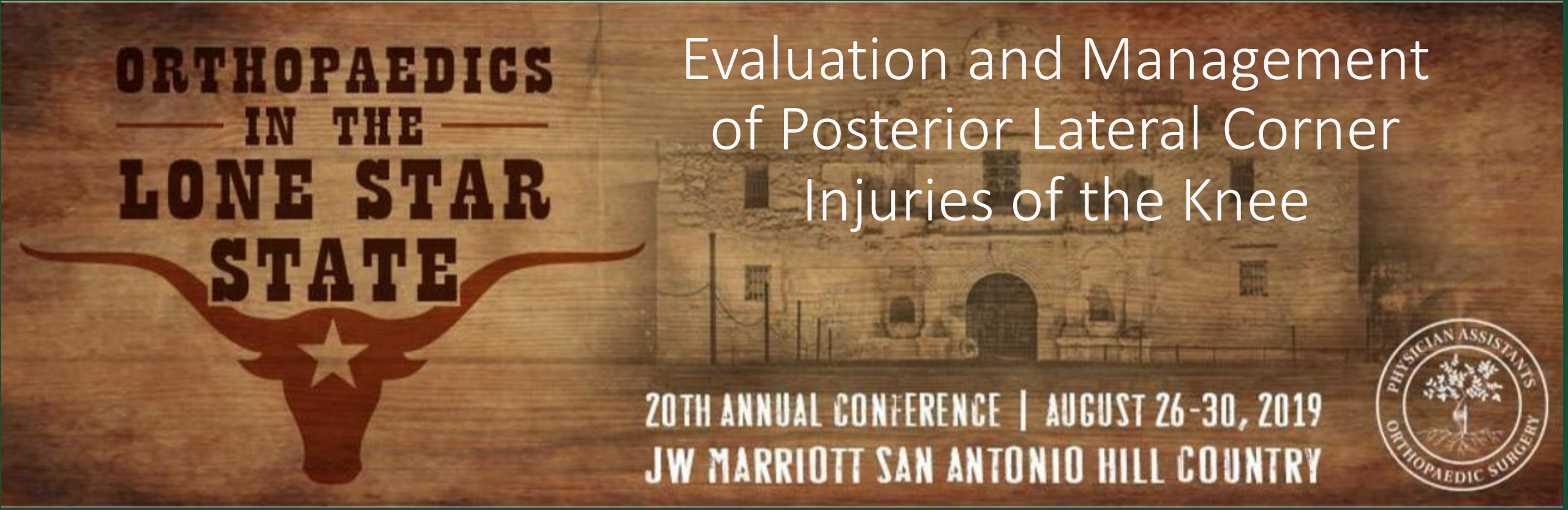

Evaluation and Management of Posterior Lateral Corner Injuries of the Knee

Thomas M. DeBerardino, MD

Professor of Orthopaedic Surgery, Baylor College of Medicine

Co-Director, Baylor-BRIO Texas Sports Medicine Fellowship

Medical Director, Burkhart Research Institute for Orthopaedics

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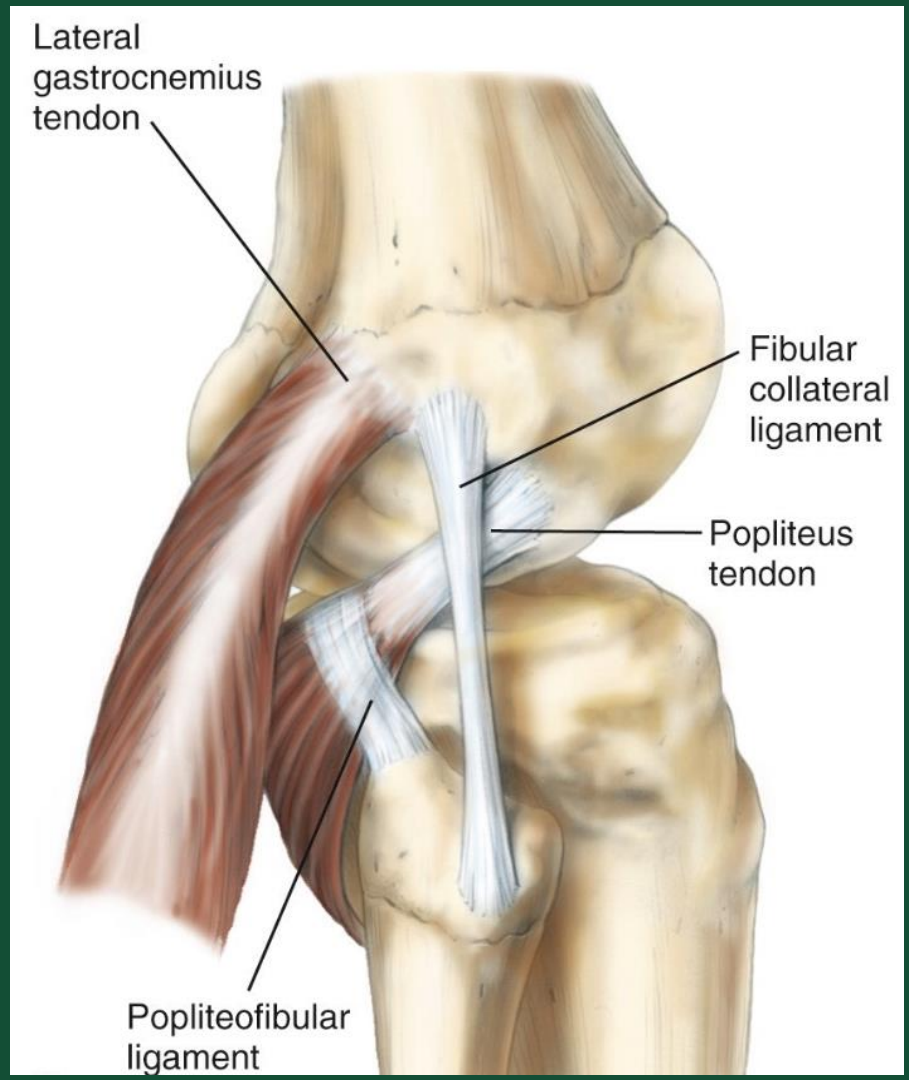
Disclosure

- The following relationships with commercial interests related to this presentation existed during the past 12 months:
- Research support: MTF, Histogenics and Arthrex
- Consultant: Arthrex, MTF, Aesculap
- Dr. DeBerardino does not intend to discuss the use of any off-label use/unapproved use of drugs or devices

Posterolateral Corner Anatomy

- 3 major static stabilizers
- Lateral (fibular) collateral ligament (LCL)
- Popliteus tendon (PLT)
- Popliteofibular ligament (PFL)



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Anatomy

LCL

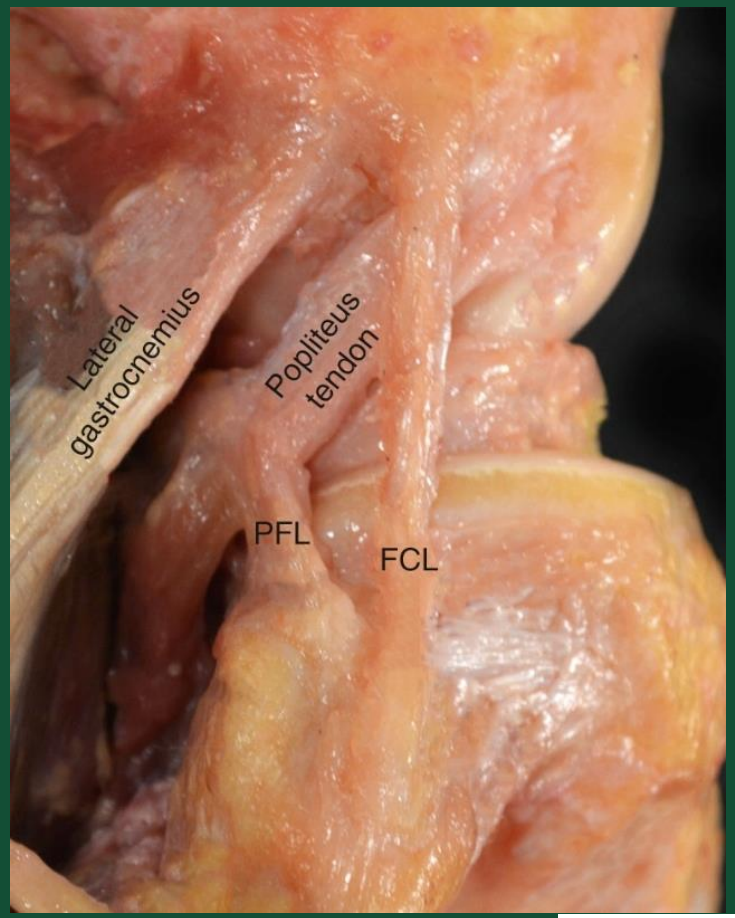
- Femoral attachment: slightly proximal and posterior to lateral epicondyle
- Fibular attachment: 8 mm posterior to anterior margin and 30 mm distal to tip of fibular

PLT

- Femoral attachment: 18 mm distal and anterior to LCL

PFL

- Originates at musculotendinous junction of poptliteus
- Attaches to fibular styloid



PLC Injury

- Isolated (not common)
  - direct blow to anteromedial knee
  - hyperextension and non-contact varus
- More often associated with PCL and ACL injury
- Peroneal nerve injury occurs in up to 1/3 cases

Grade of Injury

- Grade I injuries = minimal instability (ie, varus or rotational instability of 0 to 5 mm or 0° to 5°)
- Grade II injuries = moderate instability (ie, 5 to 10 mm or 5° to 10°)
- Grade III injuries = significant instability (>10 mm or >10°)
- LCL = lateral collateral ligament, PFL = popliteofibular ligament

Ranawat A, Baker CL III, Henry S, Harner CD. Posterolateral Corner Injury of the Knee: Evaluation and Management. J Am Acad Orthop Surg September 2008;16:506-518

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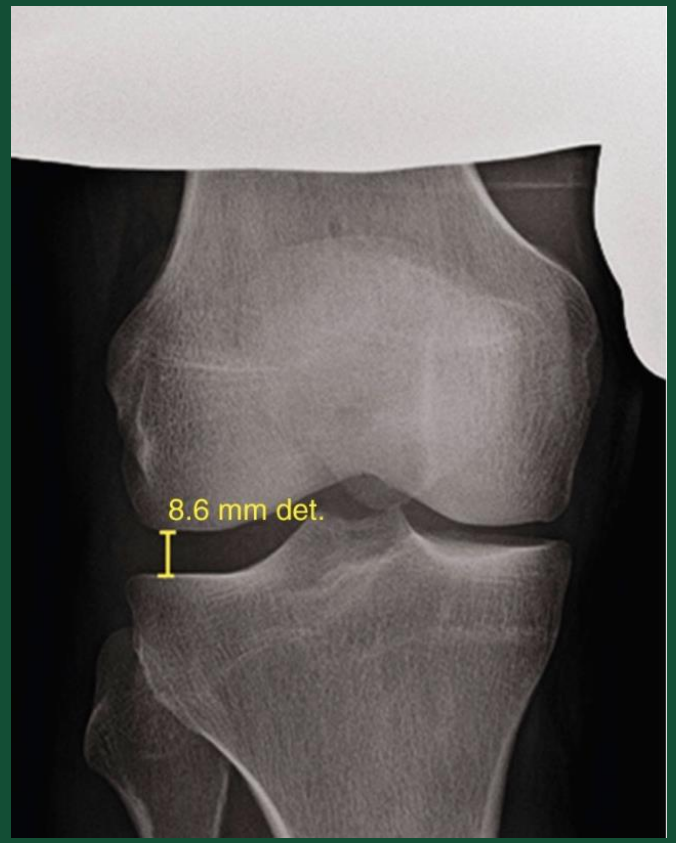
Reverse Pivot Shift

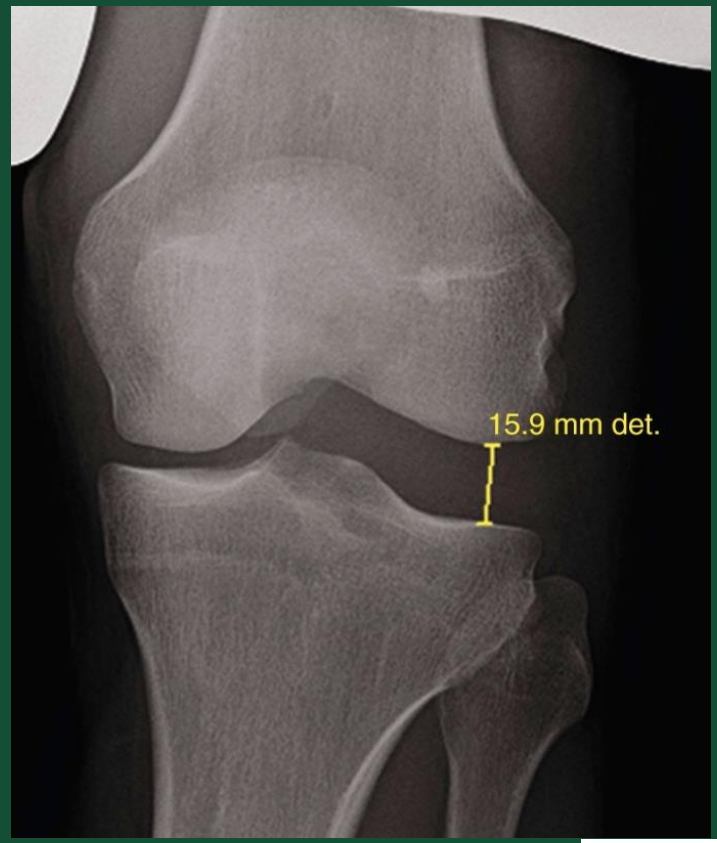
- Patient supine with knee flexed 90 degrees
- Valgus load applied and external rotation of tibia
- Knee extended and if tibial reduces at approximately 30 flexion it is positive
- Check contralateral knee- 1/3 positive

Imaging

- Standard radiographs often normal
- Varus stress views important
- 2.2 - 4mm difference positive for LCL tear
- >4mm also PLC tear
- Need full leg alignment view

