ACL Injuries

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Introduction

- *Whenever young men gather regularly on green autumn fields, or winter ice, or polished wooden floors to dispute the physical possession and position of various leather and rubber objects according to certain rules, sooner or later somebody is going to get hurt.*

—T.B. Quigley '33

Learning Objectives

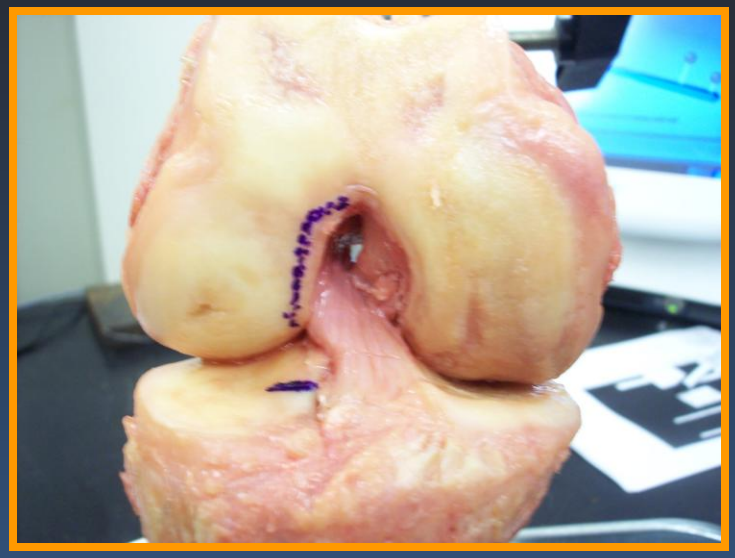
- Understand ACL anatomy and biomechanics
- Recognize clinical presentation and diagnostic methods
- Review treatment options: surgical & non-surgical
- Compare graft types
- Outline rehab and prevention protocols

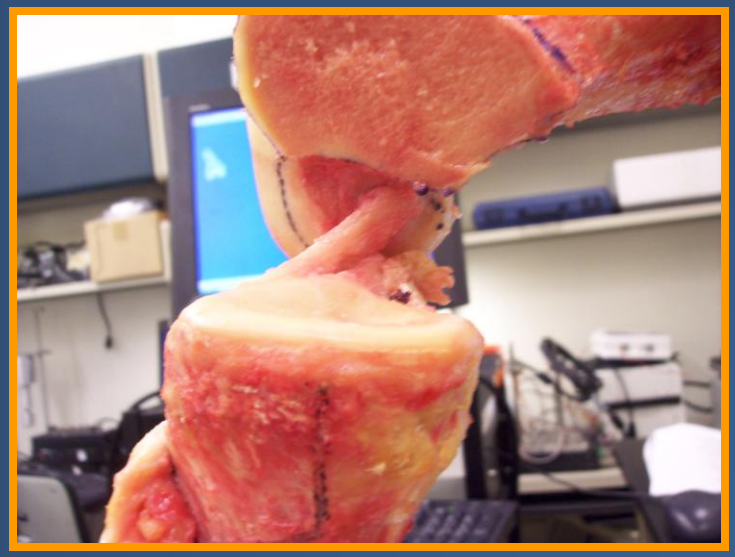
ACL Anatomy & Biomechanics

- Origin: Posteromedial lateral femoral condyle
- Insertion: Anterior intercondylar tibia
- Function: Prevents anterior tibial translation & rotation

Function
Stability

- Primary restraint to anterior tibial translation
  - Secondary stabilizers
    - Medial meniscus
    - Posterolateral corner
- Absence of ACL results in…
  - Functional problems
    - Rotatory instability during cutting, pivoting activities
  - Knee "endangerment"
    - Meniscal and/or chondral injury → → DJD





Epidemiology

- ~200,000/year
- Females: 3-10x risk
  - notch width, laxity
- Differences in neuromuscular firing patterns, landing from jumps

Mechanism of Injury

- Non-contact: pivoting, deceleration
- Contact: direct blow to knee
- Common in: football, soccer, basketball, skiing

Clinical Presentation

- Noncontact (70%) – twisting/pivoting event
- "Pop" sound, swelling, instability
- Limited ROM, pain with pivoting

Physical Examination

- Effusion
- Joint line tenderness
- Special tests:
  - Lachman Test (sensitive)
  - Anterior Drawer Test
  - Pivot Shift Test (specific)

Physical Exam

Lachman

Anterior tibial translation with knee at 20-30 of flexion, tibia neutral.

