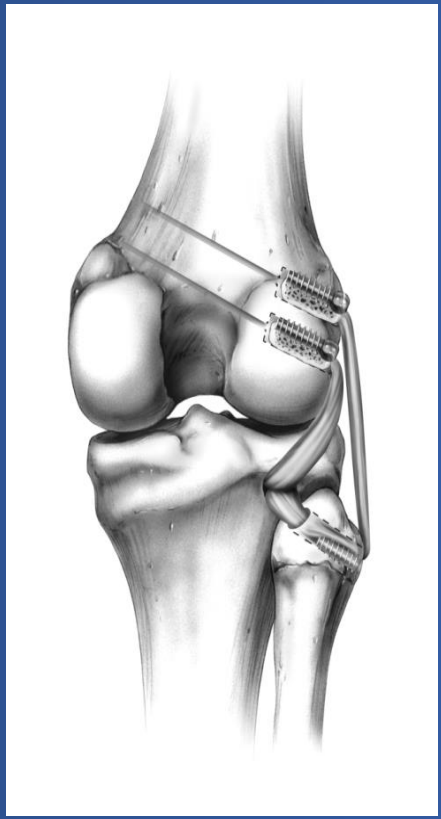
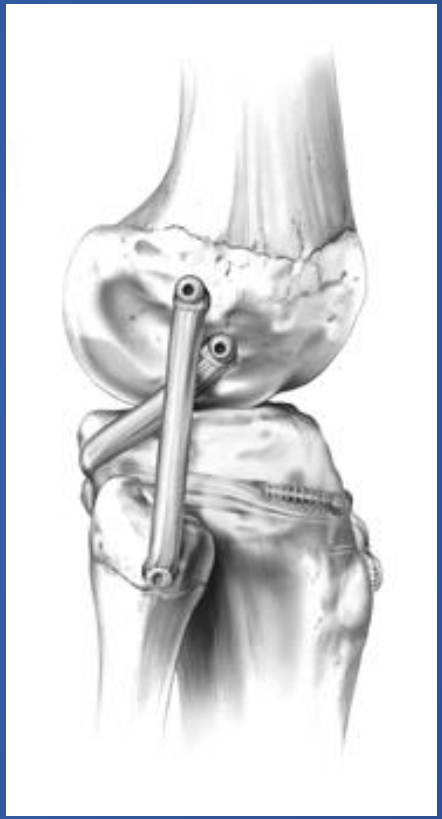
Posterolateral Corner Injuries of the Knee



TOA Annual Meeting
2022
Austin, TX

M. Brett Raynor, M.D.
Texas Orthopaedic Associates
Dallas, TX



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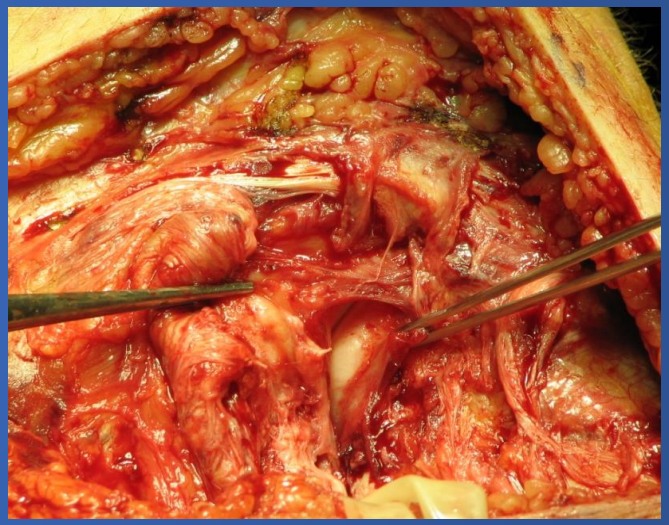
Background: The Problem with PLC Injuries

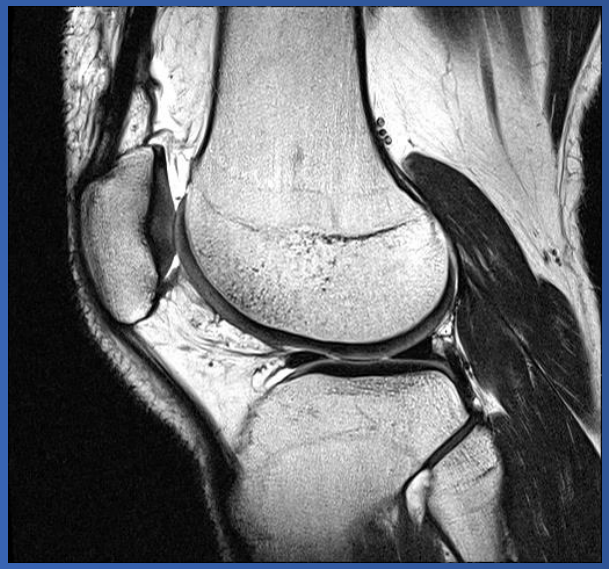
- Often missed diagnosis both clinically and on MRI
- Usually do no heal on their own
- Frequent cause of failed cruciate reconstructions
- Most traditional surgeries non-anatomic → Postop: often casted, rehab not defined
- Poor outcomes; high rate of recurrent varus > ER