Stress Radiographs





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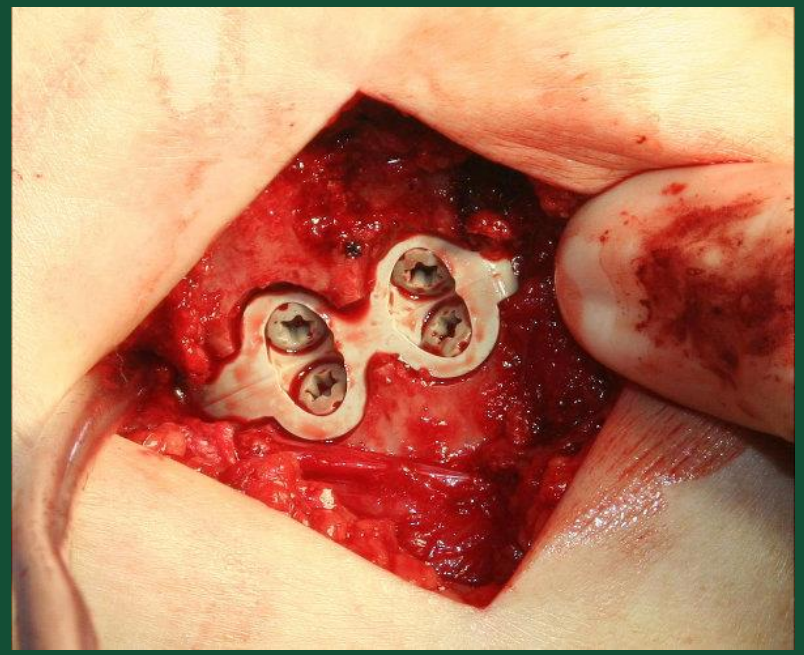
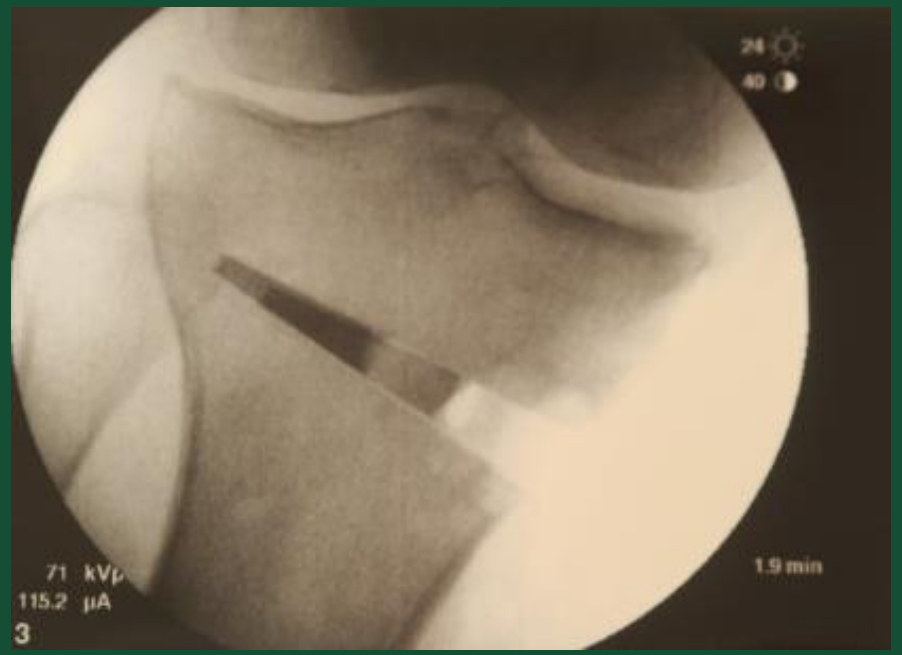
Treatment

- Grade 1-2 treat non-op but brace and rehab slowly
- Grade 3 primary repair within 3 weeks if avulsions without mid-substance injury
- Outcomes poor with repair if tendon involvement
  - Stannard et al., 37% failure repair vs. 9% failure reconstruction
  - Levy et al., 40% failure repair vs. 6% failure reconstruction

Treatment

- Chronic injuries need to full evaluation of limb alignment
- If varus, DO NOT hesitate to perform a valgus osteotomy
- May also consider change tibial slope





Varus Stress Radiographs

Orthop J Sports Med. 2018 May 2;6(5)

Fibular Collateral Ligament

Varus Stress Radiographic Analysis Using 3 Different Clinical Techniques

Patrick W. Kane,*† MD, Mark E. Cinque,† MS, Gilbert Moatshe,* MD, Jorge Chahla,† MD, PhD, Nicholas N. DePhillipo,* MS, ATC, OTC, Matthew T. Provencher,*† MD, CAPT, MC, USNR, and Robert F. LaPrade,*†‡ MD, PhD

Investigation performed at The Steadman Clinic and The Steadman Philippon Research Institute, Vail, Colorado, USA

Background: Fibular collateral ligament (FCL) tears are challenging to diagnose. Left untreated, FCL tears lead to residual ligament instability and increased joint loading on the medial compartment of the knee. Additionally, when a concomitant anterior cruciate ligament (ACL) reconstruction is performed, increased forces on reconstruction grafts occur, which may lead to premature graft failure. Stress radiographs constitute a reliable and validated technique for the objective assessment of a complete grade III FCL tear.

Purpose: To evaluate side-to-side difference (SSD) values of lateral compartment gapping on varus stress radiographs in patients with a grade III injury to the FCL. Additionally, to evaluate the reliability and reproducibility of 3 different measurement techniques that used various radiographic reference points.

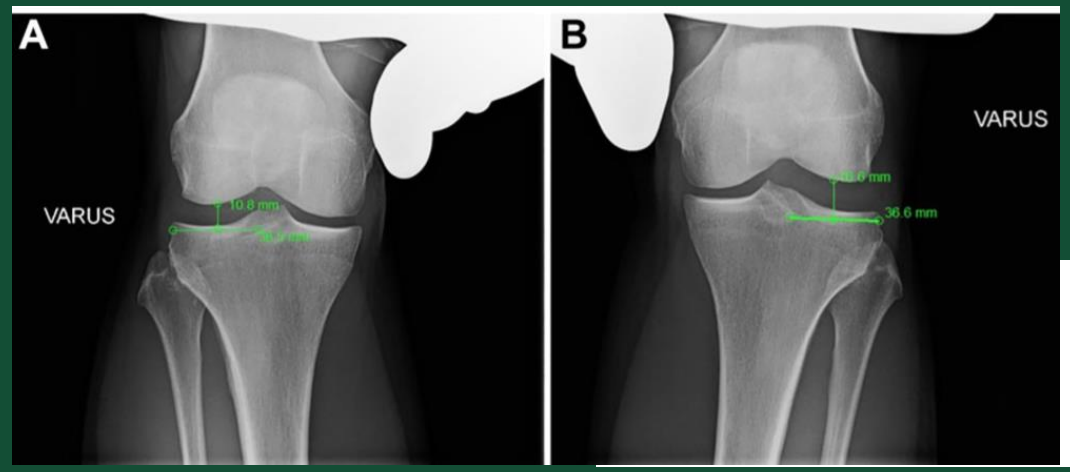
Study Design: Cohort study (diagnosis); Level of evidence, 2.

Methods: Inclusion criteria were patients who sustained an FCL with or without a concomitant ACL injury and underwent a combined FCL + ACL reconstruction between 2010 and 2016. Patients were excluded if they had a complete posterolateral corner injury, open physes, intra-articular fracture, meniscal root tear, other ligament injury, or prior surgery on either knee. All FCL tears were diagnosed with a clinical varus stress examination at 0° and 20° of knee flexion and varus stress radiographs at 20° of knee flexion measured in 3 different locations. The SSD for lateral compartment gapping was obtained from the varus stress radiographs and then statistically compared for interrater and intrarater reliability.

Results: A total of 98 consecutive patients (50 males, 48 females; 13 isolated FCL injuries, 85 combined ACL + FCL injuries) with mean age 33.6 years (range, 18-69 years) were included. Measurement techniques 1, 2, and 3 had mean ± SD lateral compartment SSDs of 2.4 ± 0.20 mm, 2.2 ± 0.20 mm, and 2.0 ± 0.03 mm, respectively (no significant differences). Interrater reliabilities for the 3 measuring techniques were 0.83, 0.86, and 0.91, respectively, while intrarater reliabilities were 0.99, 0.77, and 0.99, respectively.

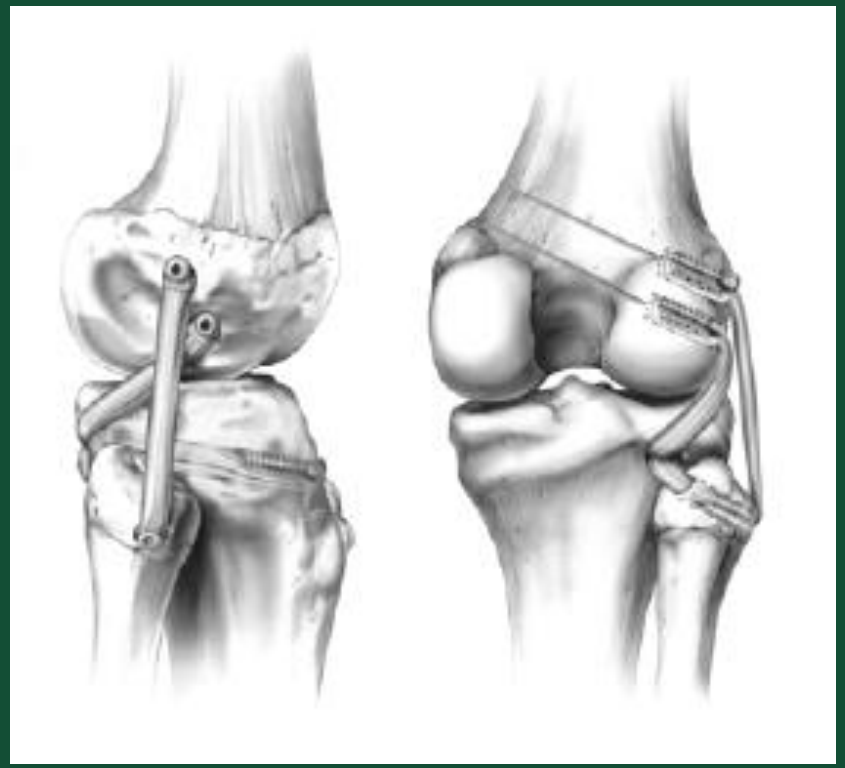
Conclusion: This study demonstrated a lower SSD value of 2.2 mm to be consistent with a grade III FCL tear on clinician-applied varus stress radiographs in the clinical setting. Although all SSD measurement locations had excellent reliability, the method using the midpoint of the lateral tibial plateau was found to be the most reproducible.

Keywords: fibular collateral ligament; varus stress radiographs; posterolateral corner; ACL



Anatomic Posterolateral Knee Reconstruction

- Reconstructs FCL, PLT, PFL
- Biomechanically validated
- Prospective study (>200 pts)



THE JOURNAL OF BONE & JOINT SURGERY
JBJS

This is an enhanced PDF from The Journal of Bone and Joint Surgery

The PDF of the article you requested follows this cover page.

Outcomes of an Anatomic Posterolateral Knee Reconstruction

Robert F. LaPrade, Steinar Johansen, Julie Agel, May Arna Risberg, Havard Moksnes and Lars Engebretsen

J Bone Joint Surg Am. 2010;92:16-22. doi:10.2106/JBJS.I.00474

Graft Preparation

- Split Achilles tendon into 2 grafts
- Or 2 soft tissue grafts (ST or PL)
- If bone blocks : 9 x 20 mm
- Tubularize remaining tendon- “leader”
- Leave thicker for native portion
- Tendon lengths
  - FCL = 70 mm
  - PLT = 60 mm

PIONEERING INNOVATION with the

Collateral Ligament

RECONSTRUCTION SET

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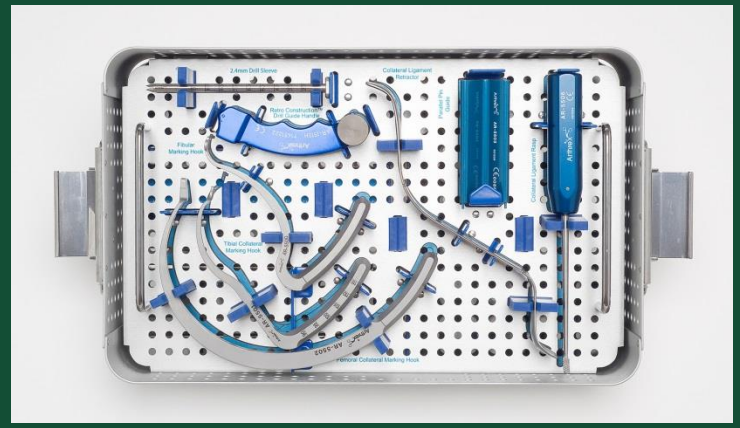
Collateral Ligament Reconstruction Set