Graded relative to opposite knee…

- Grade I: 1-5 mm laxity
- Grade II: 6-10 mm laxity
- Grade III: >10 mm laxity

- ***Modifier***: "A" soft endpoint
  "B" no endpoint

Physical Exam

Pivot Shift

1). Abduct, ER (ITB)

2). Valgus, then ext → flex

Most sensitive when patient asleep on the table…

- Grade I: Glide
- Grade II: Jump
- Grade III: Lock

Imaging

- X-rays
  - Rule out fracture
  - Skeletal maturity
  - Segond sign
- MRI: gold standard for ACL and associated injuries (meniscus tears, other ligaments, cartilage)

Imaging
MRI

- Not necessary to diagnose an ACL tear.
- Most helpful for detecting associated pathology.
  - Other ligaments
  - Meniscal tears
  - Chondral defects

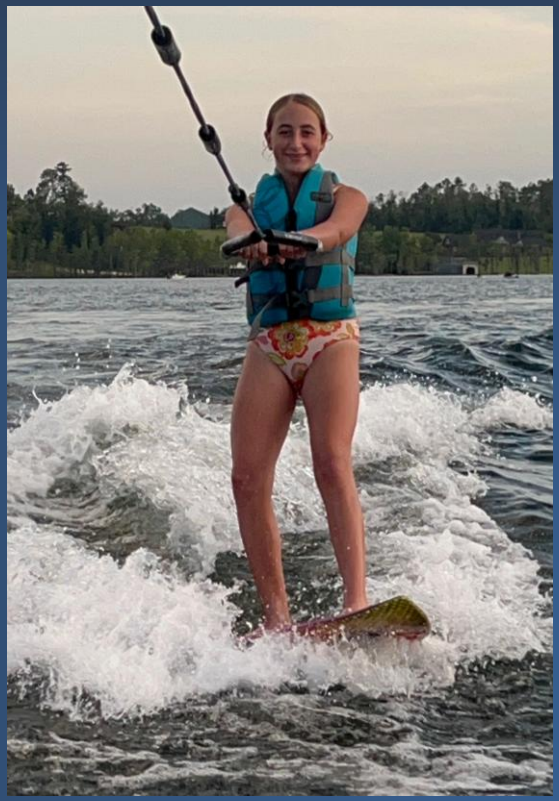
Imaging
MRI

- ACL tear
  - Ligament disruption
    - Sagittal + Oblique cut
  - Bone bruise
    - PL tibial plateau/LFC


Tribute To Sherman Ro e
Aviator / Instructor - "Tuskegee Airmen"

Treatment Options

- Non-surgical vs. Surgical
- Consider: age, activity, instability



Indications

- **In isolation, surgery is indicated if…**
  - You need the ACL to ***function***…
    - Desire to return to cutting/pivoting activities
  - You need the ACL to ***protect***…
    - The younger and more active you are, the greater the lifetime "endangerment"

For most patients <40 yo = SURGERY

For patients >40 yo = depends on activity level

Nonsurgical Management

- Activity modification
- Bracing, physical therapy

Indications

- **Other factors to consider**
  - Additional injuries
    - Meniscal, chondral, ligamentous
  - Skeletal maturity
  - Prior surgery
  - Timing
    - Prehab
- **Relative contraindications:**
  - Sedentary
  - DJD
  - Limited ROM

Surgical Indications

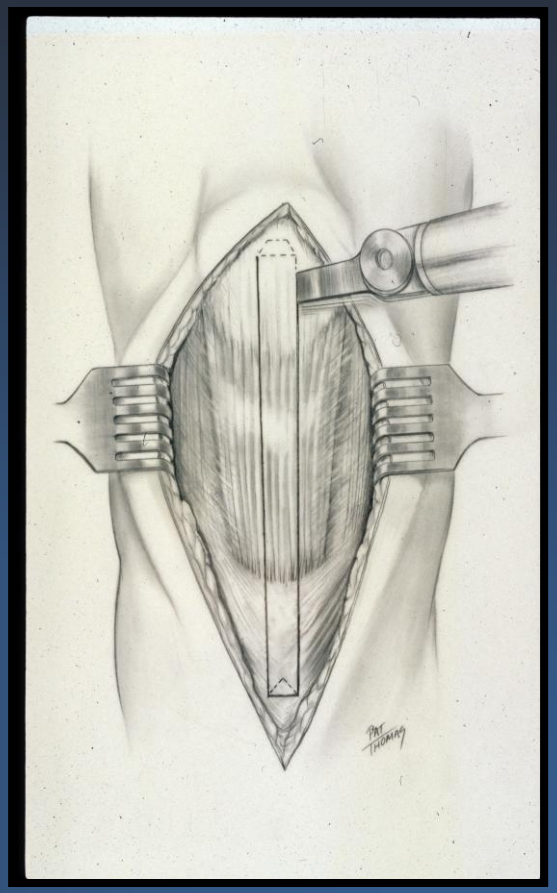
- Young, active individuals
- Symptomatic instability
- Associated injuries

