



The Bee's Knees: Knee Review & Updates

Chairperson:

Peter Vezeridis, MD

Presenter Title

Presenter Place of Employment

Tuesday, March 26th, 2024

12:50-1:30pm



2024

**Work Related Injuries
Workshop**

Updates on ACL Injuries

Joseph John Czarnecki, MD,
FAANA, FAAOS

Director, Cartilage Care Center
Excel Orthopaedic Specialists



2024

**Work Related Injuries
Workshop**

Disclosures

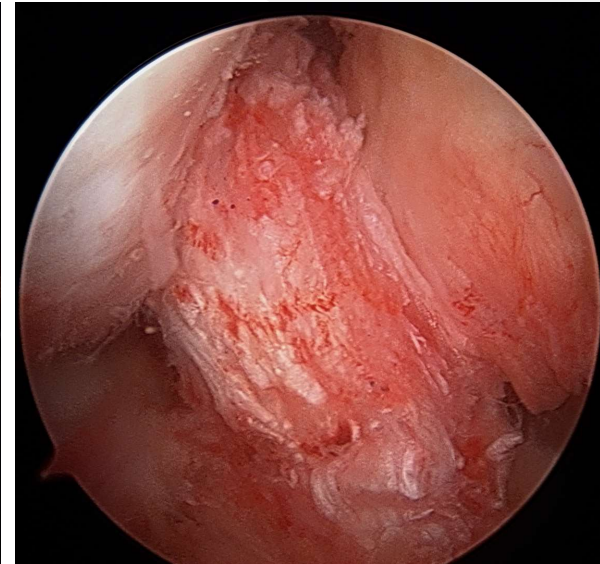
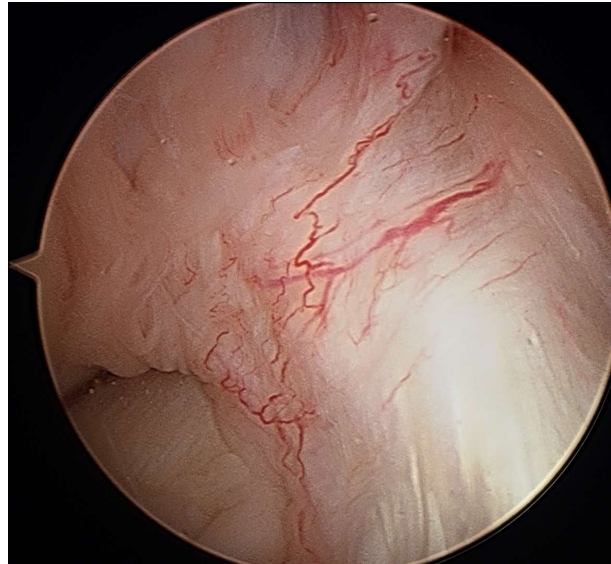
- Vericel Speakers Bureau

ACL Overview

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Work Related Injuries
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- Associated Injuries
- Reconstruction Techniques
 - Autograft vs. Allograft
 - Soft-tissue vs. bone
- Return to work



ACL Injuries

- Non-contact usually more frequent than contact
- Work injuries more commonly contact from trauma or fall on slippery surface
 - Pop, buckling, immediate swelling and pain
 - If no associated injuries, pain usually goes away
 - Knee remains unstable for stopping, jumping, cutting, pivoting, twisting
- General population incidence 1 in 3,000
 - 100,000 – 200,000 people a year in US

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Work Related Injuries
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Diagnosis

History

- Pop, buckles (gives way,) immediate swelling, instability
- Often confused with patellar subluxation

Physical Exam

- Limited ROM
- Effusion (joint swelling, “water on the knee”)
- Lachman test
- Pivot shift
- Lateral joint line tenderness from bone bruises



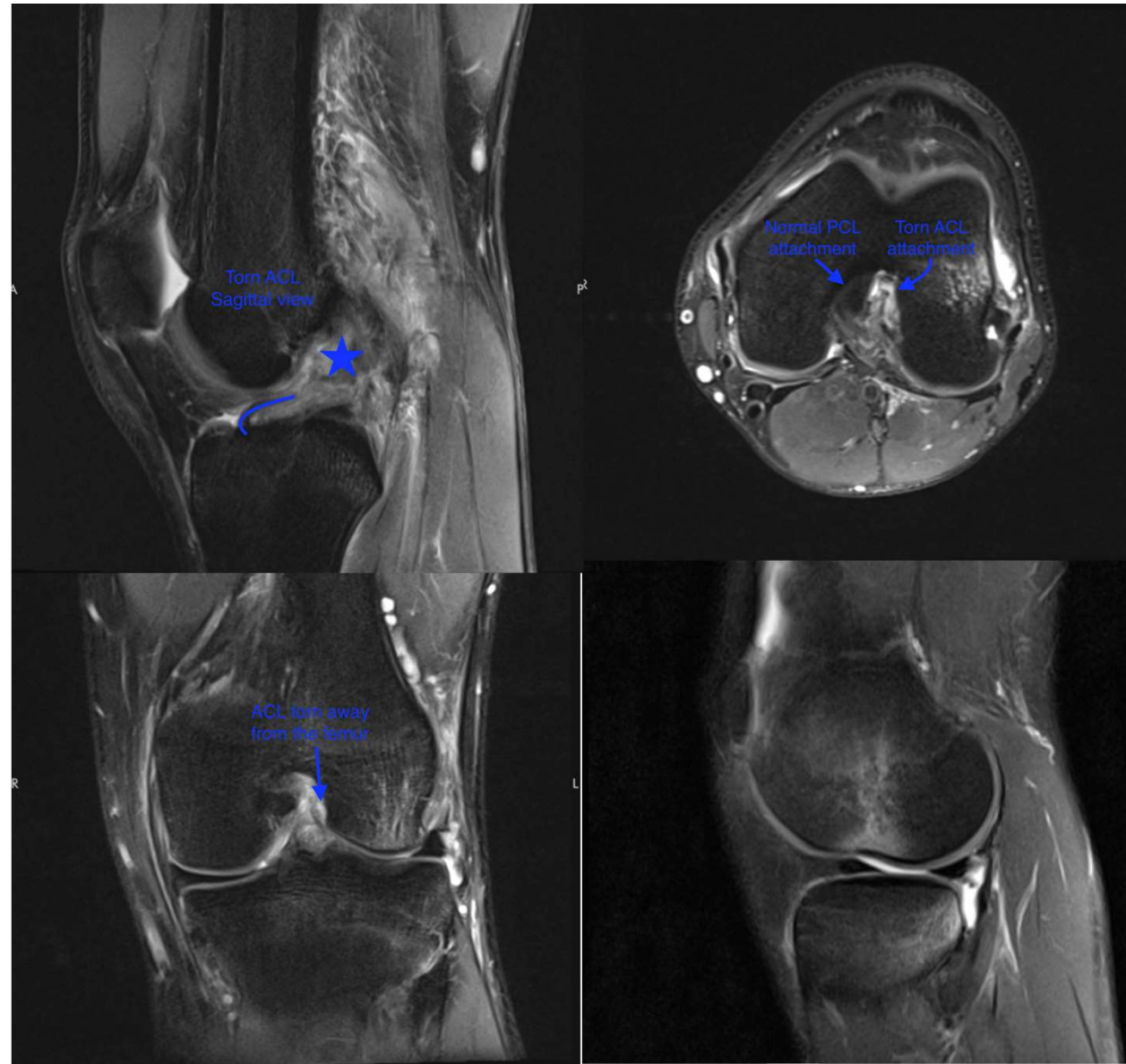
Imaging

X-ray

- Occasional Segond fracture at Gerdy's tubercle lateral tibia (anterolateral ligament attachment)