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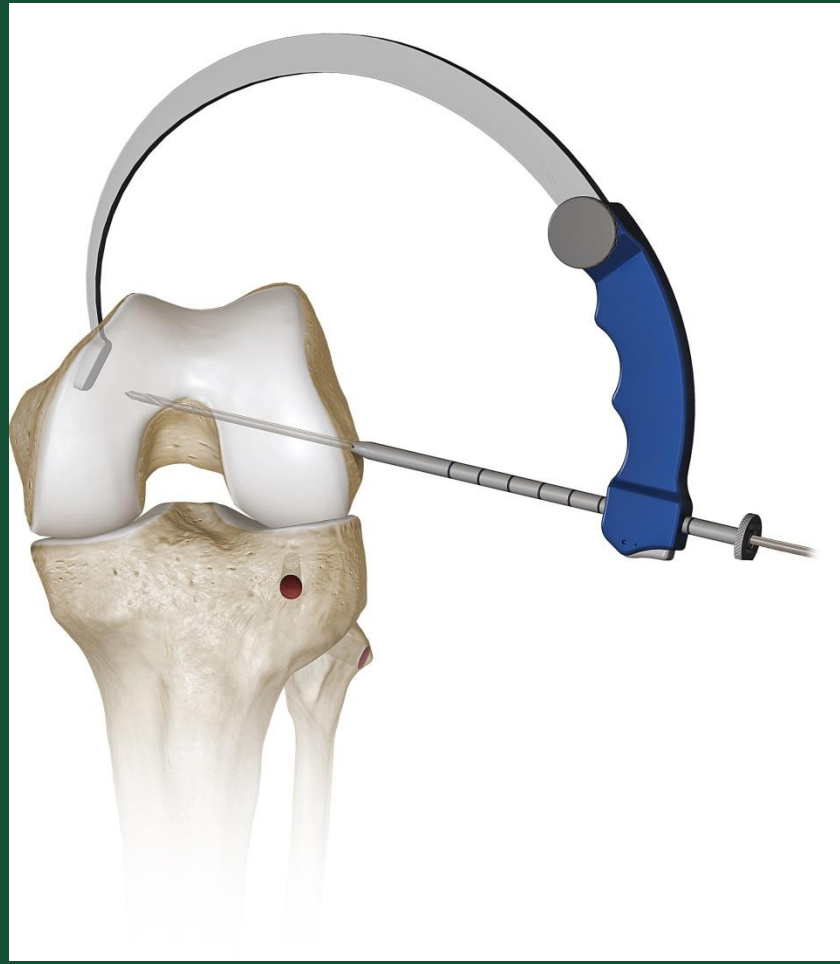
Femur Collateral Marking Hook
& RetroConstruction™ Drill Guide Handle



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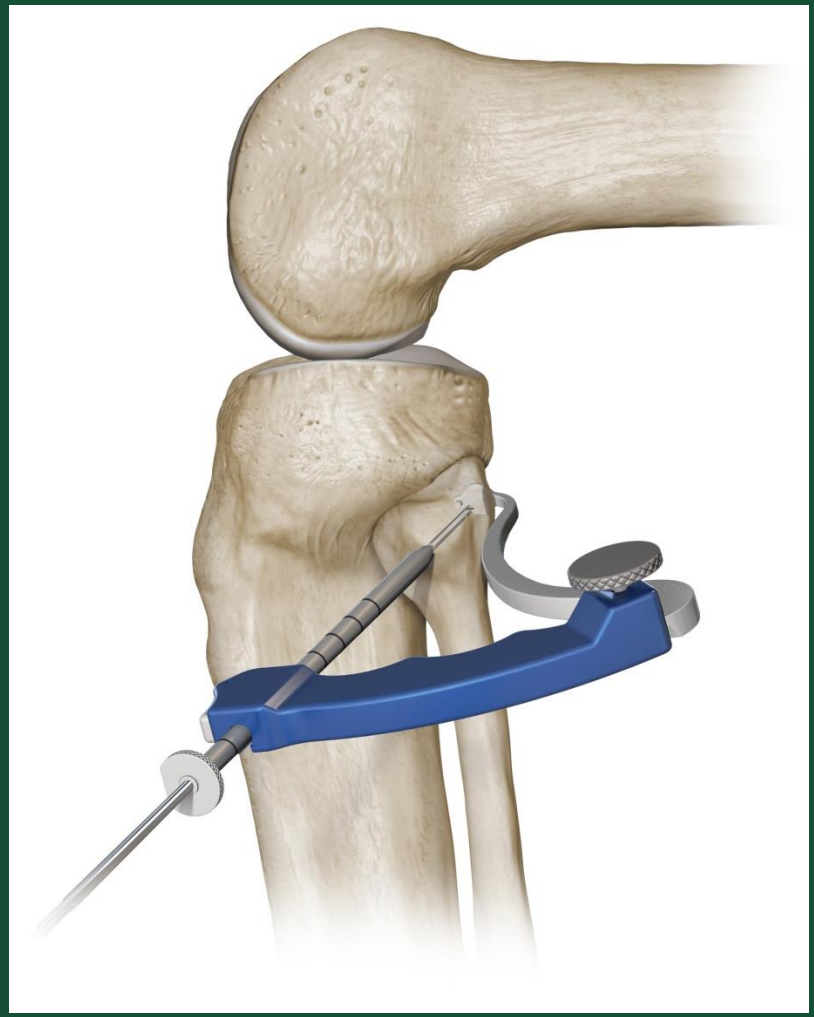
Fibular Marking Hook
& RetroConstruction™ Drill Guide Handle



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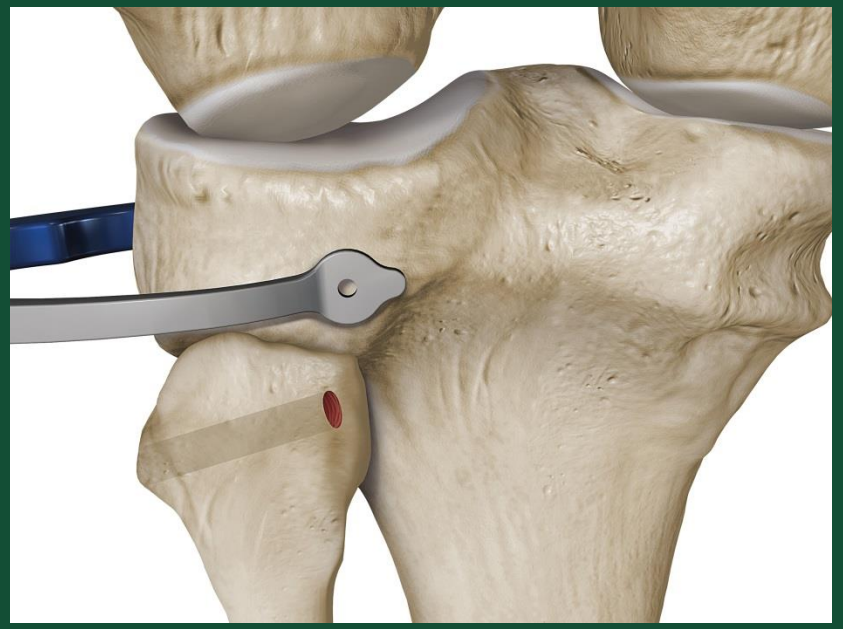
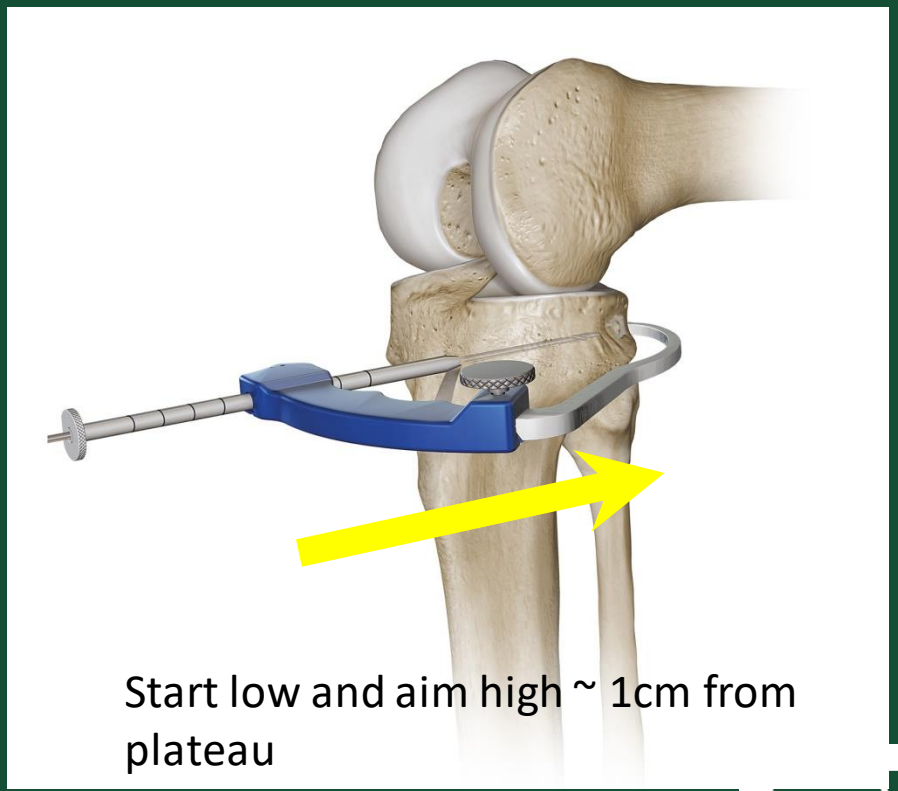
Tibial Collateral Marking Hook & RetroConstruction™ Drill Guide Handle



Tibial bypass drill hole for PLT and PFL



Start low and aim high ~ 1cm from plateau

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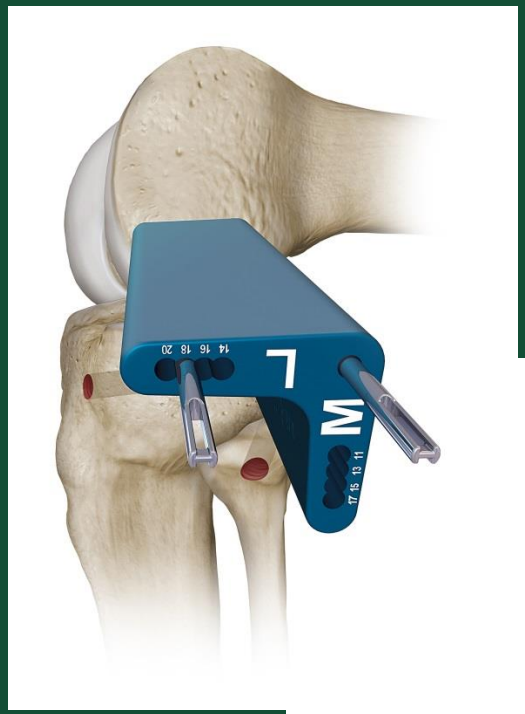
Parallel Drill Guide



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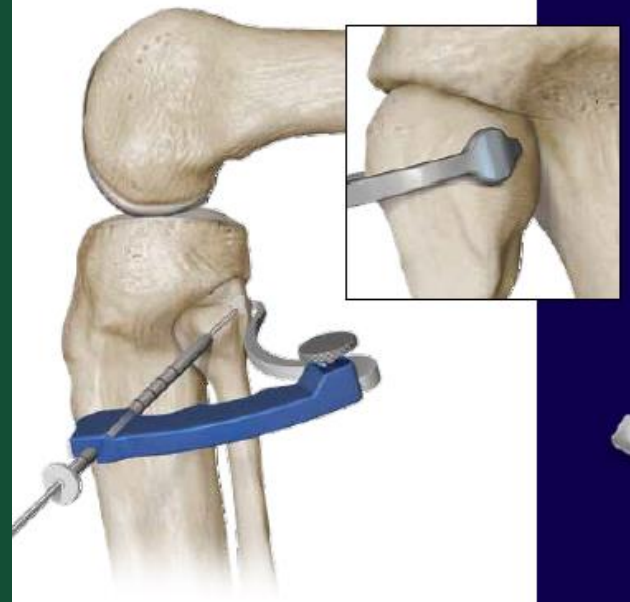
Collateral Ligament Retractor

Collateral Ligament Rasp

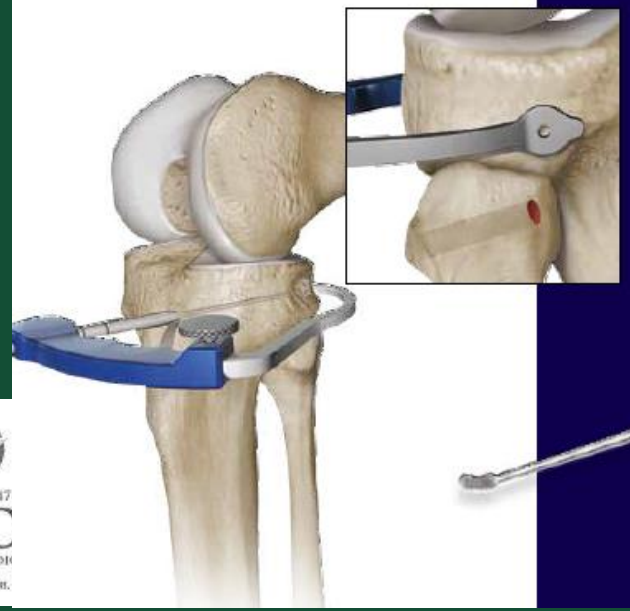


Fibular Marking Hook

The unique Fibular Marking Hook provides anatomic precision for minimally invasive and open techniques, for fibular-based reconstructions. The shape of the fibular marking hook tightly contours the fibular head, enabling surgeons to get around anatomic structures when placing the 8 mm diameter paddle which is designed specifically to fit onto the fibular attachment of the popliteofibular ligament (PFL). The 2.4 mm Drill Sleeve is set up in the ideal lateral-to-posteromedial direction which confirms the osseous length of the fibular tunnel and anatomic positioning before drilling – minimizing the potential of fracturing the fibular head.

Collateral Ligament Retractor

The Collateral Ligament Retractor has patient-specific ends designed to protect the neurovascular structures during drilling and guides FiberSticks™ for graft passing. The built-in suture cleats provide an ergonomic handle for individual graft tensioning.

