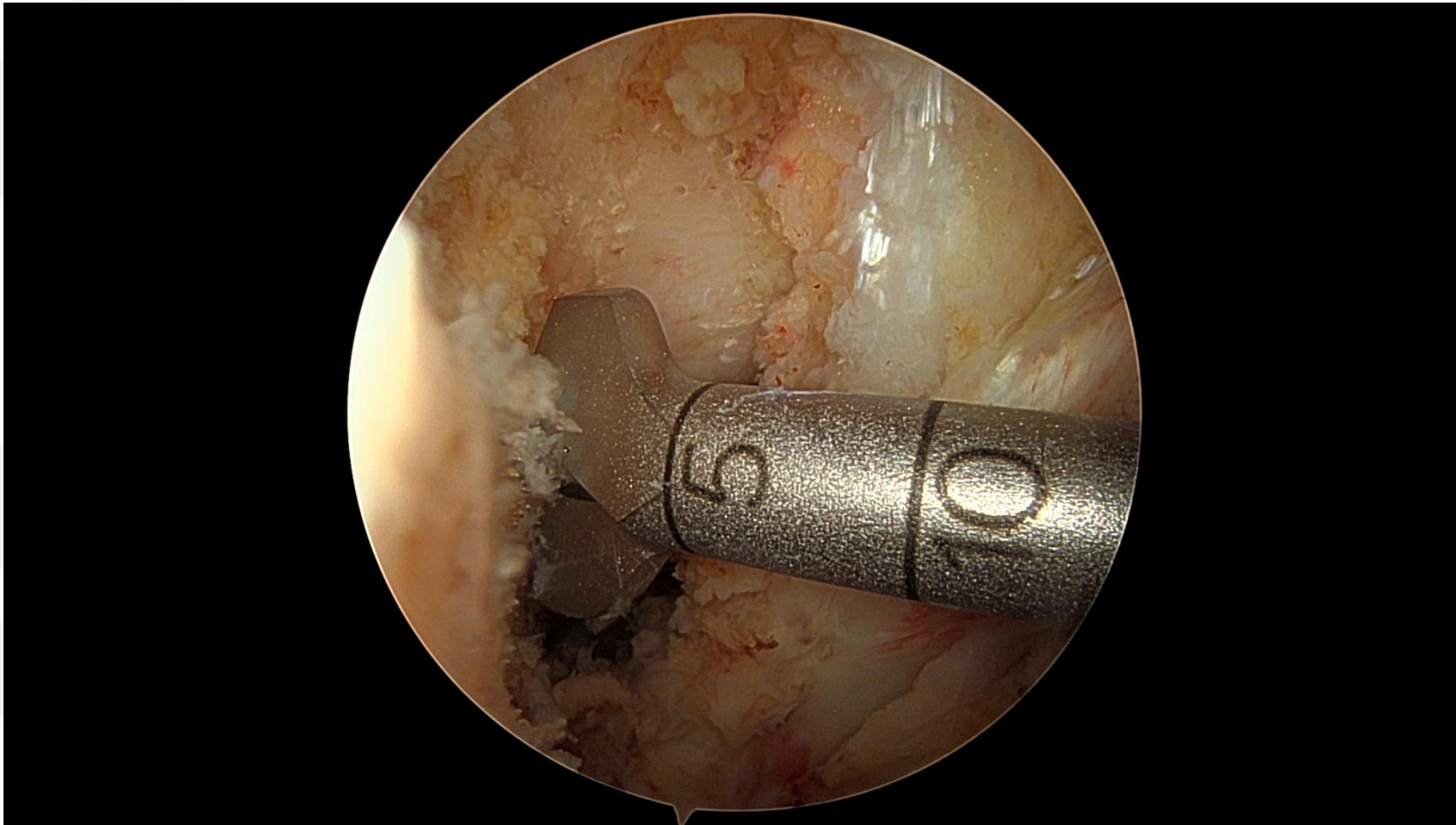
- Quad Auto case

# Thank you