Graft Options

- Autograft
  - BTB (patellar tendon)
  - Hamstring
  - Quadriceps
- Allograft: cadaveric tissue

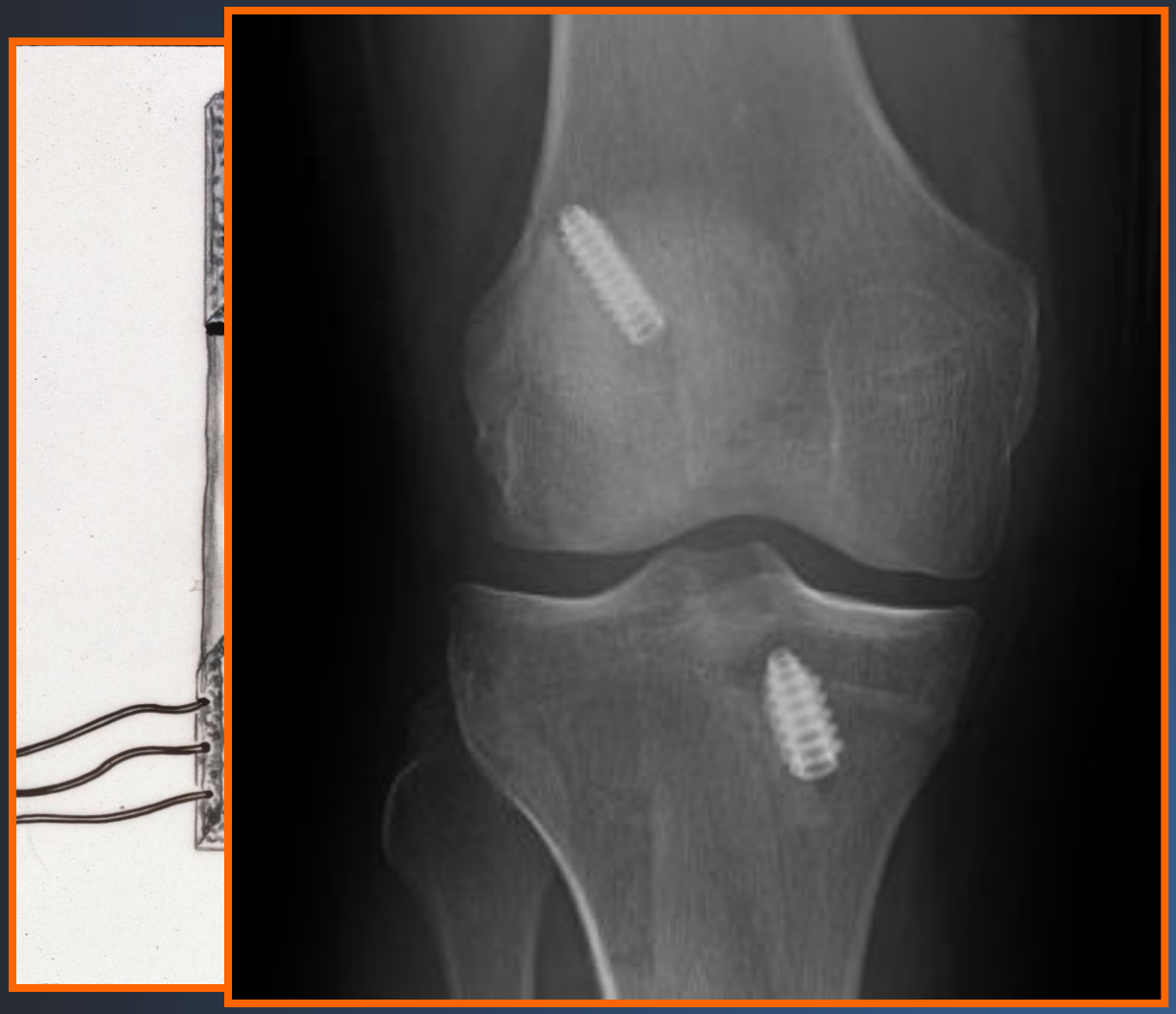
Patellar Tendon (BTB)