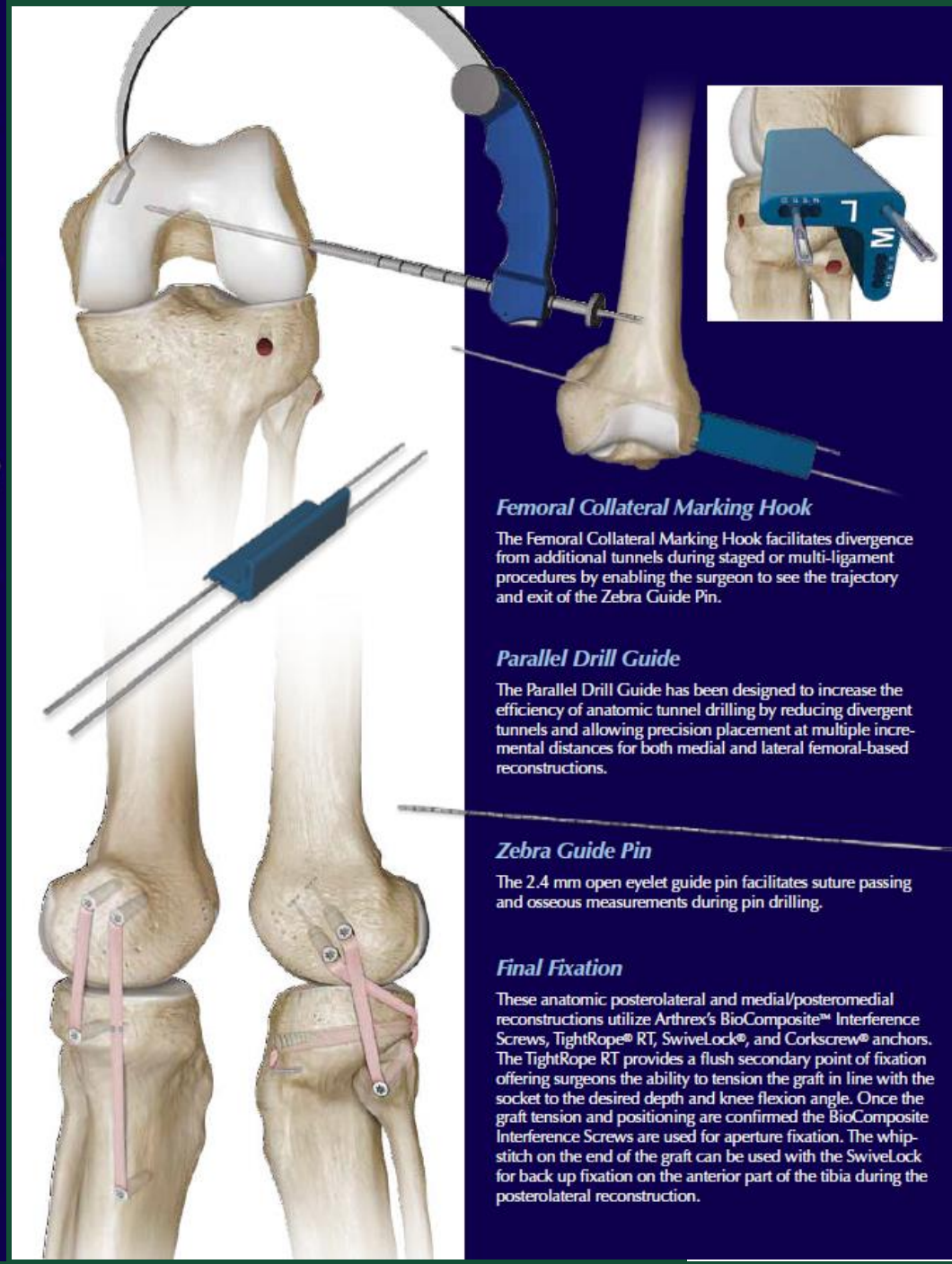


Tibial Collateral Marking Hook

The Tibial Marking Hook is designed for both posterolateral and medial/posteromedial tibial based reconstructions. The ergonomic 8 mm diameter paddle provides tactile feedback upon entry into the posterior popliteal sulcus and confirms the exit point of the Zebra Guide Pin during posterolateral corner reconstructions.

Collateral Ligament Rasp

Ideal for chamfering the aperture of reconstruction tunnels before graft passing, in order to reduce tissue abrasion or laceration.



Femoral Collateral Marking Hook

The Femoral Collateral Marking Hook facilitates divergence from additional tunnels during staged or multi-ligament procedures by enabling the surgeon to see the trajectory and exit of the Zebra Guide Pin.

Parallel Drill Guide

The Parallel Drill Guide has been designed to increase the efficiency of anatomic tunnel drilling by reducing divergent tunnels and allowing precision placement at multiple incremental distances for both medial and lateral femoral-based reconstructions.

Zebra Guide Pin

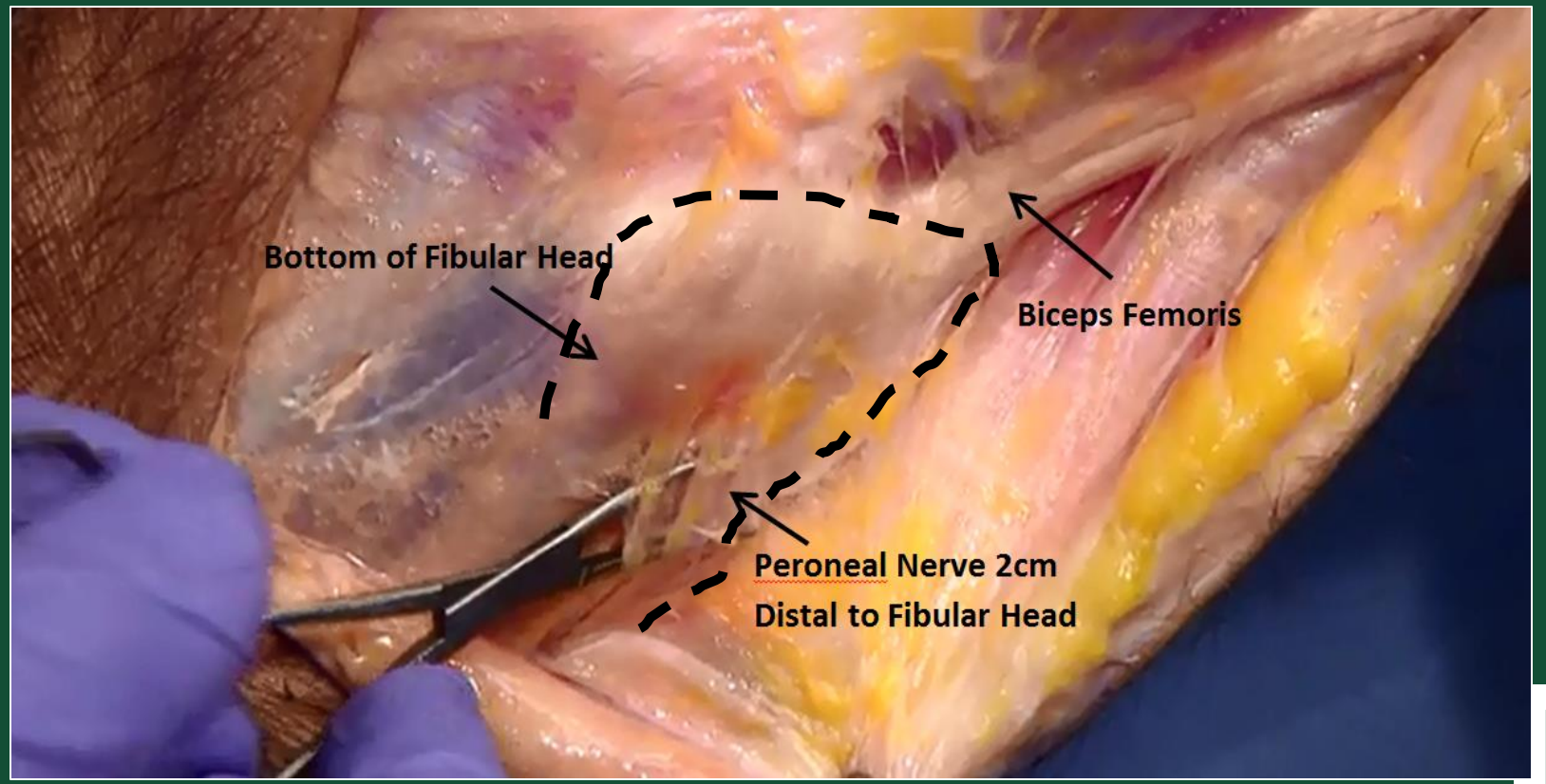
The 2.4 mm open eyelet guide pin facilitates suture passing and osseous measurements during pin drilling.

Final Fixation

These anatomic posterolateral and medial/posteromedial reconstructions utilize Arthrex's BioComposite™ Interference Screws, TightRope® RT, SwiveLock®, and Corkscrew® anchors. The TightRope RT provides a flush secondary point of fixation offering surgeons the ability to tension the graft in line with the socket to the desired depth and knee flexion angle. Once the graft tension and positioning are confirmed the BioComposite Interference Screws are used for aperture fixation. The whip-stitch on the end of the graft can be used with the SwiveLock for back up fixation on the anterior part of the tibia during the posterolateral reconstruction.

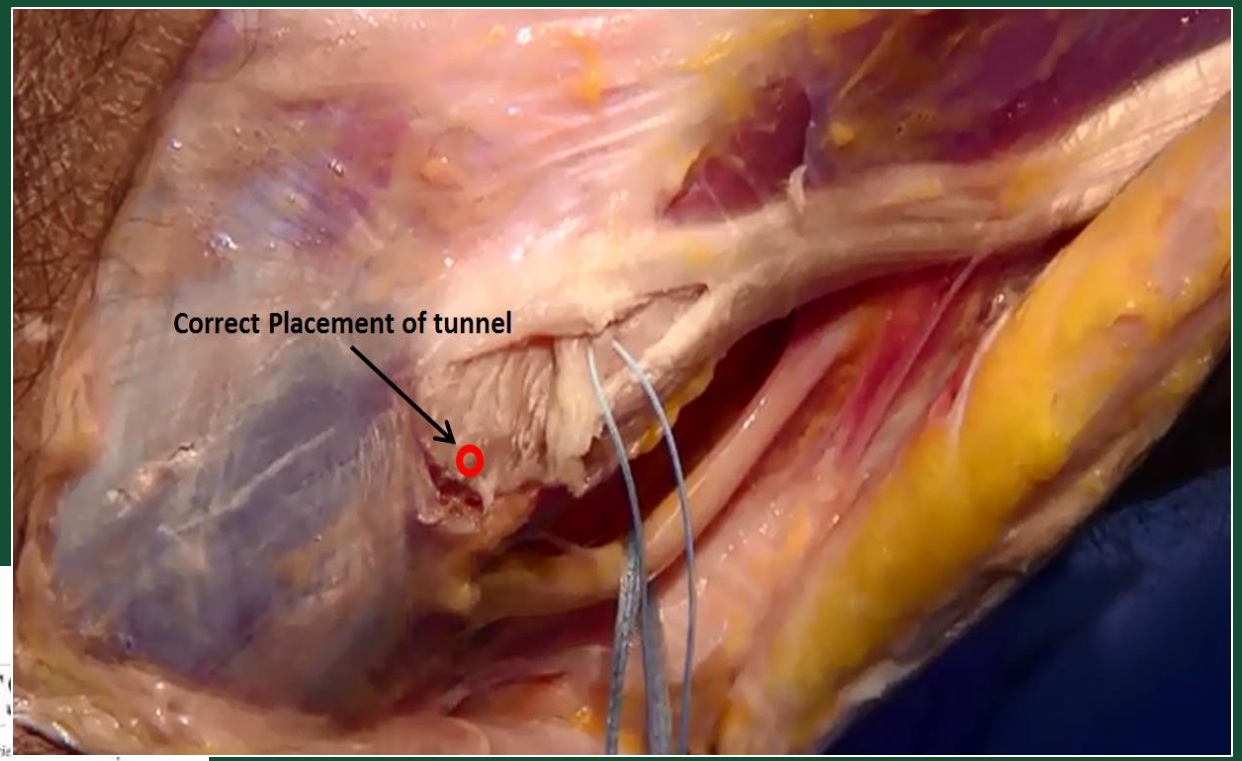
Dissect the Posterior Lateral Corner

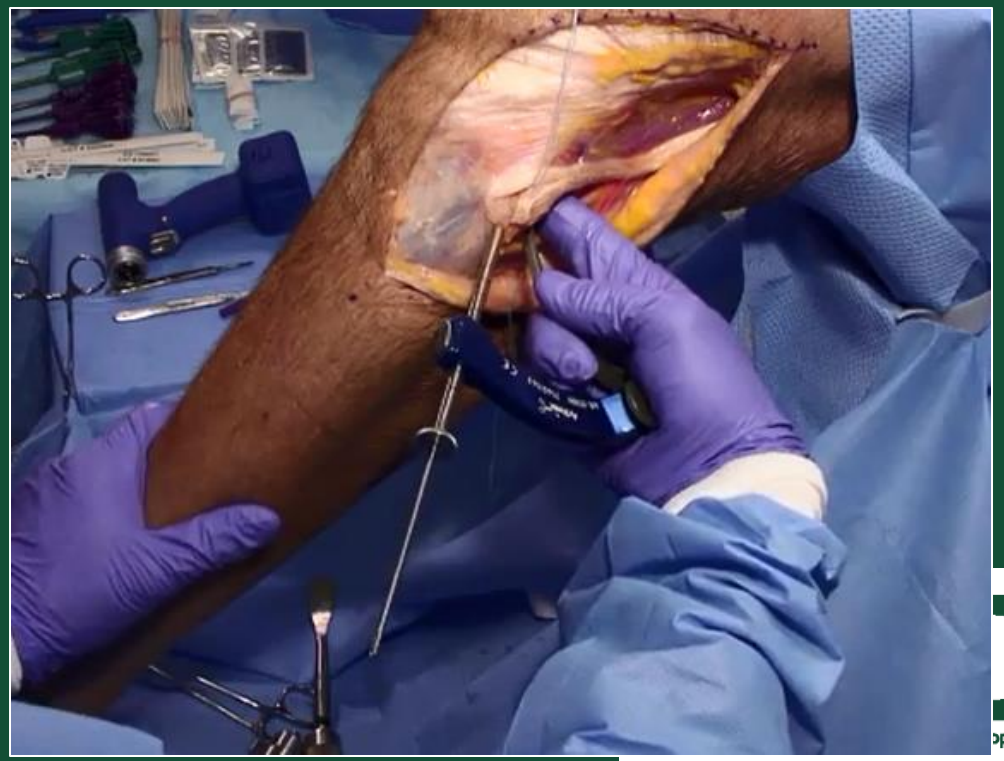
- Identify and Protect the Peroneal nerve