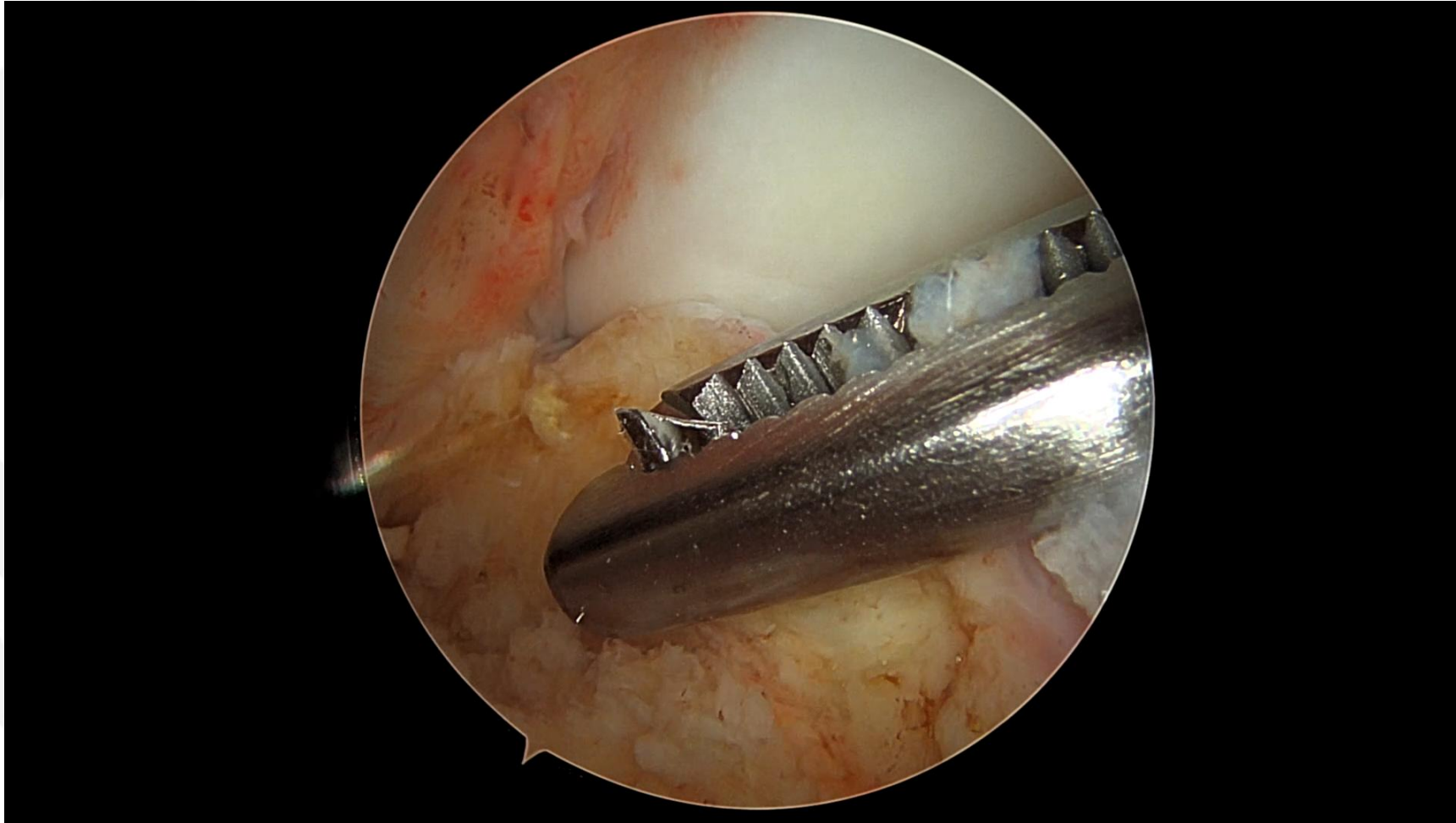
- Questions?
- [patrickb@uognj.com](mailto:patrickb@uognj.com)