- Bone-to-bone healing, strong fixation
- Cons: anterior knee pain



BTB Autograft

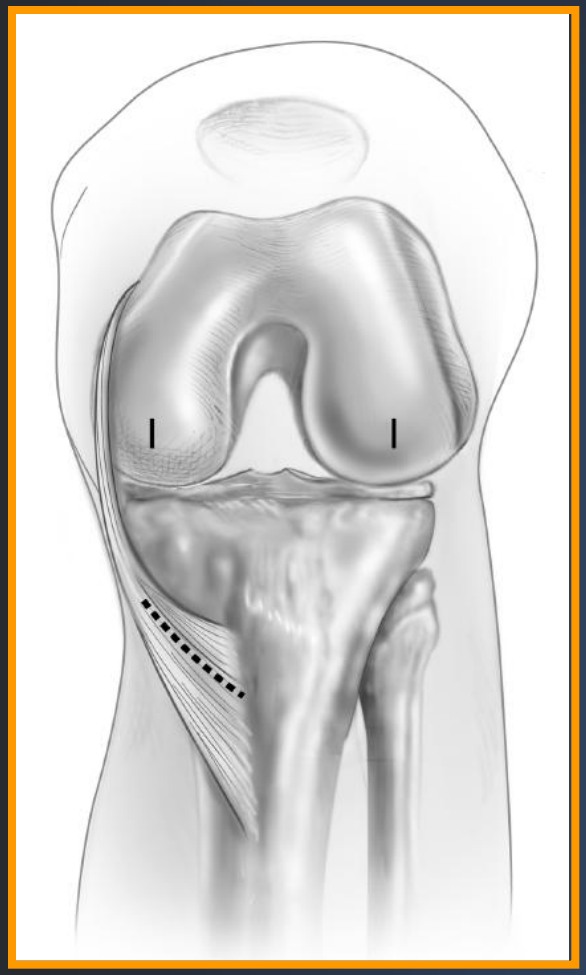
BTB Autograft