Fibular Tunnel

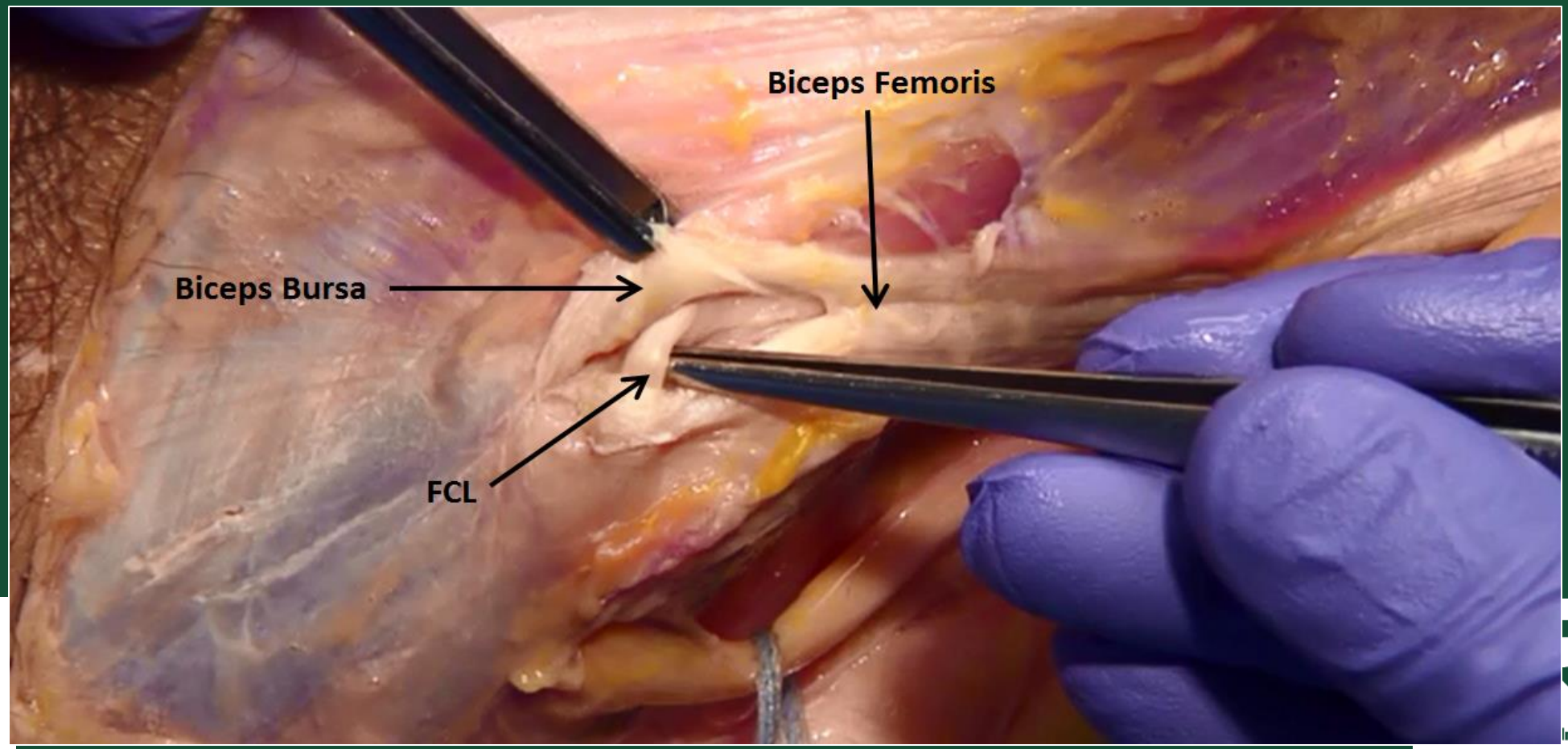
- Fibular attachment of FCL is more distal on fibular head (where lateral compartment musculature attaches)
- Too proximal leads to risk of fibular head fracture





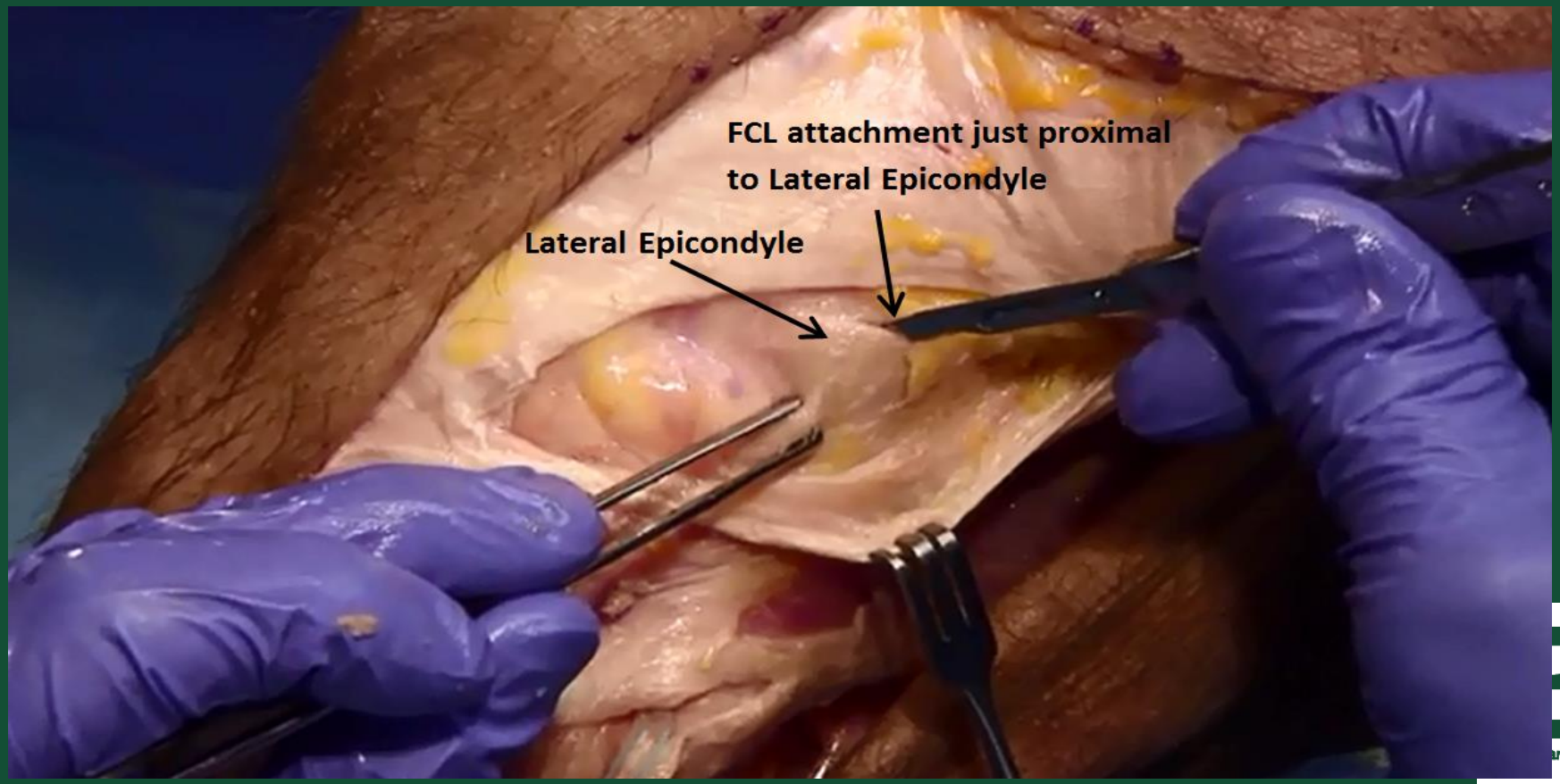
Femoral Tunnel

- Tunnel Beneath the Biceps, IT band



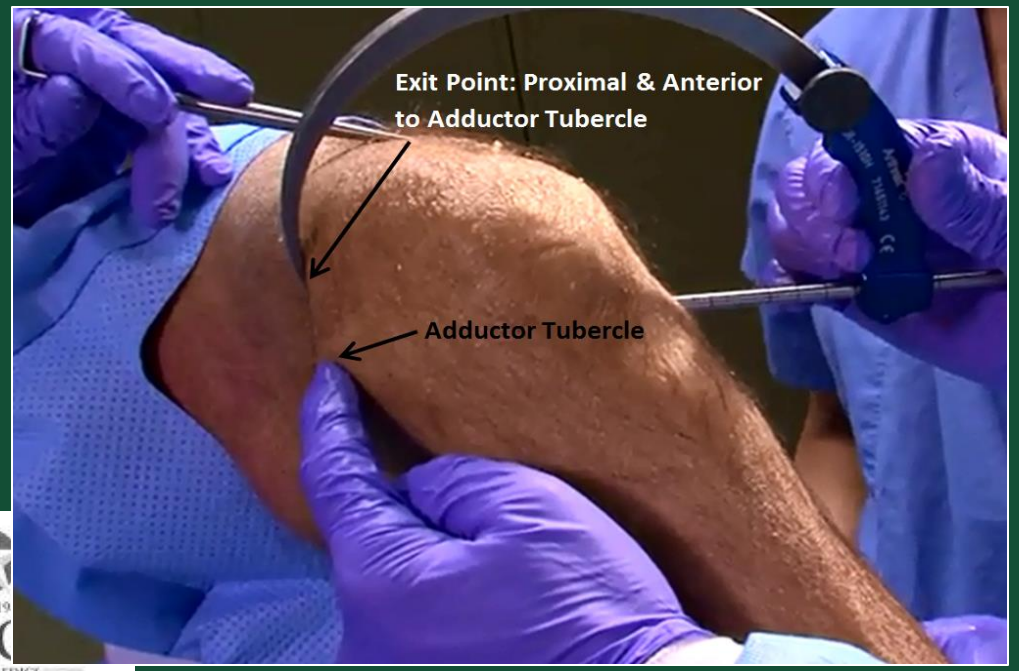
Femoral Tunnel

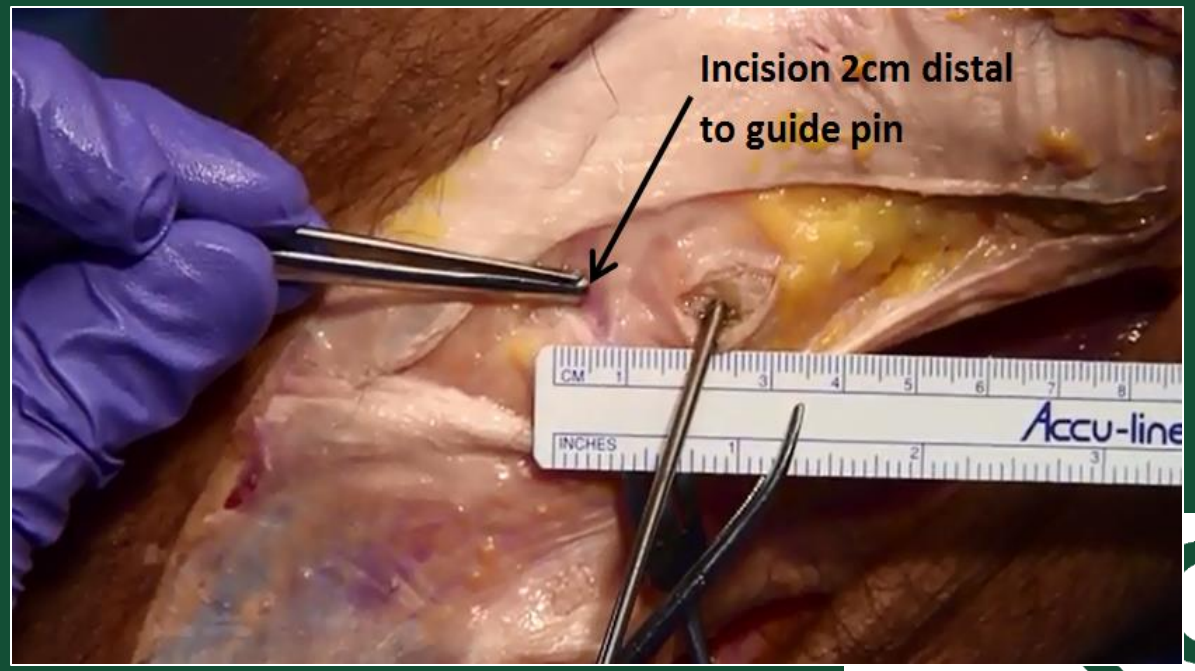
- Identify the Popliteal Sulcus and the LCL insertion
  - FCL insertion at apex & slightly posterior to Lateral Epicondyle



Femoral Tunnel

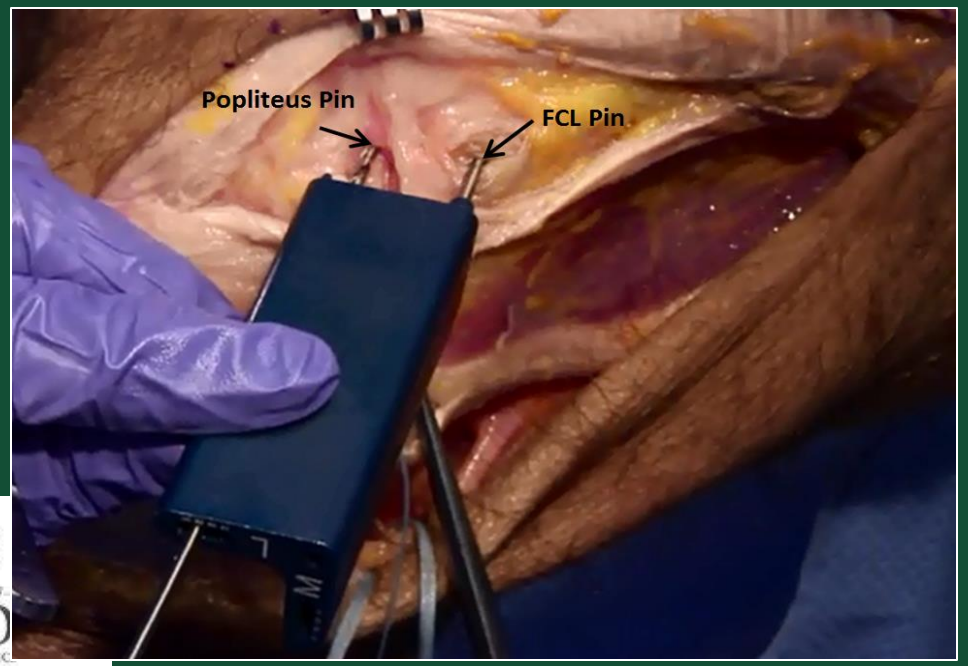
- Place femoral guide on the knee angling slightly proximal
- Medial portion of the guide should go anterior and proximal of the adductor tubercle to avoid other tunnels