MRI

- Usually mid substance tear; occasionally detached from femur
- Corresponding bone bruise pattern (pivot shift injury)

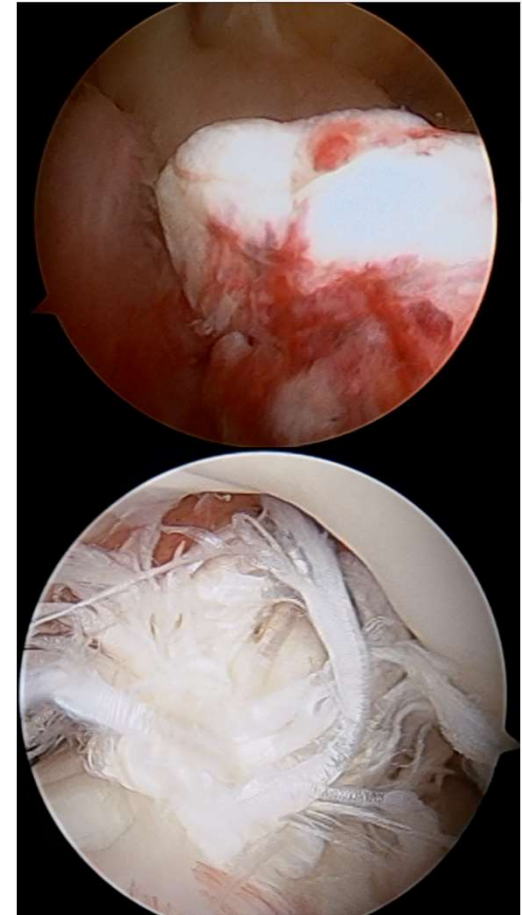


“Doc, Do I Need Surgery ?”

- Under age 35
- Symptoms of instability
- Meniscal tear or cartilage injury at same time

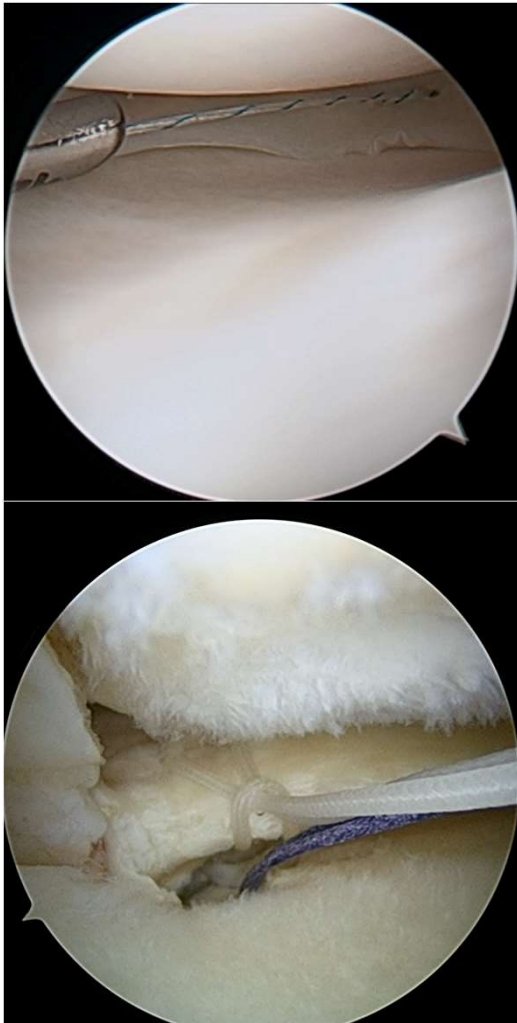
- Active lifestyle
- No significant arthritis

- Trial of physical therapy for some patients
 - Prehab before proceeding with surgery
- Bracing for at-risk activities



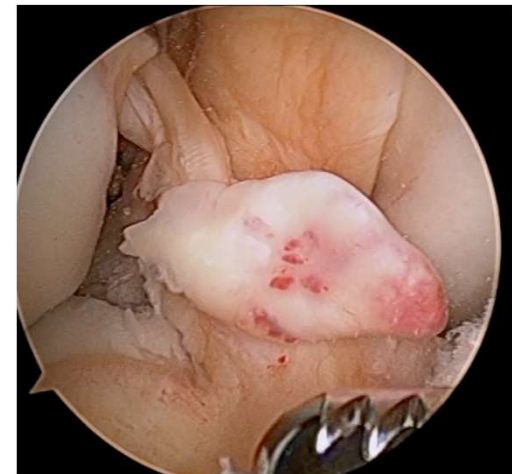
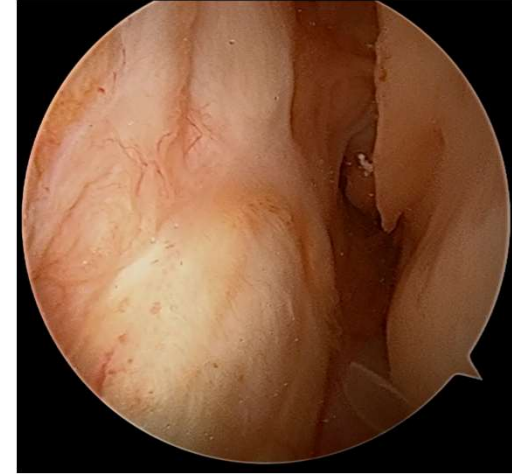
Meniscal Tears

- Normal menisci serve as a gasket, increasing the surface area of contact, reducing stress per unit area
- Acute knee injuries more likely to tear lateral meniscus
- Chronic ACL instability leads to medial meniscal tears
 - Secondary stabilizer to anterior tibial translation
 - Chronic damage in which posterior horn sees excessive stress