# ACL Tears: Treatment Technique



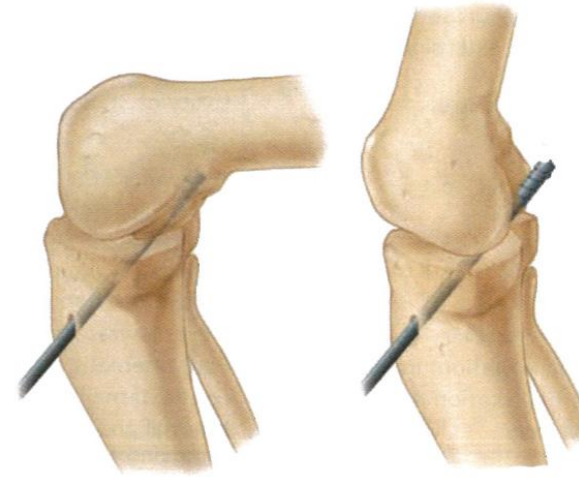
# ACL Tears: Treatment Technique



# ACL Tears: Treatment Technique

- Tunnel Trouble
  - Femoral tunnel
    - 1-2mm rim of “back wall”
    - 10 o’clock, or 2 o’clock – horizontal graft
  - Tibial tunnel
    - 10-11mm in front of anterior PCL insertion
    - 6mm anterior to median eminence
    - 9mm posterior to inter-meniscal ligament

## Femoral Tunnel Blowout



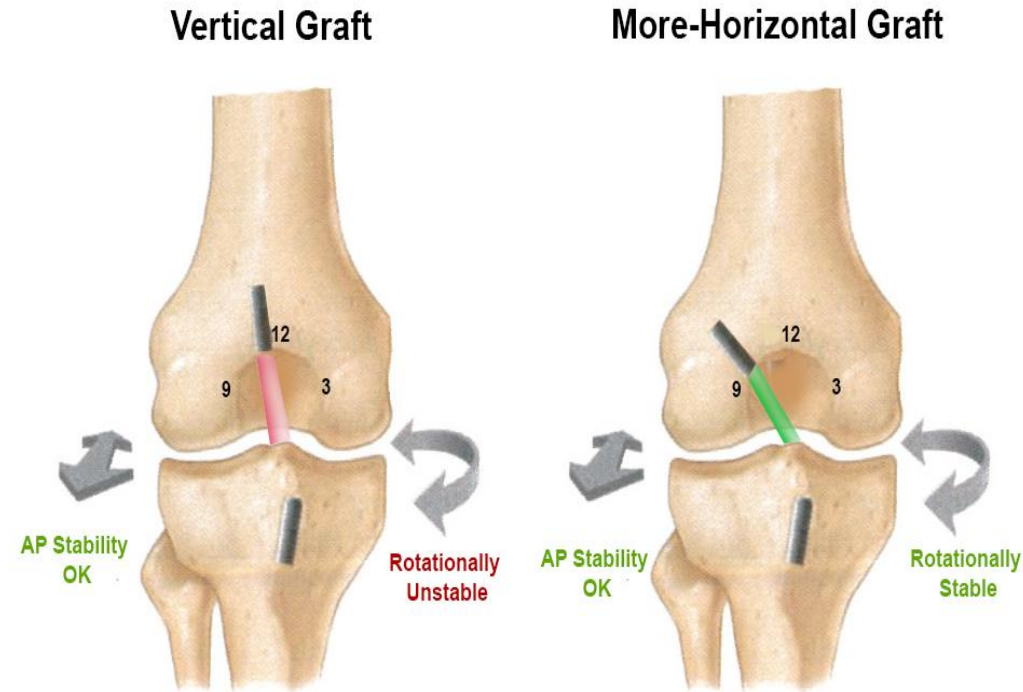
Flexion > 70 degrees

Flexion < 70 degrees



# ACL Tears: Treatment Technique

- Tunnel Trouble
  - Femoral tunnel
    - Too vertical?
      - Rotational instability
    - Too anterior?
      - Tight in flexion, loose in extension
      - “Resident’s ridge”
    - Too posterior?
      - Loose in extension, tight in flexion
  - Tibial tunnel
    - Too anterior?
      - Tight in flexion, roof impingement in ext
    - Too posterior?
      - Impingement with PCL





# ACL Tears: Treatment Technique

- Fixation – bone blocks
  - Metal screws
  - Biointerference screws
  - BTB tightrope
- Fixation – soft tissue
  - Femoral button
  - Biointerference screws
  - +/- anchors
  - All-inside technique