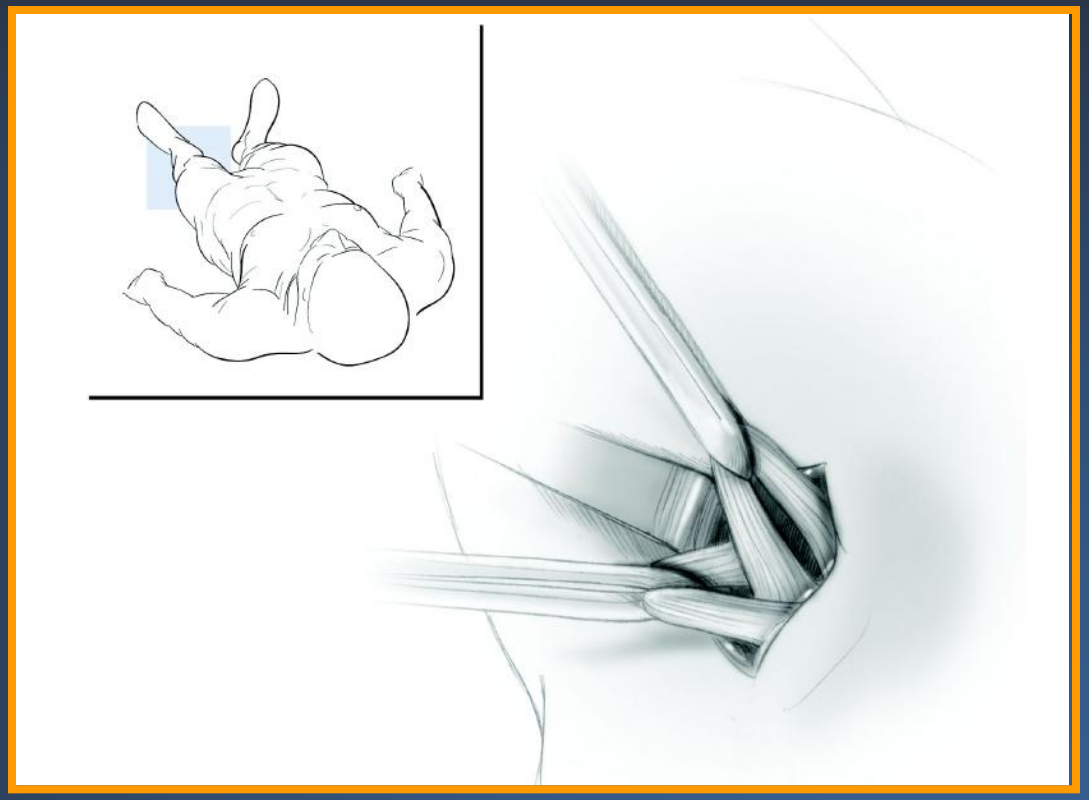


Hamstring Tendon Graft

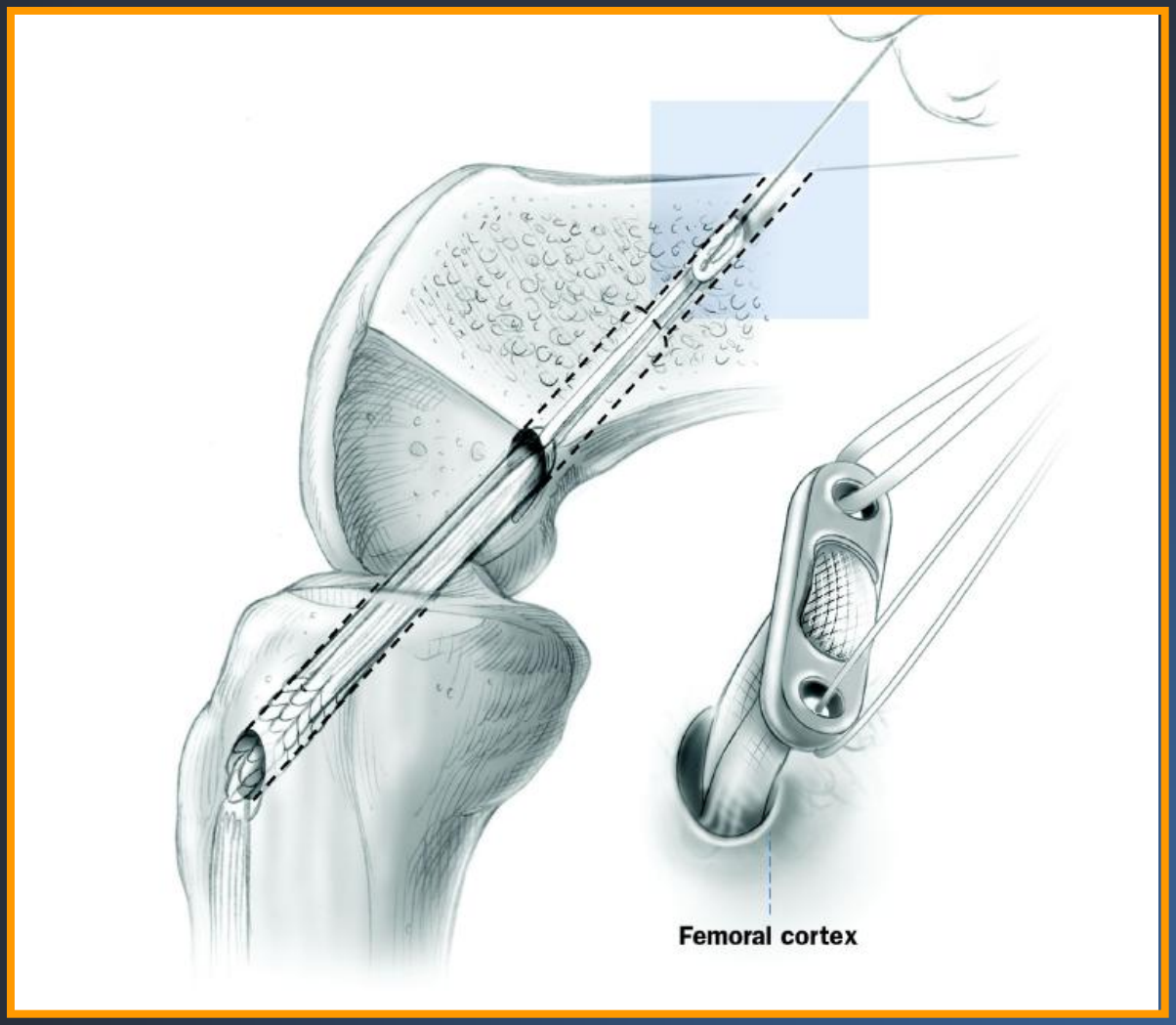
- Less anterior knee pain
- Possible hamstring weakness