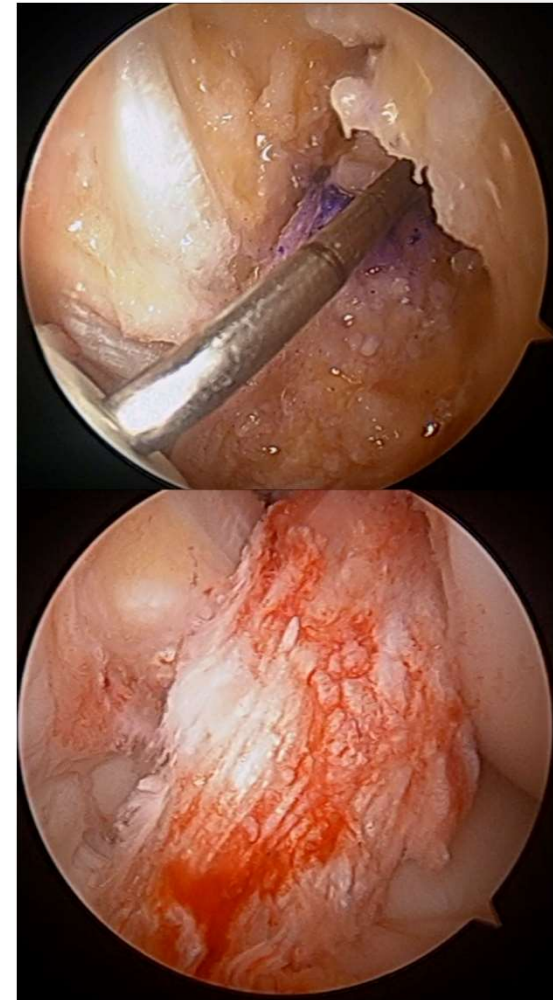
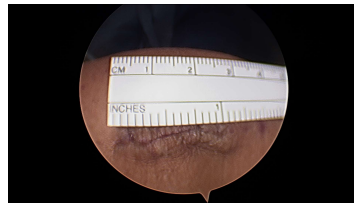
“I Have Decided Upon Surgery. Now What Do I Do?”

- Autograft (Using your own tissue)
 - Quadriceps Tendon
 - Patellar Tendon (BTB)
 - Hamstring Tendons
 - Lower re-tear rates (2-5%)
- Allograft (Cadaver)
 - Less pain
 - Higher re-tear rate (10-40%)
 - Non-irradiated grafts have re-tear rates closer to autograft (4.5%)
- Sports medicine surgeon



Autograft – Quadriceps (with or without bone plug)

- Advantages
 - Larger graft (8-10mm wide, 4-6mm thick)
 - Partial thickness graft (walls and floor preserved)
 - Bone-to-bone healing on femoral side
 - No negative impact upon knee flexion strength
 - Low re-tear rates
 - No increased incidence of anterior knee pain and arthritis
- Disadvantages
 - New to many surgeons
 - Visible scar when sitting (only 1.25")



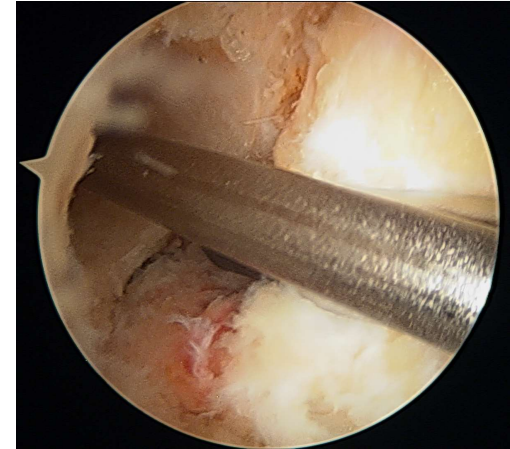
Autograft – Bone patellar tendon bone (BTB)

- Advantages (historical gold standard)
 - Large graft (8-10mm wide, 3-4mm thick)
 - Bone-to-bone healing on both sides
 - No negative impact upon knee flexion strength
 - Low re-tear rates
- Disadvantages
 - More painful larger scar, difficulty kneeling
 - Increased anterior knee pain, PF DJD
 - Full thickness graft of central tendon, may shorten tendon



Autograft – Hamstring

- Advantages
 - Popular
 - Relatively easy harvest
 - Cosmetic scar
- Disadvantages
 - Decreased knee flexion strength, cramping, loss of top-end speed
 - Smaller grafts (6.5-9mm)
 - Supplement w/ allograft under 8mm
 - Laxity on instrumented testing
 - Soft tissue healing slower, tunnel widening on X-rays
 - Occasional truncated grafts
 - Avoid with MCL injuries

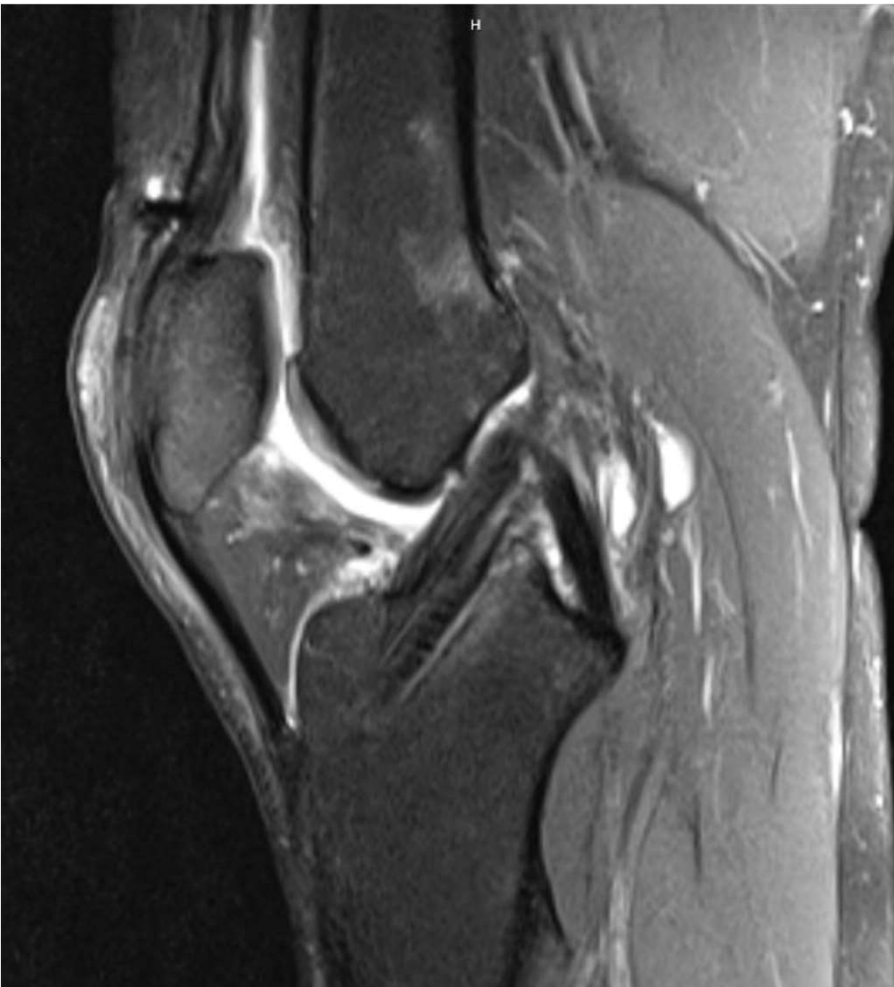


Allografts

- Advantages
 - Over age 35-40, revision, collagen disorders, multi-ligament injuries
 - Fast, easy
 - No harvest
 - Most cosmetic scar
- Disadvantages
 - Higher re-tear rates (4.5-40%)
 - Irradiated, soft tissue
 - Tunnel widening
 - More difficult revisions requiring bone graft at times
 - Rare communicable disease <1:1,000,000