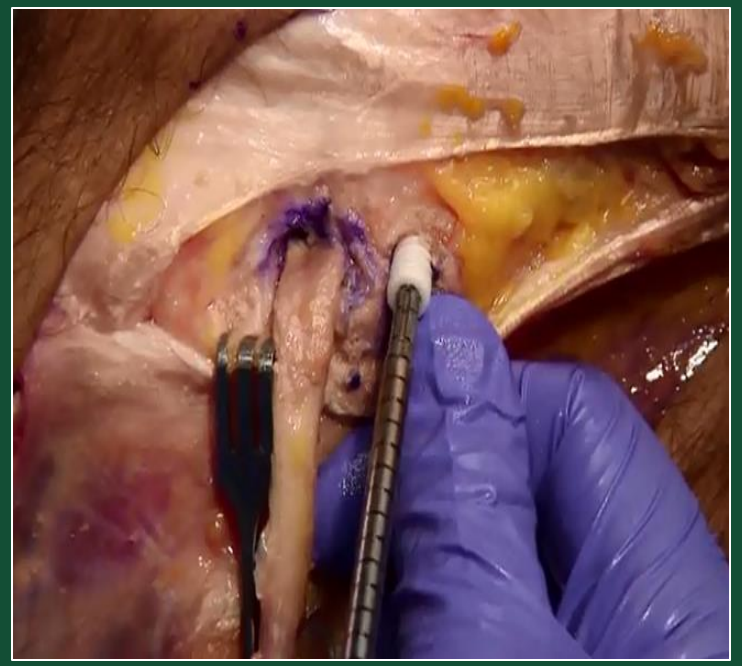




Femoral Tunnel

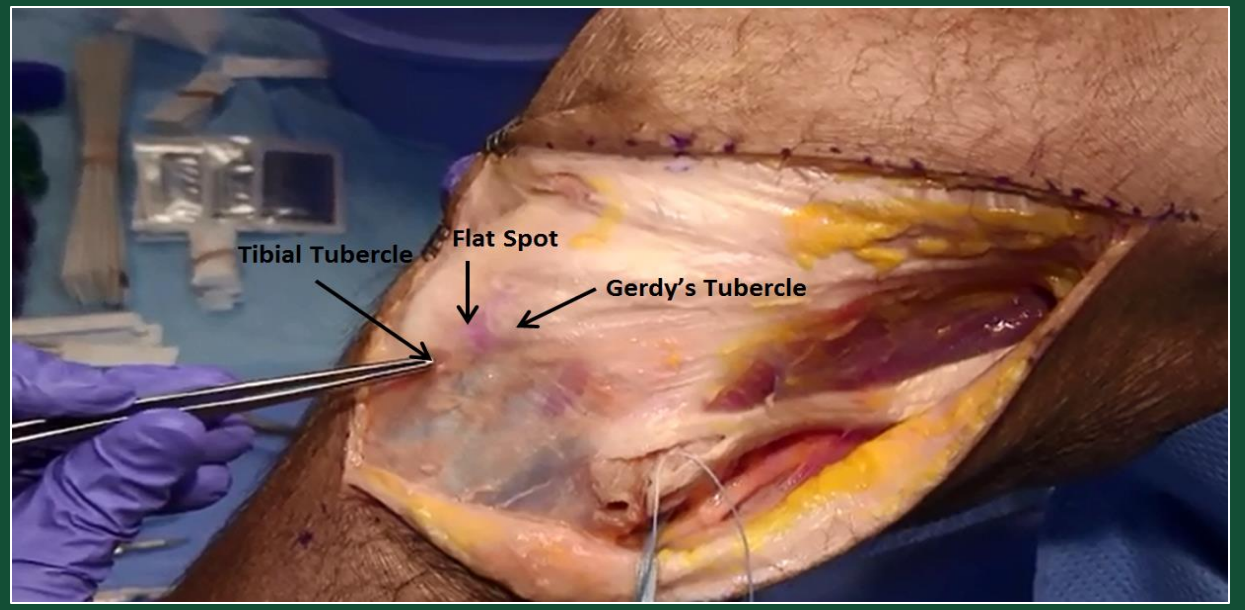
- Use parallel drill guide to mark popliteus tendon tunnel
- Popliteus tunnel is ~18.5mm from FCL attachment
- Place guide wire in 18mm slot and drill across femur



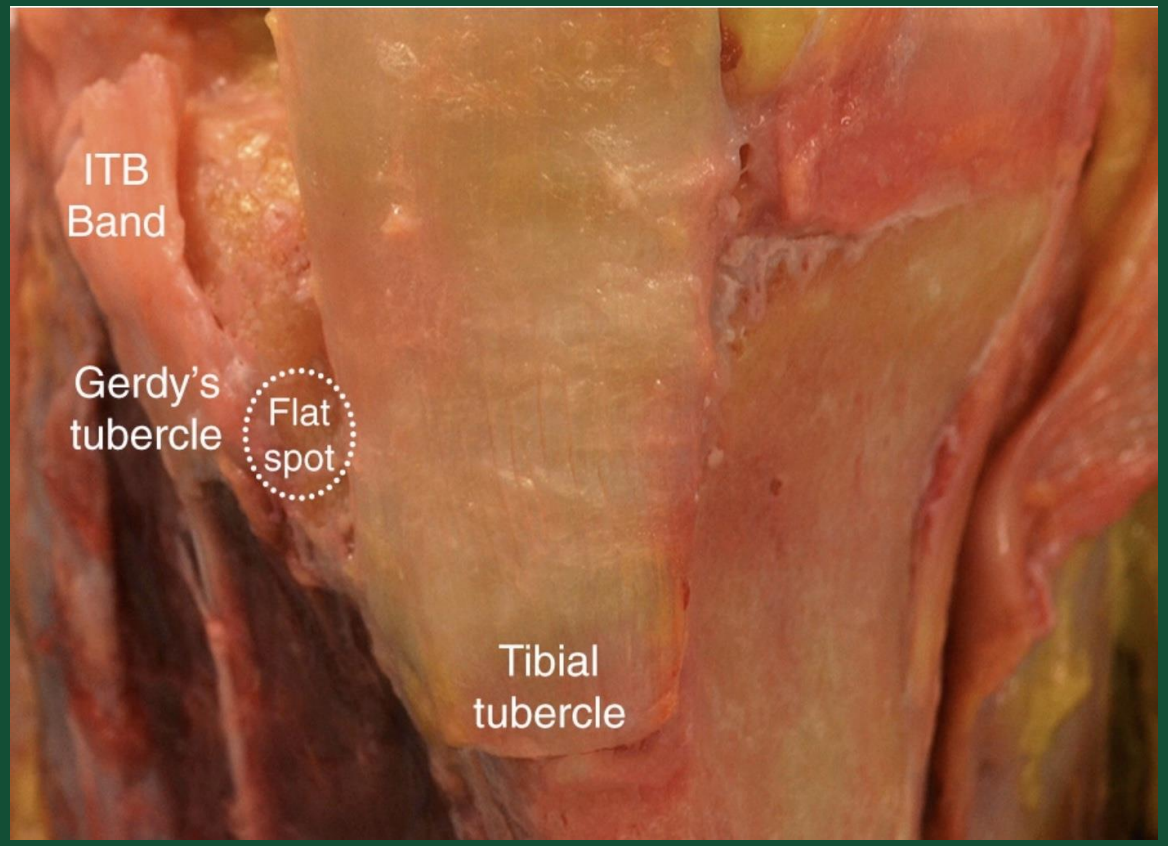


Tibial Tunnel

- The flat spot between Gerdy's and the tibial tubercle steeply falls off the lateral side of the tibia heading towards the proximal tib/fib joint
- Proper tunnel placement is directly on the flat spot

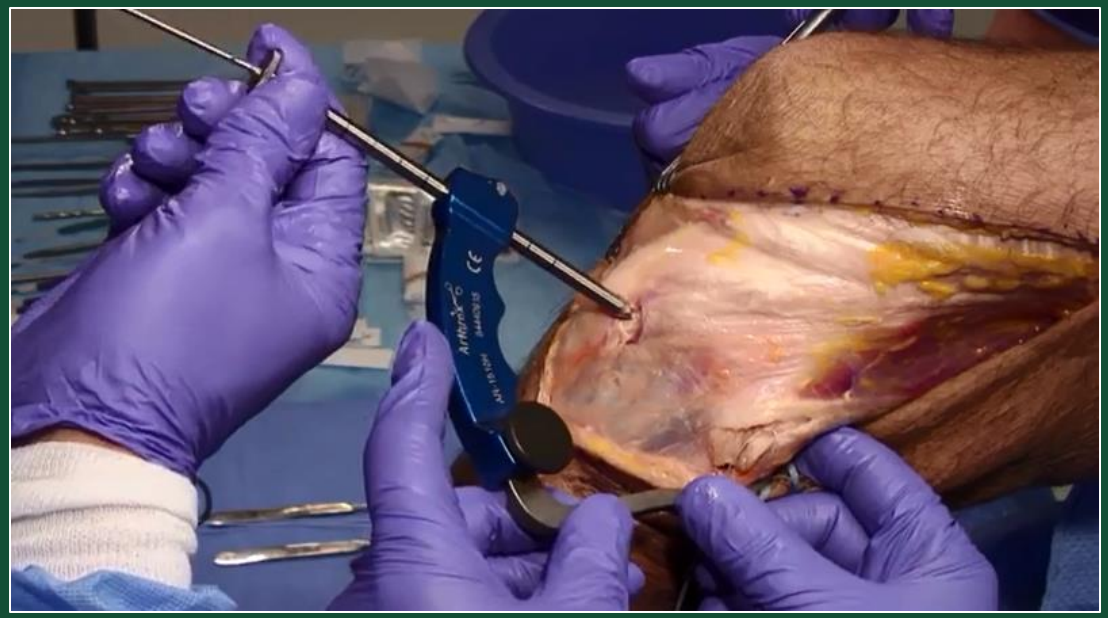


Tibial Tunnel Location

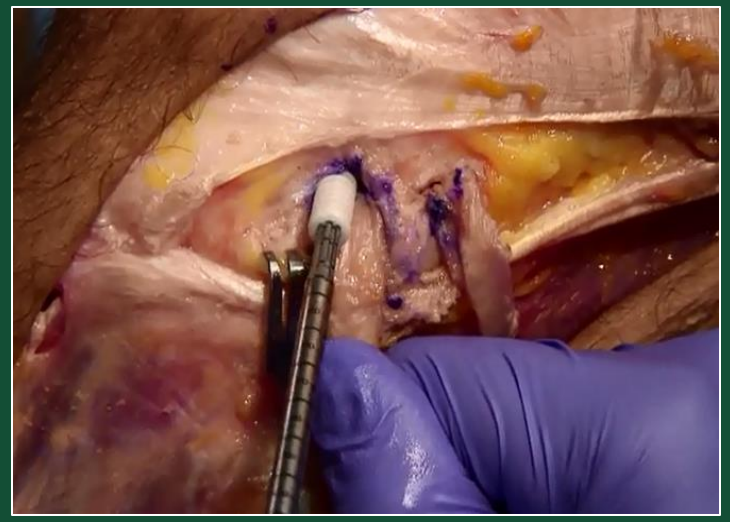


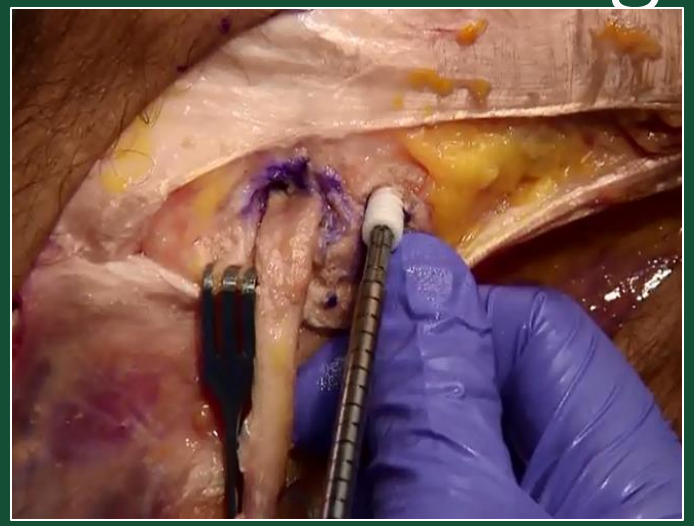
Tibial Tunnel

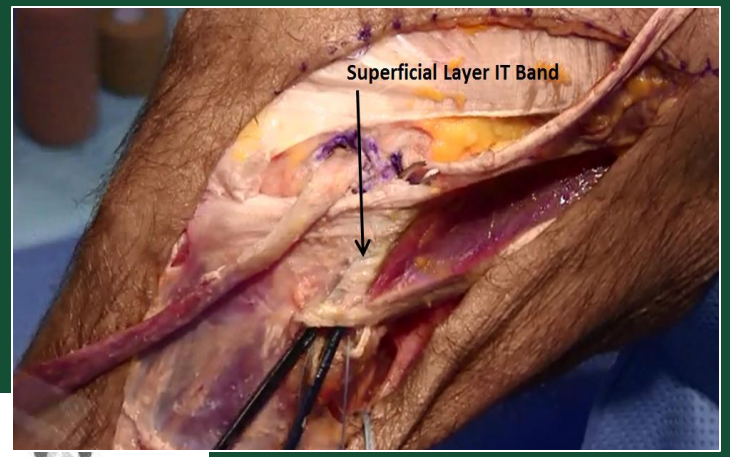
- (Posterior) Place guide 1cm medial and proximal to PFL
- (Anterior) Place the drill sleeve between Gerdy's tubercle and Tibial tubercle (on flat spot)
- Note interosseous length
- This will help identify when the drill bit will exit the posterior tibial cortex eliminating the risk for neurovascular injury