Hamstring





Hamstring



Hamstring

Figure 14

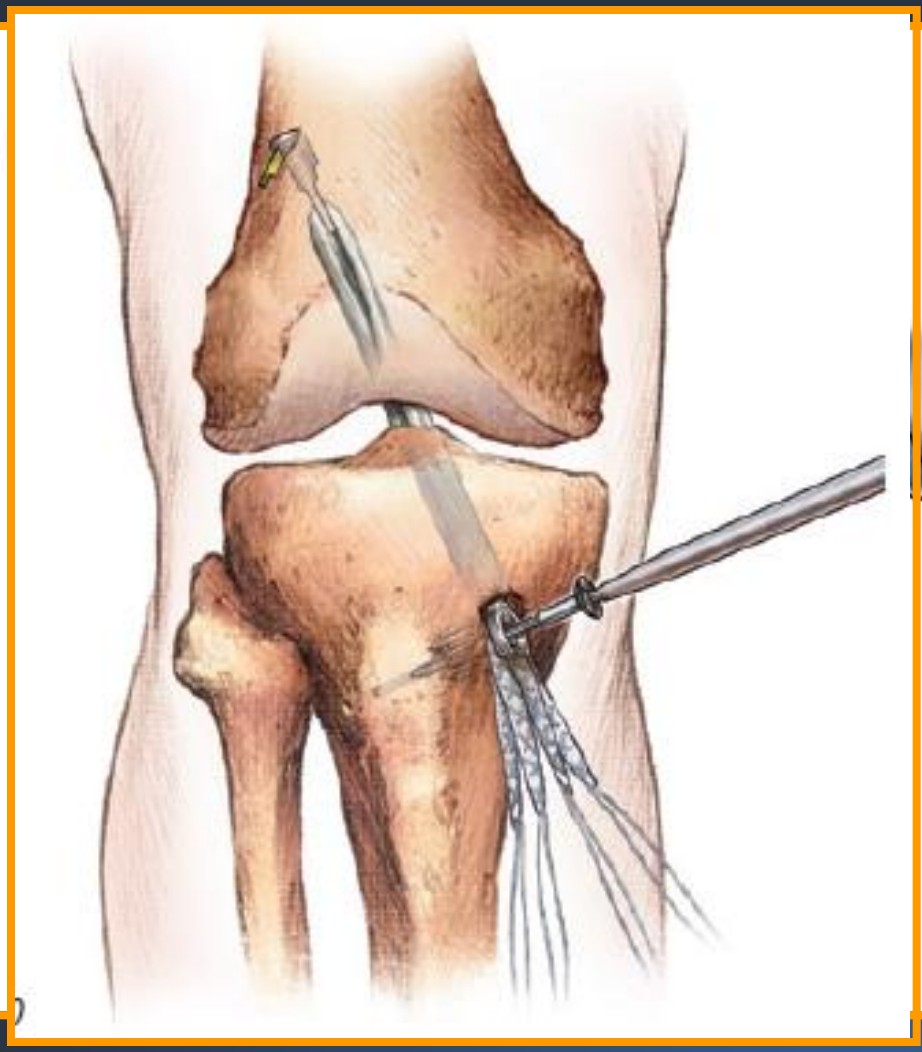


Figure 16

Quad Tendon Graft

- Thick graft, low morbidity
- No tunnel mismatch


250
240
230
220
210
200

Allograft

- No donor site morbidity
- Higher failure rate in young athletes