ACL Post-op

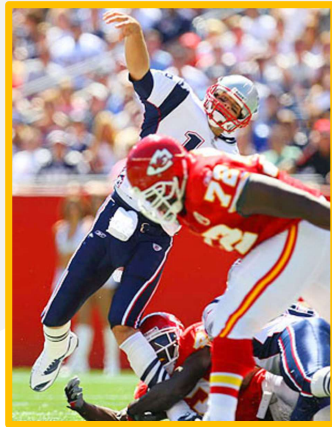


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- Significant variability for return
 - Pain tolerance and motivation
 - Available accommodations
 - Right versus left with driving
 - Associated procedures affecting weight-bearing and ROM
- Ideal scenario
 - Out 1-2 weeks, then sedentary
 - Light duty at 6 weeks
 - Moderate duty at 3 months on stable terrain, no pivoting
 - 6 months more significant
 - 8-9 months no restrictions

Open Lateral Extra-Articular Tenodesis (LET) in ACL Reconstruction



Xinning “Tiger” Li, M.D.

Professor of Orthopaedic Surgery

Sports Medicine and Shoulder Surgery

Boston University School of Medicine – Boston Medical Center

Fellowship Director – BU Sports Medicine

Team Physician – Boston University Athletics

Disclosures

Xinning Li, MD, FAAOS (Boston, MA)

Submitted on: 08/02/2023

AAOS: Board or committee member

AAOS Now: Editorial or governing board

American Journal of Sports Medicine: Editorial or governing board

American Orthopaedic Association: Board or committee member

American Shoulder and Elbow Surgeons: Board or committee member

Arthroscopy Association of North America: Board or committee member

BMC Musculoskeletal Disorders: Editorial or governing board

DePuy, A Johnson & Johnson Company: Paid consultant

FH Ortho: IP royalties; Paid consultant

Journal of Bone and Joint Surgery - American: Editorial or governing board

Journal of Medical Insight (JOMI): Editorial or governing board

Orthopedic Reviews: Editorial or governing board

World Journal of Orthopaedics: Editorial or governing board

History

- 20 yr old male s/p twisting injury to his L Knee.
 - ACL Recon w/ Hamstring Autograft ~4 years ago.
 - Persistent instability with pain
- Revision ACL Reconstruction w/ Ortho Surgeon (OSH)
 - Bailed mid surgery b/c concern w/ tunnel convergence.
 - Referred to me for revision
- Races downhill mountain biking
- No Tob and social EtOH

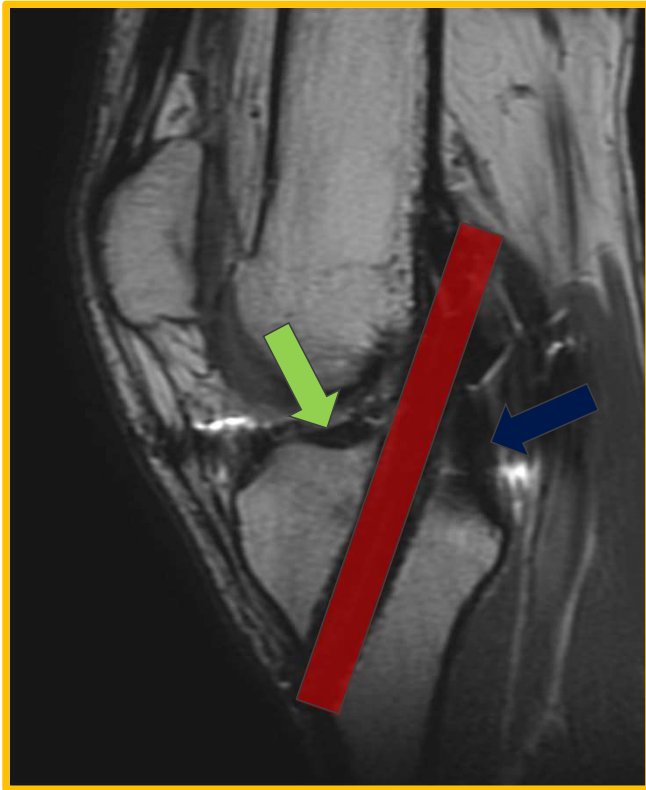
Exam

- Full ROM (0 to 140)
- Lachman 3A (+ Endpoint) and 3+ Pivot Shift
- Medial Joint Line Tenderness and McMurray Positive.
- Varus and Valgus Stress 0 and 30 is Symmetrical to contralateral side.
- ER Dial 30 and 90 Symmetrical

Image



MRI



CT



Tunnel Diameter ~13mm

Exam



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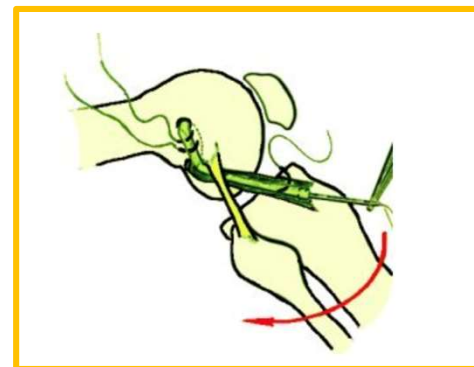
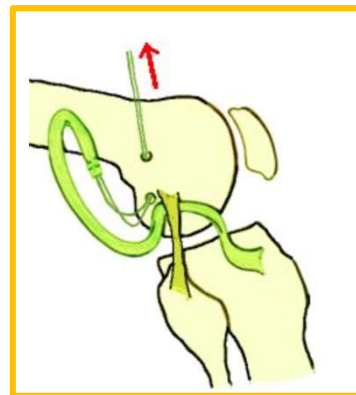
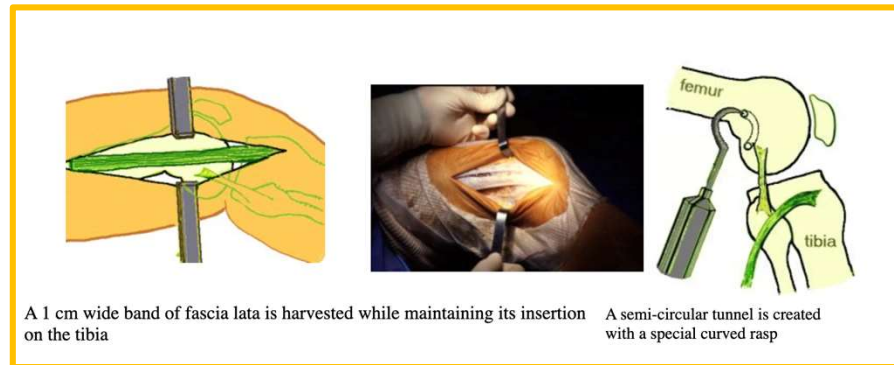
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Primary vs Revision ACL Reconstruction:

What is the LET and Should we add it?