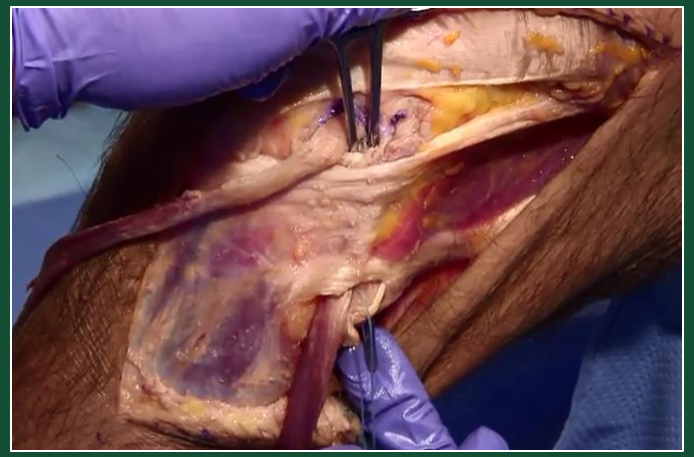


Graft Passage









Secure with a biocomposite screw anterior to the graft

Pass the FCL graft under the superficial layer of the IT band towards its location on the fibular head

Pass the Popliteus graft under the IT band heading posteriorly towards the posterior tunnel on the tibia

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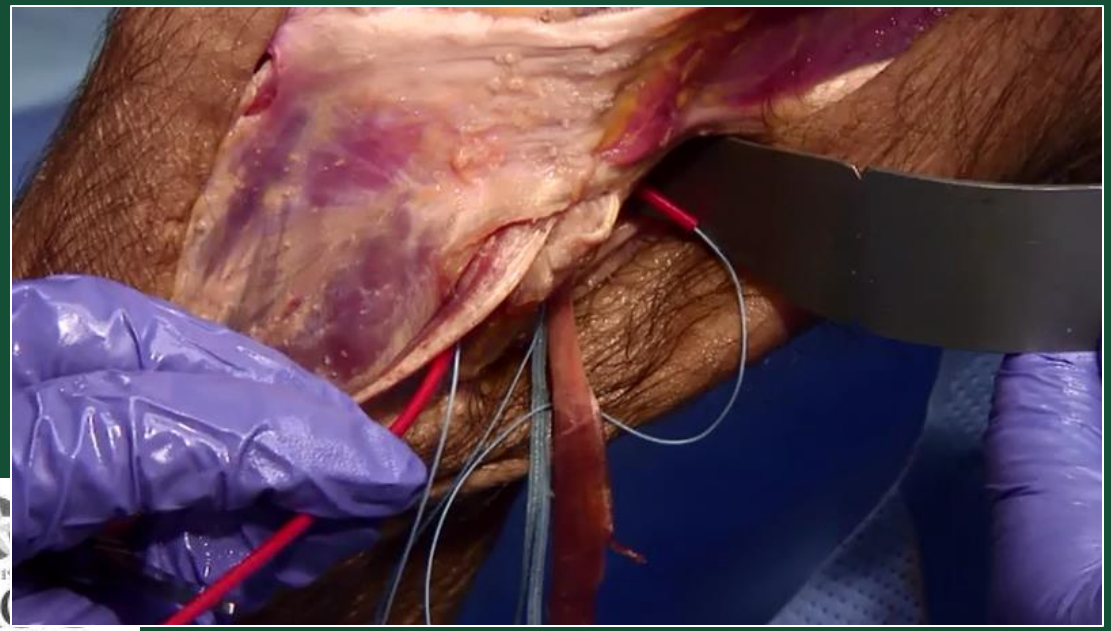
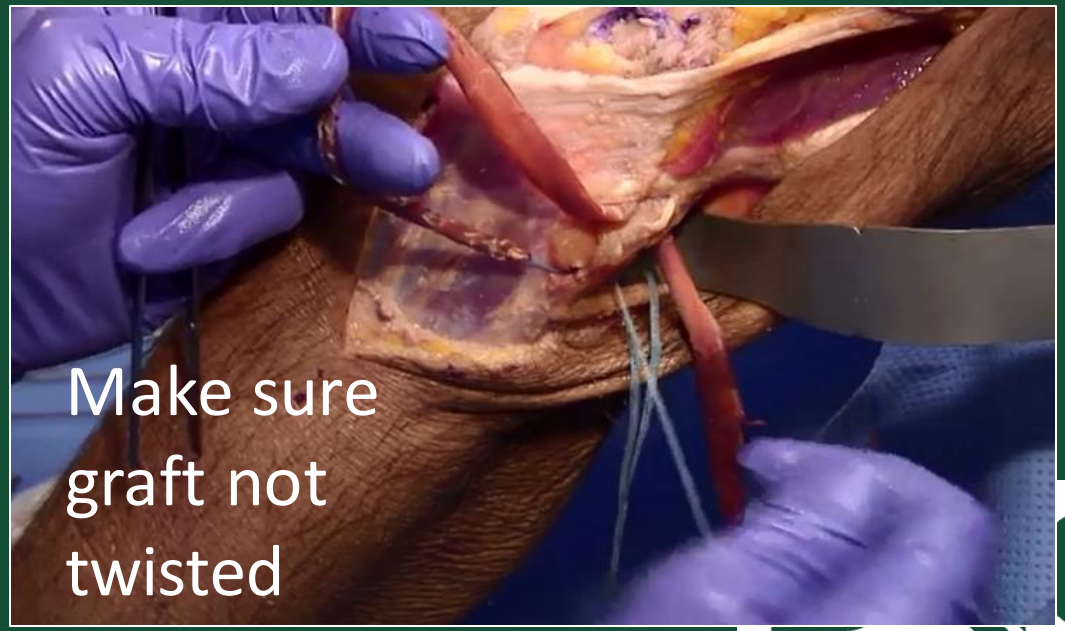
Graft Passage

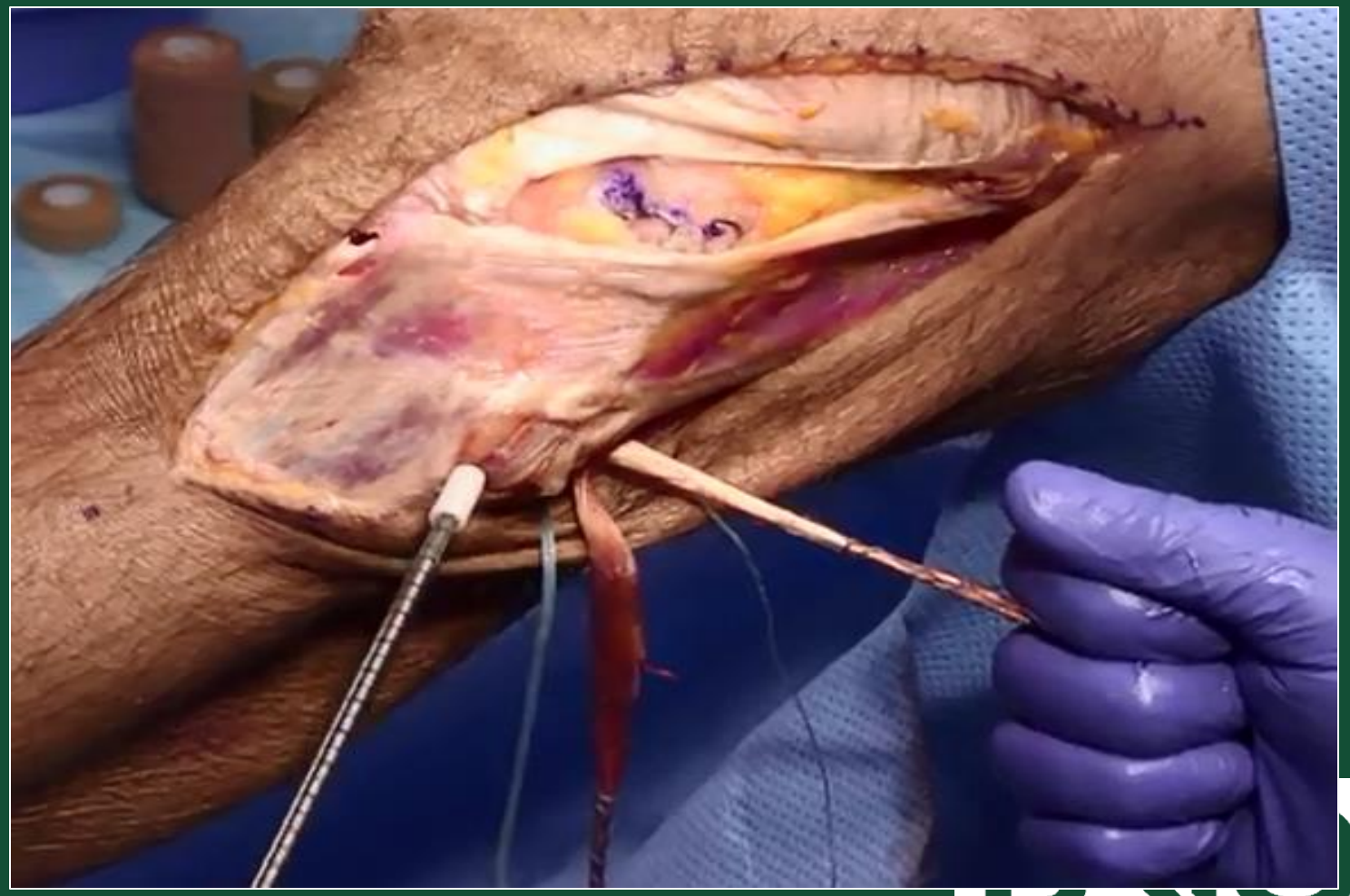
- Place retractor behind fibular head and run FiberStick through fibular head tunnel (anterior to posterior)
- Pass FCL graft anterior to posterior through tunnel





Graft Passage

- Place the knee at 20^0 of flexion (neutral tibial rotation) and apply valgus reduction force while pulling traction on graft
- Place screw in FCL tunnel



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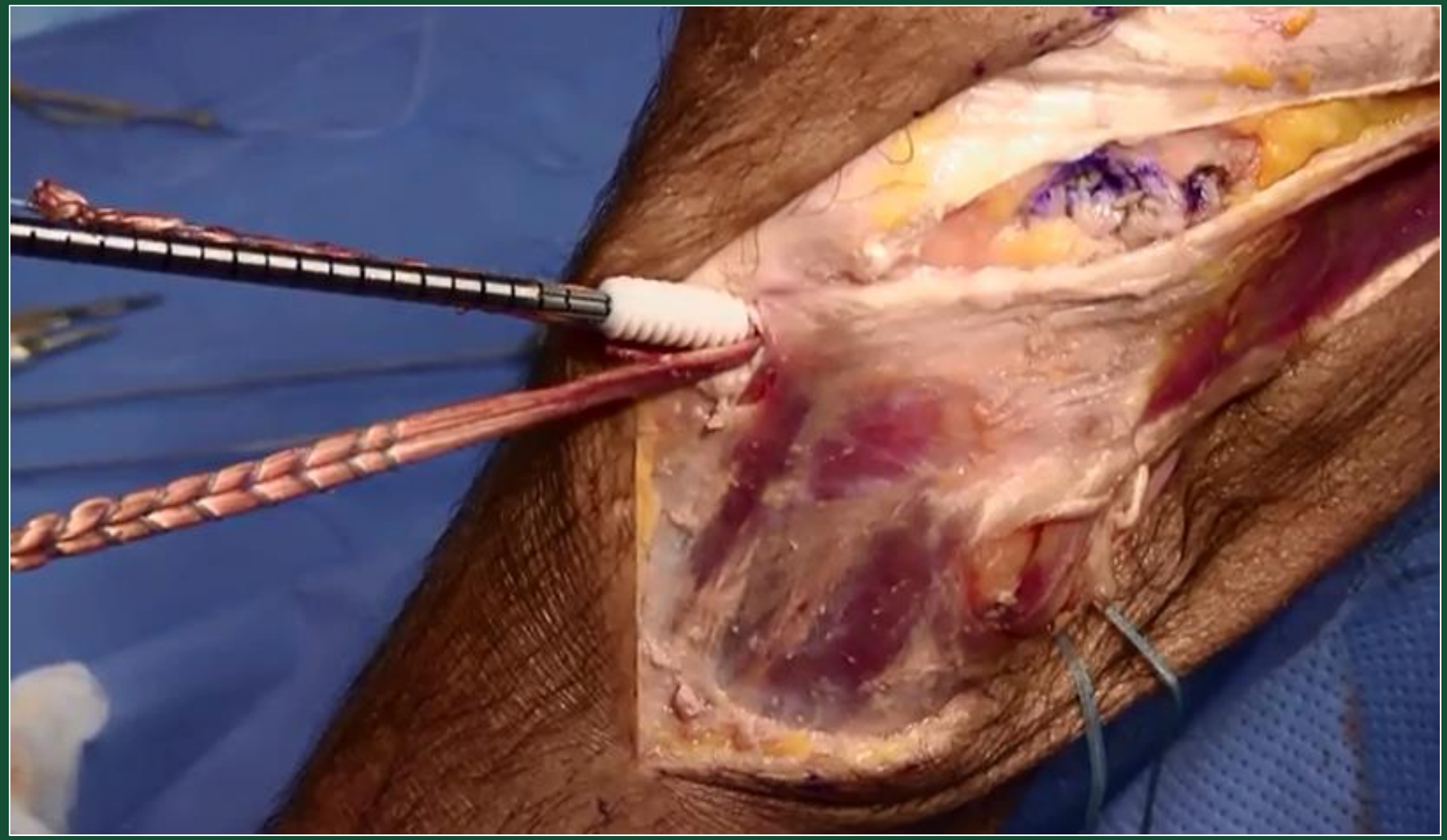
Graft Passage