Surgical Technique

- Arthroscopic-assisted approach
- Anatomic tunnel placement and graft fixation

smith&nephew
100
110
120
130
140
150
160
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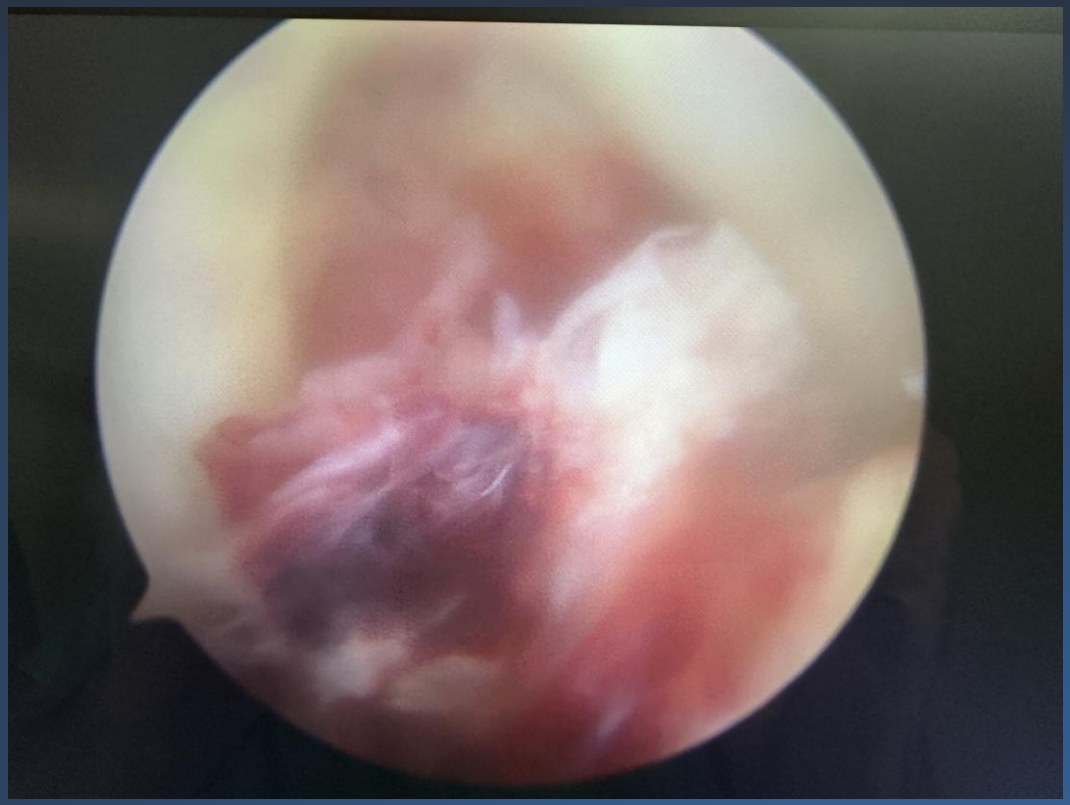
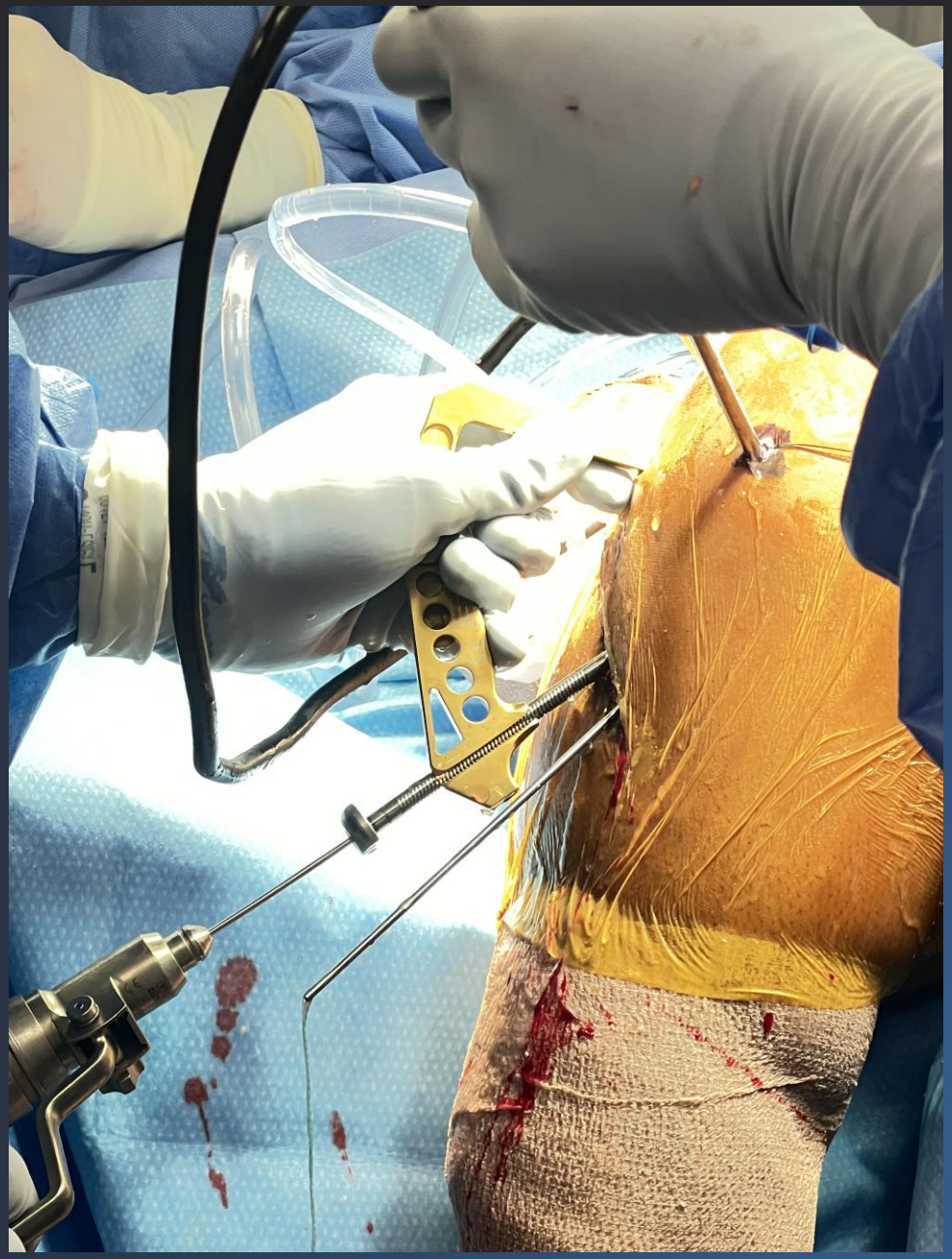
230