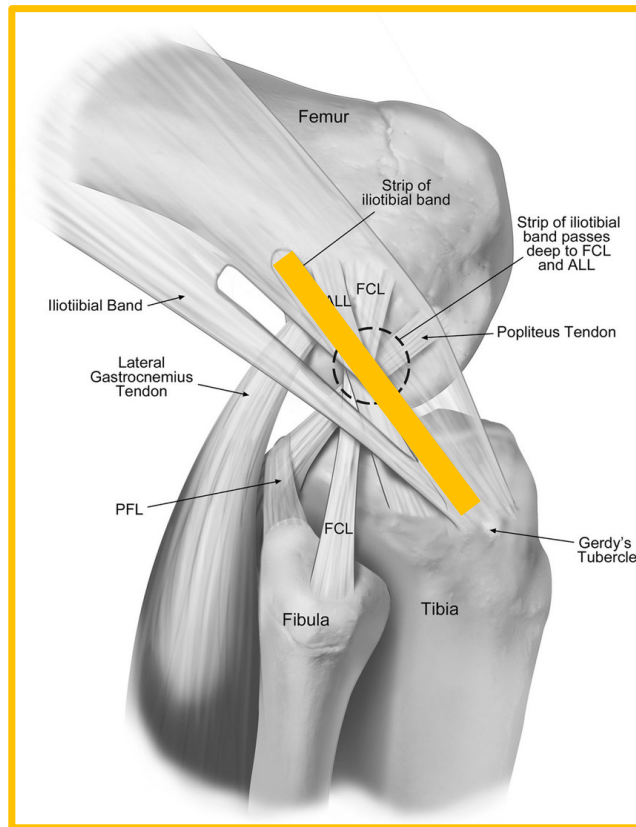
What is Open LET?

- Marcel Lemaire (1967) isolated LET to reduce rotational instability.

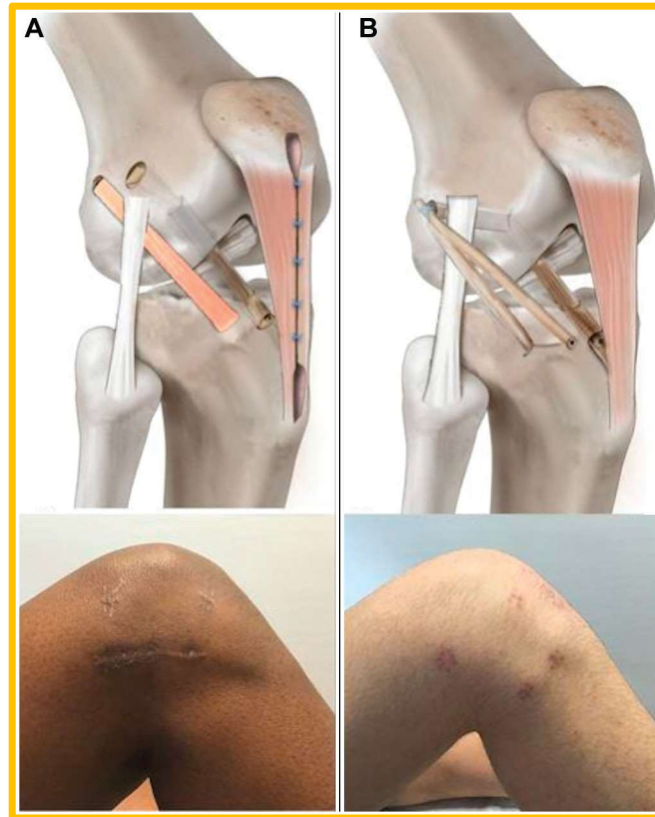


What is Open LET?