- Pass a FiberStick through anterior tibial tunnel and retrieve looped end out of posterior tibia
- Pass both grafts from posterior to anterior

Graft Passage

With the knee at 45-60^0 flexion (neutral tibial rotation) tension the grafts and place composite screw



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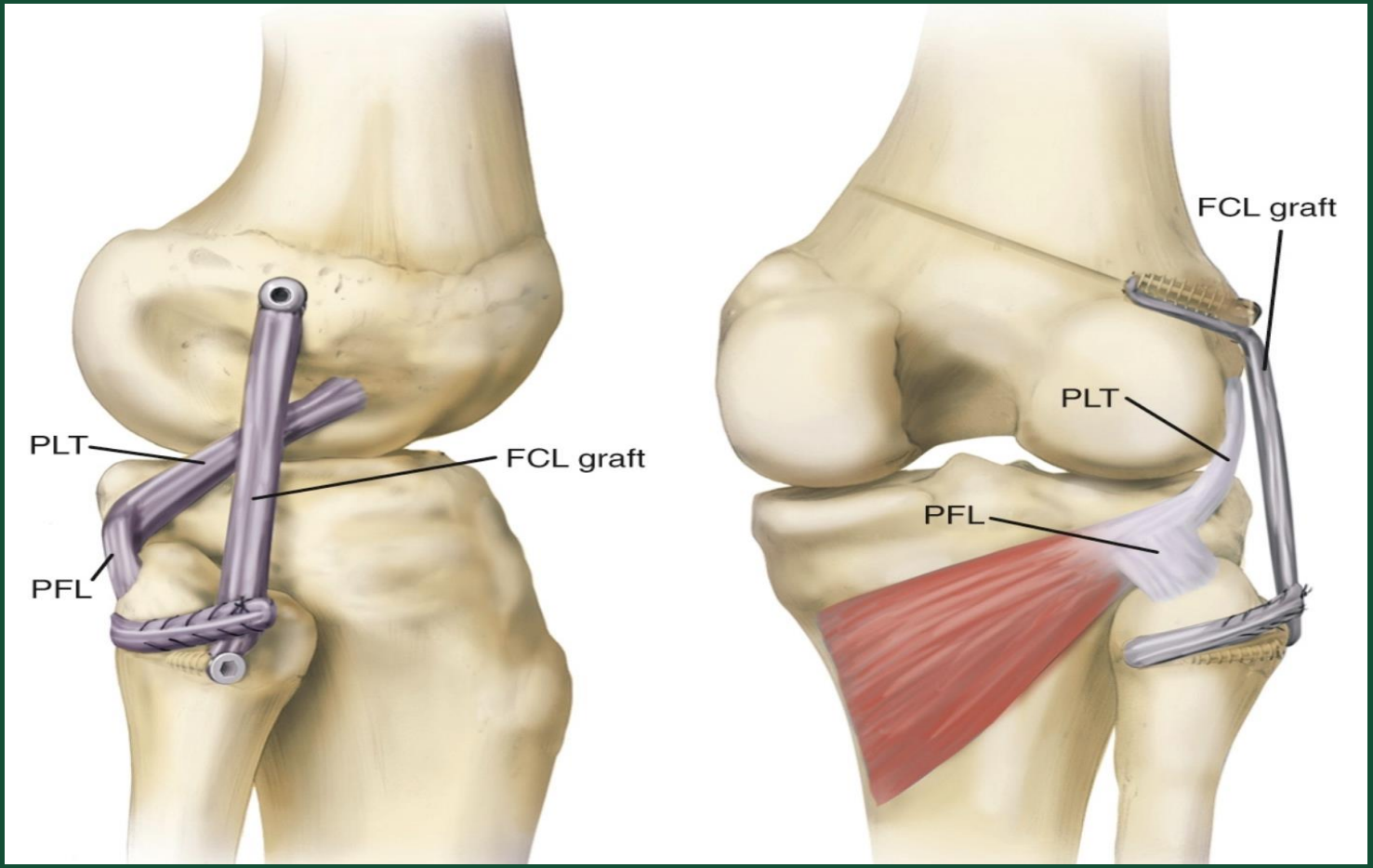
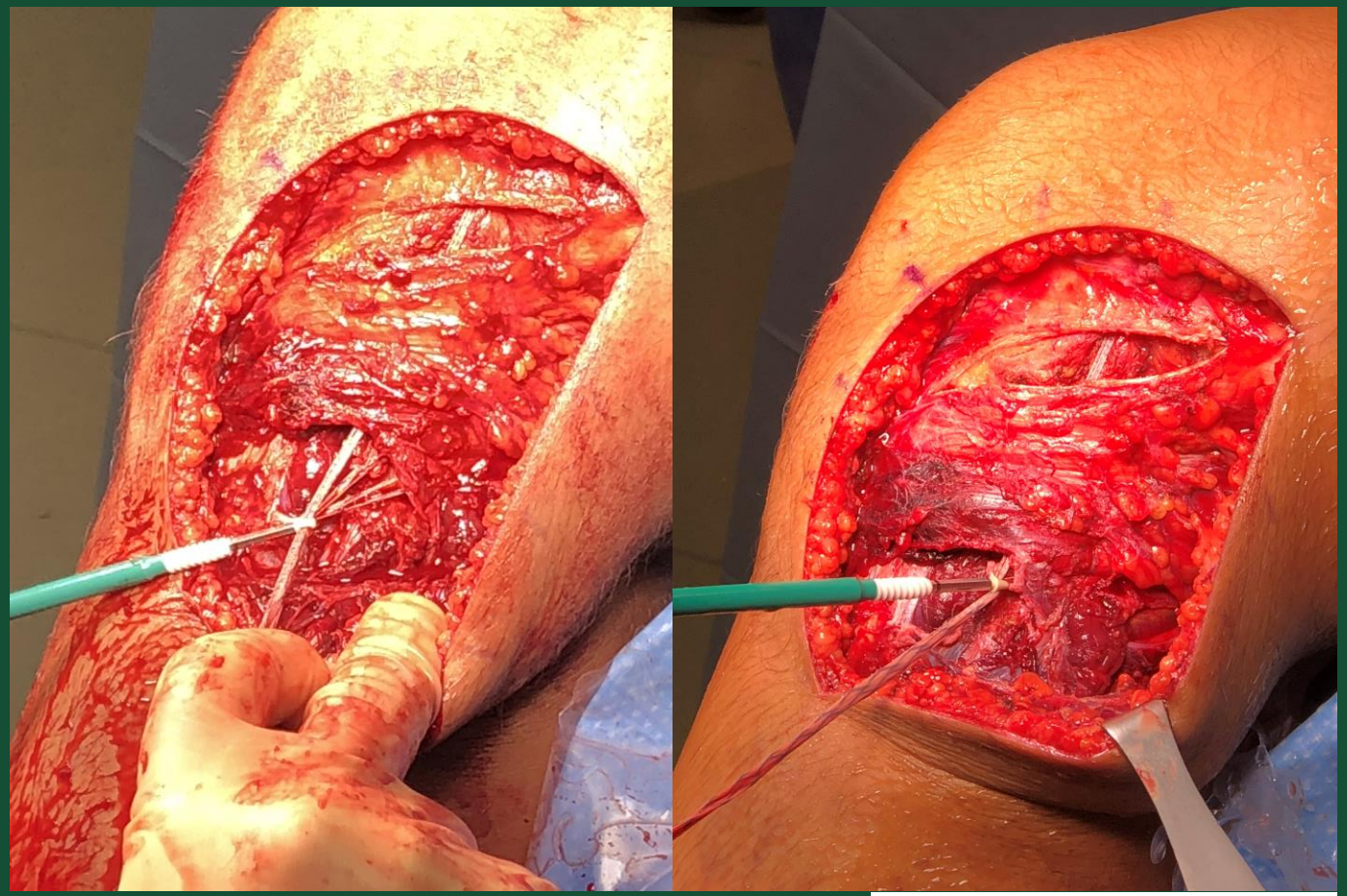
Isolated LCL Reconstruction



Recent Case – Acute Fibular Avulsion of LCL & Biceps

- Combined internal brace + repair of LCL with repair of biceps
- 4.75 mm Vented Biocomposite Swivelock anchor at anatomic LCL insertion point on fibula



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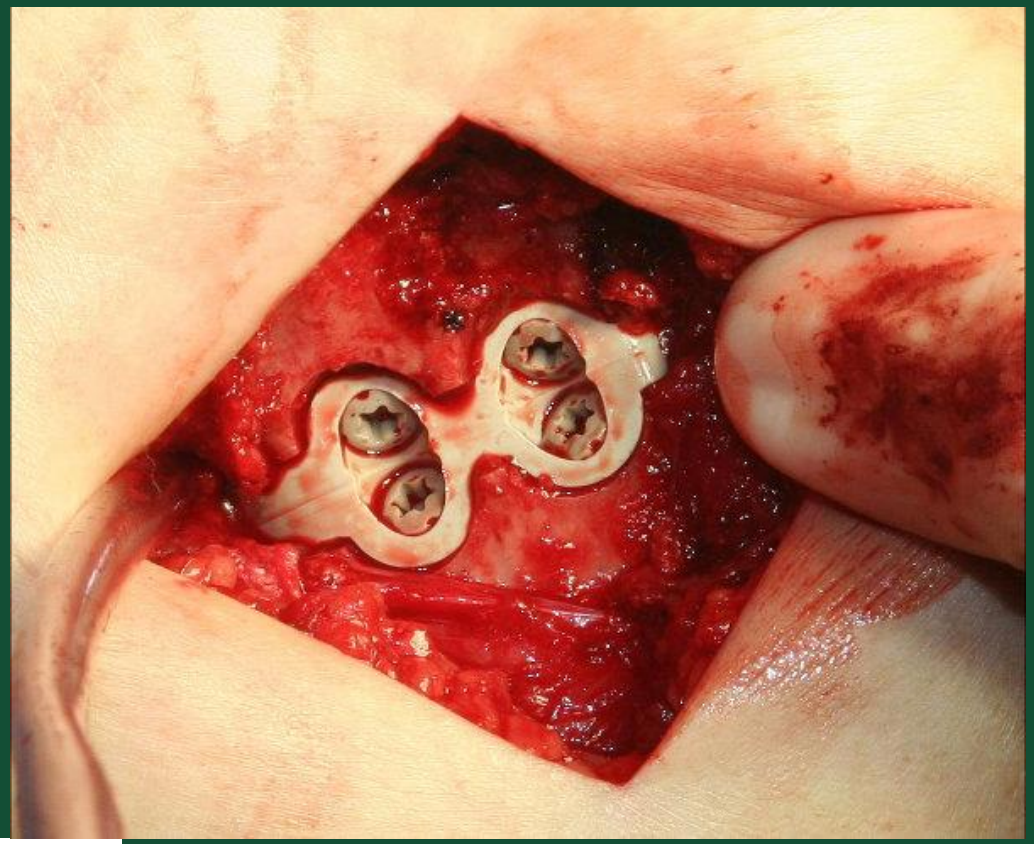
Consider HTO in Chronic Varus Knee



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Am J Sports Med. 2018 Aug;46(10):2355-2365. doi: 10.1177/0363546518784301. Epub 2018 Jul 17.

Partial Controlled Early Postoperative Weightbearing Versus Nonweightbearing After Reconstruction of the Fibular (Lateral) Collateral Ligament: A Randomized Controlled Trial and Equivalence Analysis.

LaPrade RF[1,2], DePhillipo NN[1], Cram TR[1], Cinque ME[2], Kennedy MI[2], Dornan GJ[2], O'Brien LT[3].

Author information

Abstract

BACKGROUND: While early weightbearing protocols have been advocated after anterior cruciate ligament (ACL) reconstruction, early weightbearing after fibular (lateral) collateral ligament reconstruction has not been well defined.

PURPOSE: (1) To determine if early partial controlled weightbearing after fibular collateral ligament (FCL) reconstruction resulted in an objective difference in laxity on varus stress radiographs at postoperative 6 months as compared with nonweightbearing, and (2) to determine if there was a difference in pain, edema, range of motion, and subjective patient-reported outcomes between these groups at 3 time points.

STUDY DESIGN: Randomized controlled trial; Level of evidence, 1.

METHODS: Patients were prospectively enrolled from January 2014 to April 2017. Patients who underwent isolated FCL reconstruction or combined ACL and FCL reconstructions were included in this study. Patients were randomly assigned to either a control group (nonweightbearing for 6 weeks) or a treatment group (partial controlled weightbearing at 40% body weight with crutches for 6 weeks). Patient-related data, including knee pain, edema, and range of motion, were collected for all patients at postoperative day 1, 6 weeks, and 6 months. Subjective outcomes were collected preoperatively and at 6 months postoperatively. The primary objective endpoint was varus stability, evaluated by bilateral varus stress radiographs obtained preoperatively and at 6 months postoperatively.

RESULTS: Thirty-nine patients were enrolled in the study, with 6-month follow-up obtained for 36 (92%). There was a significant improvement between the preoperative side-to-side difference (SSD) (2.4 ± 1.0) and postoperative SSD (0.2 ± 1.0) for lateral compartment laxity on varus stress radiographs among all patients ($P < .001$). Clinical and statistical equivalence was found between groups in terms of SSD on varus stress radiographs ($P < .001$). The SSD in knee edema was significantly lower in the partial early weightbearing group (beta = -0.6 cm, $P = .001$), but there were no significant group differences in knee pain, flexion, or extension. All patients demonstrated significant improvements in subjective outcome scores between the preoperative and 6-month postoperative conditions ($P < .001$ for every score measured).

CONCLUSION: Clinical and statistical equivalence was found at postoperative 6 months between the early partial weightbearing and nonweightbearing groups among patients undergoing either an isolated FCL reconstruction or a combined ACL and FCL reconstruction. There were no significant differences observed between the groups regarding knee stability, pain, swelling, range of motion, or subjective outcomes. Given these findings, the authors recommend early partial weightbearing after isolated FCL reconstruction or combined ACL and FCL reconstruction.

Post-Operative Protocol

Use of Brace- 0 – 90 degrees Range of Motion

Brace for the first 6 weeks

Sports after 4 to 6 months

Brace during sports for first 6 months

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Thank You

Questions?