Diagnostic Arthoscopy

- ACL tear
- Meniscus or cartilage pathology



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Postoperative Protocol

- Phase I (0-6 weeks): Protection/pain/swelling control
  - WB status
  - ROM – depends on +/- meniscus repair
  - Full extension by 2 weeks, SLR
- Phase II (6-12 weeks): Motion, strength
  - Full motion
  - Strengthening

Postoperative Protocol

- Phase III (12-18 weeks)
  - Strength as tolerated
  - Agility training, plyometrics
  - HEP!!!

  *** 3-6 months postop very important for strengthening quad!
- Return to sport (6-12 months)
  - Brace

Return to Sport Criteria

- >90% limb symmetry
- Functional tests, psychological readiness

Role of Physical Therapists and ATCs

- Guide rehab progression
- Monitor complications
- Educate patients

Complications to Monitor

- Arthrofibrosis
  - Terminal extension
  - Quad activation
- Infection
- Graft failure, donor site issues

Prevention Strategies

- Neuromuscular training
- FIFA 11+, PEP program

The Santa Monica Sports Medicine Research Foundation

The PEP Program: Prevent injury and Enhance Performance

This prevention program consists of a warm-up, stretching, strengthening, plyometrics, and sport specific agilities to address potential deficits in the strength and coordination of the stabilizing muscles around the knee joint. It is important to use proper technique during all of the exercises. The coaches and trainers need to emphasize correct posture, straight up and down jumps without excessive side-to-side movement, and reinforce soft landings. This program should be completed 3 times a week. If you are using this program with athletes that are twelve or under, please perform the plyometrics over a visual line on the field or a flat 2" cone and land each jump with two feet. Do not perform single leg plyometrics with young individuals until they demonstrate substantial control. (see addendum)

Summary

- ACL injuries are common and well-treated with a variety of graft options
- Therapists and ATCs play an important role in helping our patients return to their prior level of play
- Success = diagnosis + treatment + rehab

References

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Q&A

- Any Questions?

Thank you!