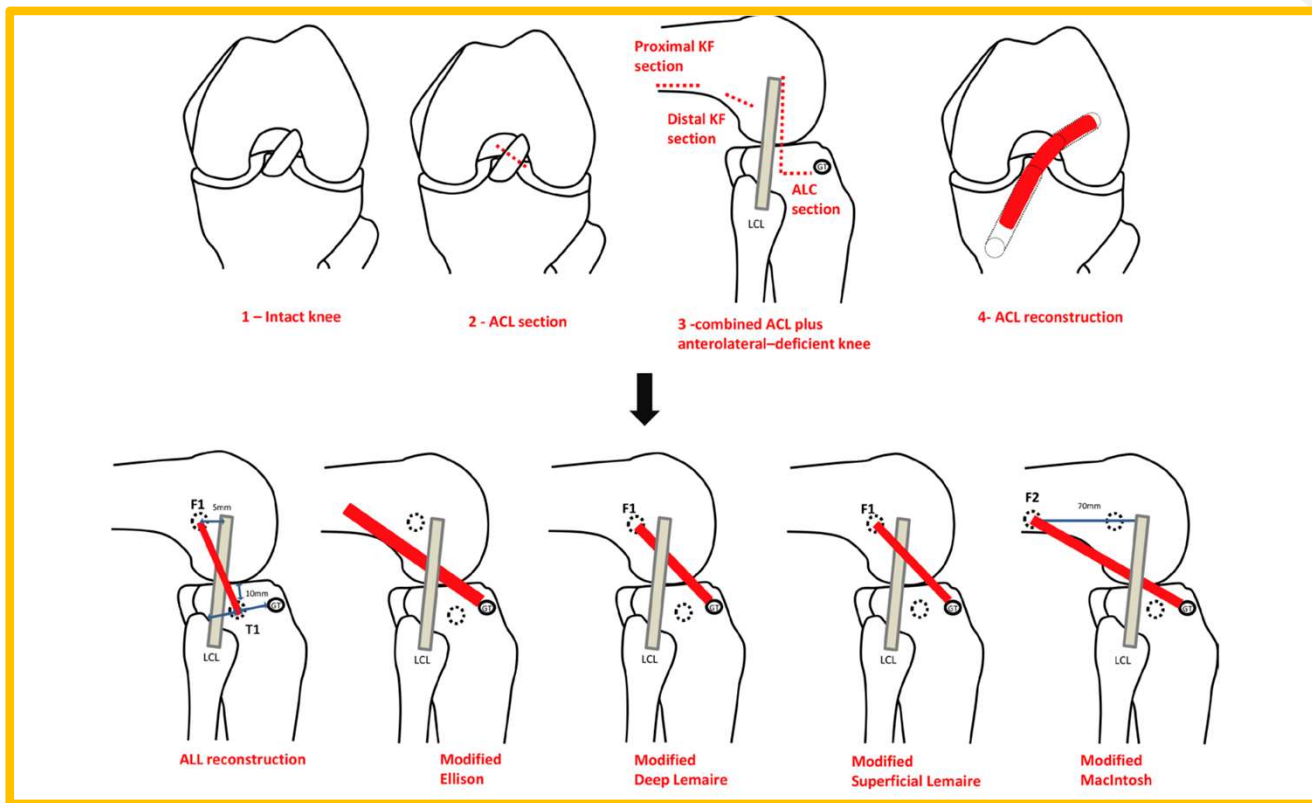
Modified Lemaire



ALL Reconstruction vs LET



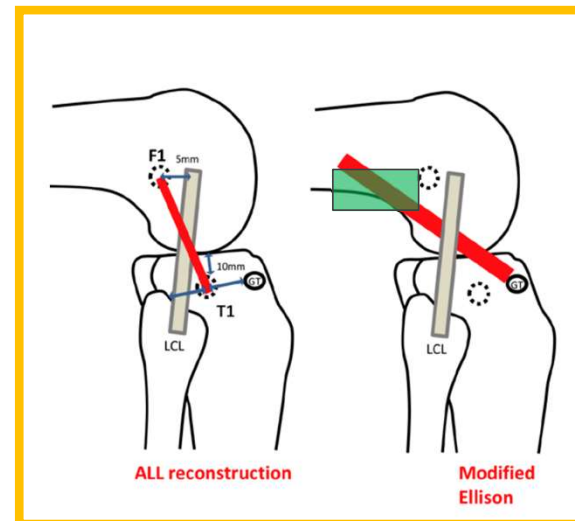
Anterolateral Knee Procedures



Different anterolateral procedures have variable impact on knee kinematics and stability when performed in combination with anterior cruciate ligament reconstruction

Thomas Neri ,^{1,2} Danè Dabirrahmani,³ Aaron Beach,¹ Samuel Grasso,¹ Sven Putnis,¹ Takeshi Oshima,¹ Joseph Cadman,³ Brian Devitt,⁴ Myles Coolican,¹ Brett Fritsch,¹ Richard Appleyard,³ David Parker¹

- Addition of either ALLR or modified Ellison procedure restored overall native knee kinematics, suggesting that these additional procedures can be considered as a mechanical reinforcement to protect the ACL graft during its integration. This would be potentially useful in primary ACL reconstruction, helping to avoid re-injury without risking overconstraint.



- ▶ Superficial and deep Lemaire and modified MacIntosh tenodeses achieved excellent rotational control but overconstrained internal rotation, leading to non-physiological kinematics. This additional control may be useful in revision surgery.

Does Adding LET to ACL Reconstruction Improve Outcomes?

Check for updates

Winner of the O'Donoghue Sports Injury Award

**Primary Hamstring ACL + LET (<25):
Decrease Clinical Failure (40% vs 25%) and
Graft Rupture (11% vs 4%) Rate**

Background: Persistent anterolateral rotatory laxity after anterior cruciate ligament (ACL) reconstruction (ACLR) has been correlated with poor clinical outcomes and graft failure.

Hypothesis: We hypothesized that a single-bundle, hamstring ACLR in combination with a lateral extra-articular tenodesis (LET) would reduce the risk of ACLR failure in young, active individuals.

Conclusion: The addition of LET to a single-bundle hamstring tendon autograft ACLR in young patients at high risk of failure results in a statistically significant, clinically relevant reduction in graft rupture and persistent rotatory laxity at 2 years after surgery.

Registration: NCT02018354 (ClinicalTrials.gov identifier)

Keywords: anterior cruciate ligament reconstruction; lateral extra-articular tenodesis; anterolateral complex; graft failure; young patients

Tim Spalding, FRCS, and the STABILITY Study Group
Investigation performed at The Fowler Kennedy Sport Medicine Clinic,
Western University, London, Ontario, Canada

Return to Play and Failure Rates Following Primary ACL Reconstruction with Bone-Patellar
Tendon-Bone versus Hamstring Autograft: A Systematic Review and Meta-Analysis

Results: 32 articles met inclusion criteria for a total patient cohort of 4,716 athletes. The overall RTS for all athletes was 74.8% (2905/3886 athletes) at a mean follow-up of 37.6 months, with

Hamstring ACL vs BTB ACL:
RTS is higher with BTB
Graft Rupture HS vs BTB
(8% vs 4%) Rate

performance. The overall re-rupture rate for the entire patient cohort was 5.9% (154/2603 patients) (BTB: 4.1%, 50/1217 patients; HT: 7.5%, 104/1386 patients).

Adding LET to Primary ACL in Elite Athletes?

> Am J Sports Med. 2022 Nov;50(13):3487-3492. doi: 10.1177/03635465221128828.
Epub 2022 Oct 18.

Effect of Lateral Extra-articular Tenodesis on the Rate of Revision Anterior Cruciate Ligament Reconstruction in Elite Athletes

Kyle A Borque¹, Mary Jones^{2 3}, Mitzi S Laughlin⁴, Ganesh Balendra^{2 3}, Lukas Willinger⁵, Vitor Hugo Pinheiro⁶, Andy Williams^{2 3}

ACL + LET:
Failure Rate 10% vs 4%
Reduce Risk of Revision by 2.8X

Methods: A consecutive cohort of elite athletes with an isolated ACL tear undergoing autograft patellar or hamstring tendon reconstruction with or without Lemaire LET were analyzed between 2005 and 2018. A minimum 2-year follow-up was required. The association between the use of LET and ACL graft failure as defined by revision ACLR was evaluated with univariate and multivariate logistic regression models.

Results: A total of 455 elite athletes (83% men and overall age 22.5 ± 4.7 years) underwent primary ACLR with (n = 117) or without (n = 338) a LET procedure. Overall, 36 athletes (7.9%) experienced ACL graft failure, including 32 (9.5%) reconstructions without a LET and 4 (3.4%) with a LET. Utilization of LET during primary ACLR reduced the risk of graft failure by 2.8 times, with 16.5 athletes needing LET to prevent a single ACL graft failure. Multivariate models showed that LET significantly reduced the risk of graft rupture (relative risk = 0.325; P = .029) as compared with ACLR alone after controlling for sex and age at ACLR. Including graft type in the model did not significantly change the risk profile, and although a patellar tendon graft had a slightly lower risk of failure, this was not statistically significant (P = .466).

Conclusion: The addition of LET reduced the risk of undergoing revision by 2.8 times in elite athletes undergoing primary ACLR. This risk reduction did not differ significantly between the patellar tendon and hamstring tendon autografts. With these results, status as an elite athlete should be included in the indications for a LET, as they are at increased risk for ACL graft failure.

Keywords: anterior cruciate ligament injury; elite athlete; lateral extra-articular tenodesis; risk factor.

[PubMed Disclaimer](#)

Adding LET to Revision ACL Surgery?

Original Article

ACL + LET or ALL:
Failure Rate 15% vs 5%

Other Studies (3):
**No Benefit of LET or ALL in low grade pivot
shift**
Higher risk of lateral pain or stiffness

Open LET in My Practice

- Modified Ellison Technique (IT Band under FCL/LCL and Staple at the flair of femur)
- All Revision ACL Reconstructions (unless low grade pivot shift)
- Patients with Laxity or Hyperextension (>5 degrees)
- Elite Athletes (High School or College Soccer or Basketball Players, etc.)
- Allograft ACL in Higher Demand Patients

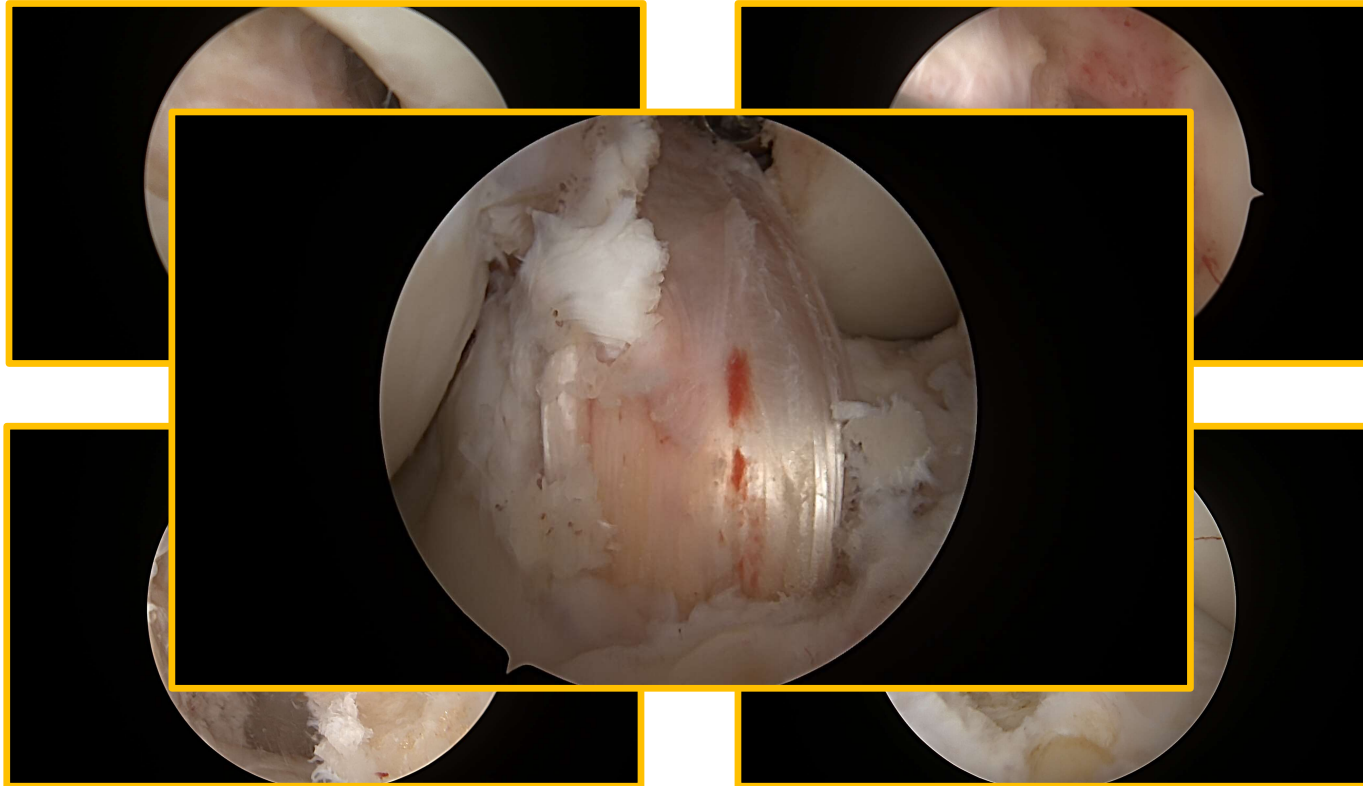
Surgery



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Scope and ACL Reconstruction



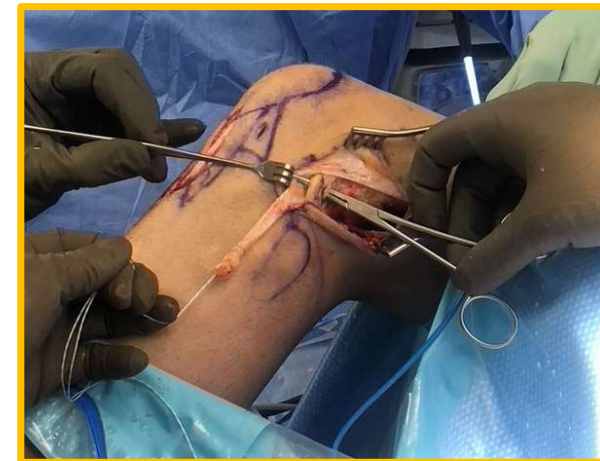
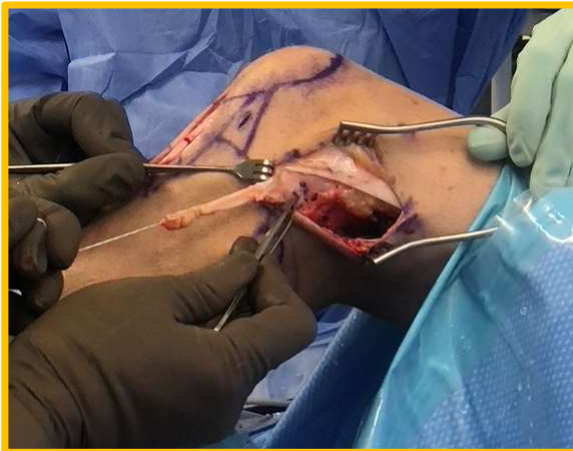
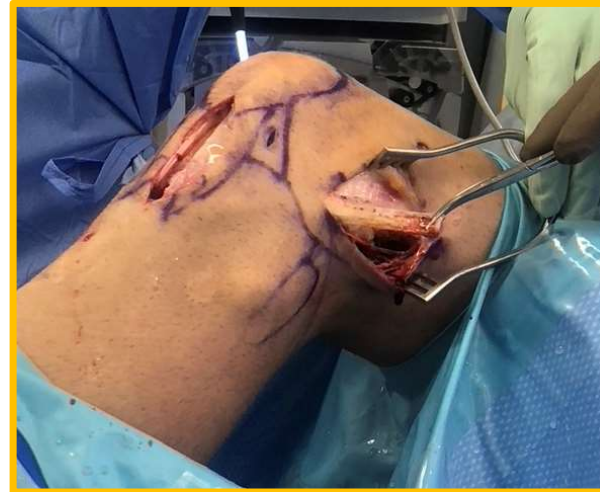
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Tibia Tunnel Drilling in Revision

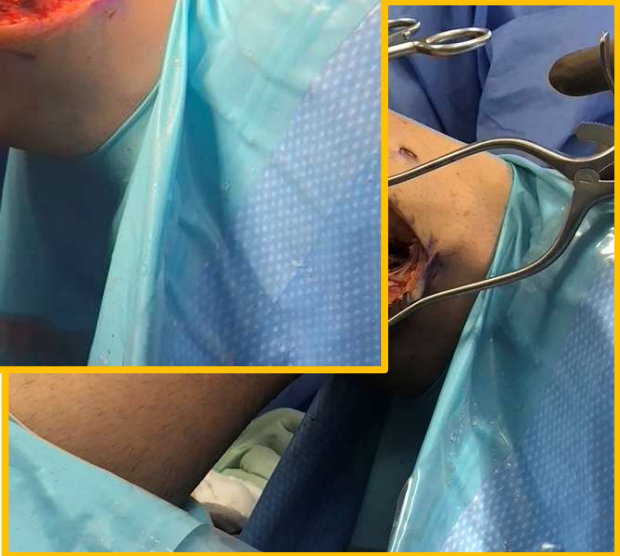
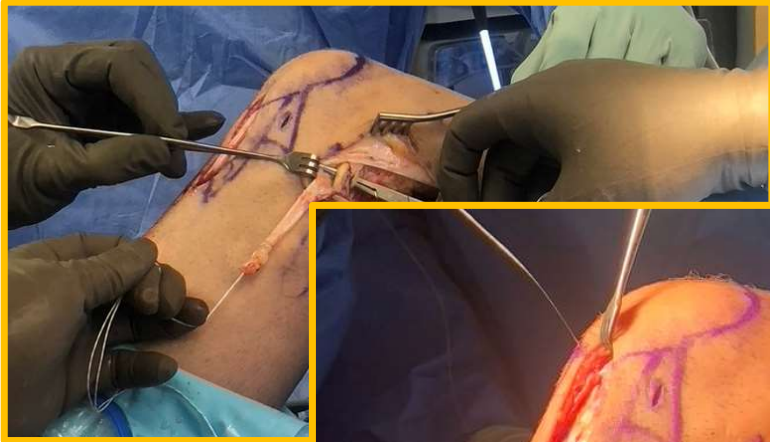


Open LET



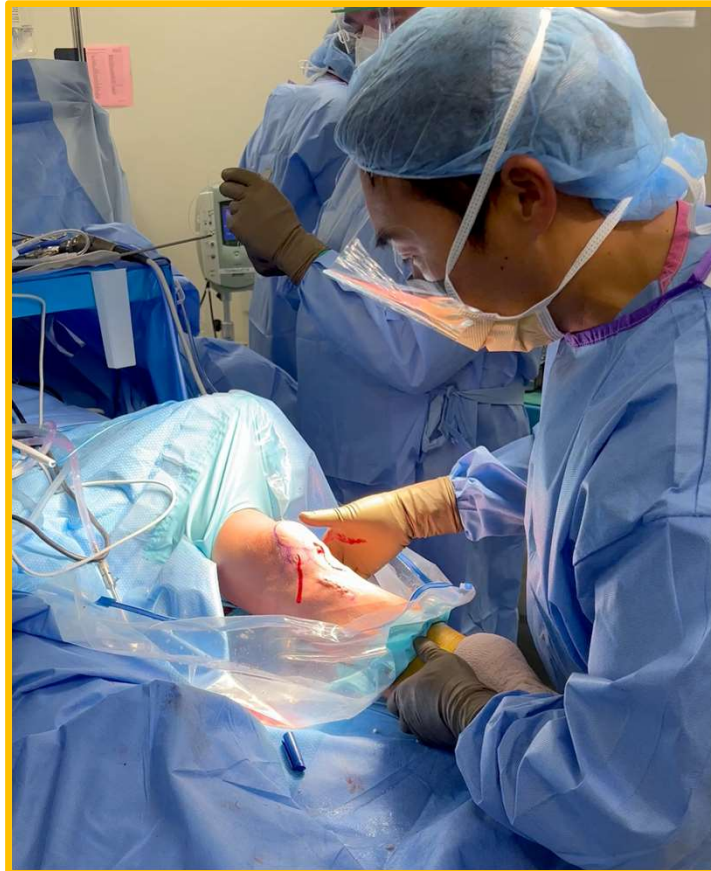
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Post Op Exam

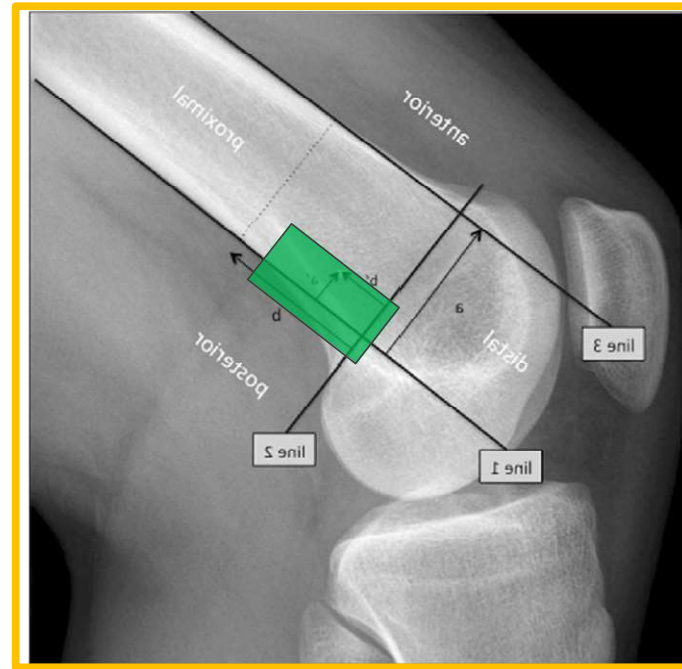
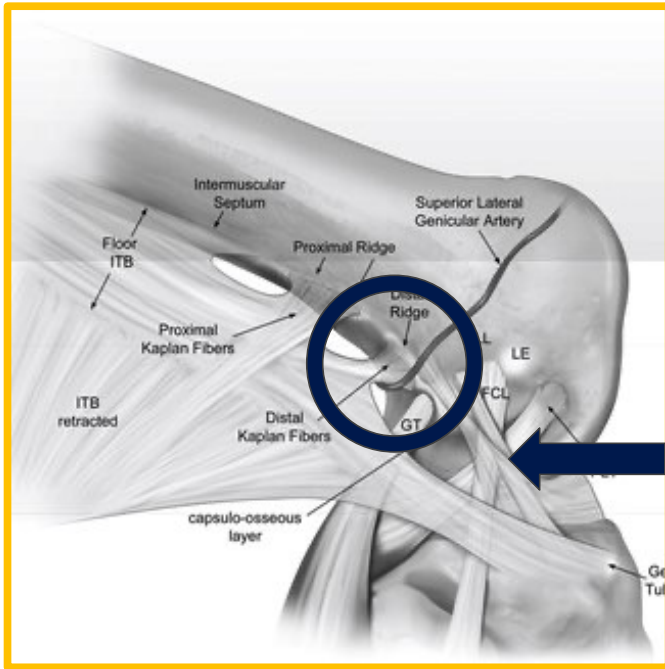
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Post Op - Images



Where to Staple?



Thanks!





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Case Discussion

Peter Vezeridis, MD

Orthopaedic Surgeon

Excel Orthopaedic Specialists