Bony Anatomy

- Convex LFC articulates with convex LTP
- Inherently unstable
- This is why most PLC injuries do not heal

*Validated in animal models



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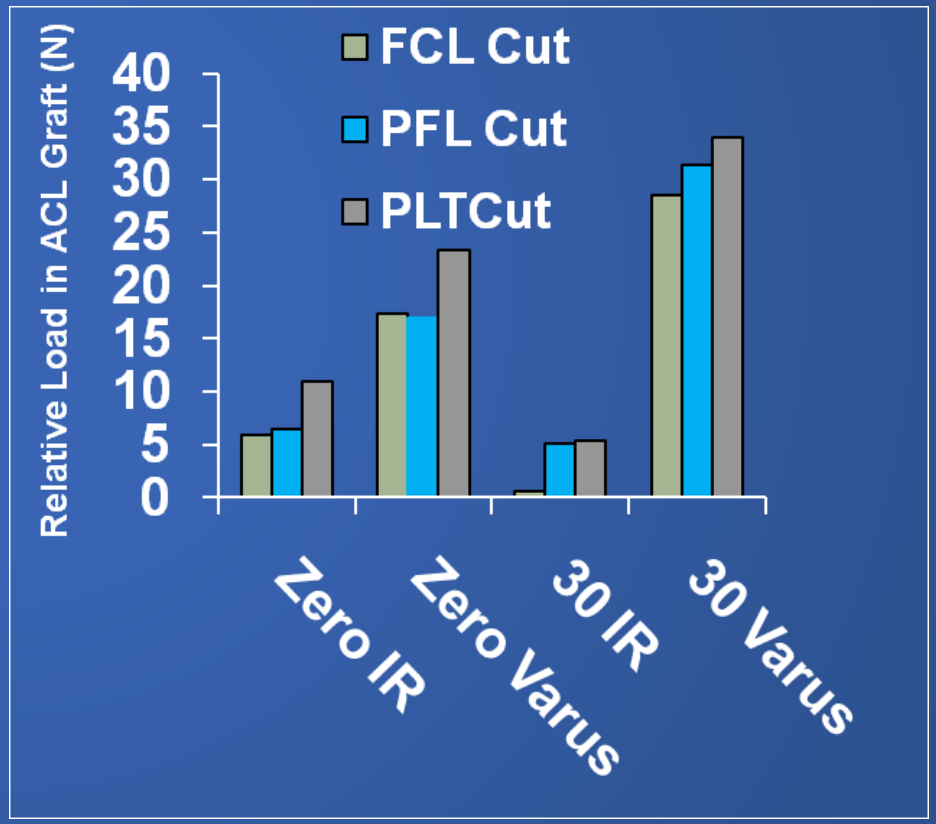
Animal Models of PLC Instability

- Verify if cut structures heal
- Verify natural history
  - Rabbit anatomy similar (JOR, 2003)
  - Rabbit instability created (JOR, 2004; AJSM, 2005)
  - Goat anatomy similar (JOR, 2005)
  - Goat surgery (JOR, 2008)
  - Canine model (JOR, 2007)
- Bony anatomy explains why PLC does not heal

Effect of PLC Injuries on ACL Reconstructions

(LaPrade, AJSM, 1999)

- Varus significantly loads ACL grafts
- Repair / reconstruct PLC injuries at time of ACLR to reduce risk of ACLR failure



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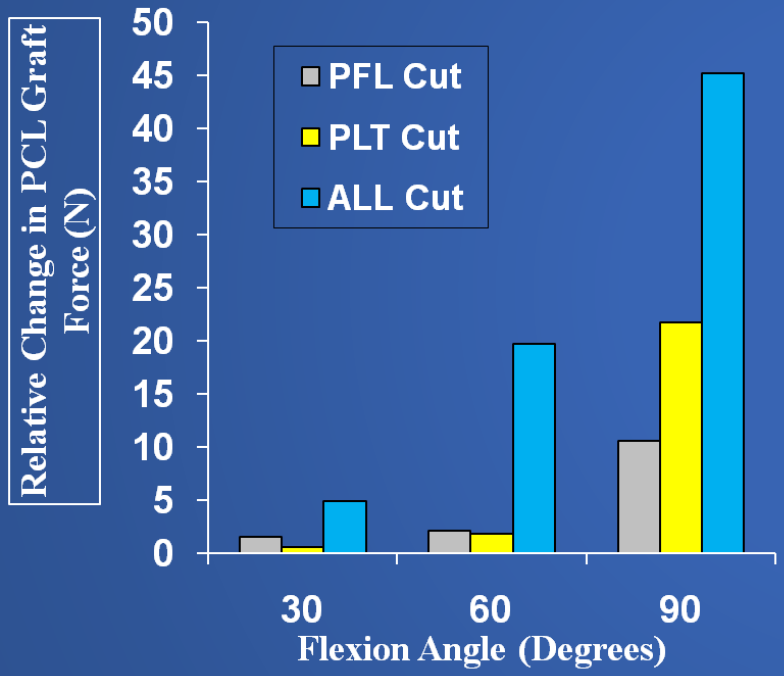
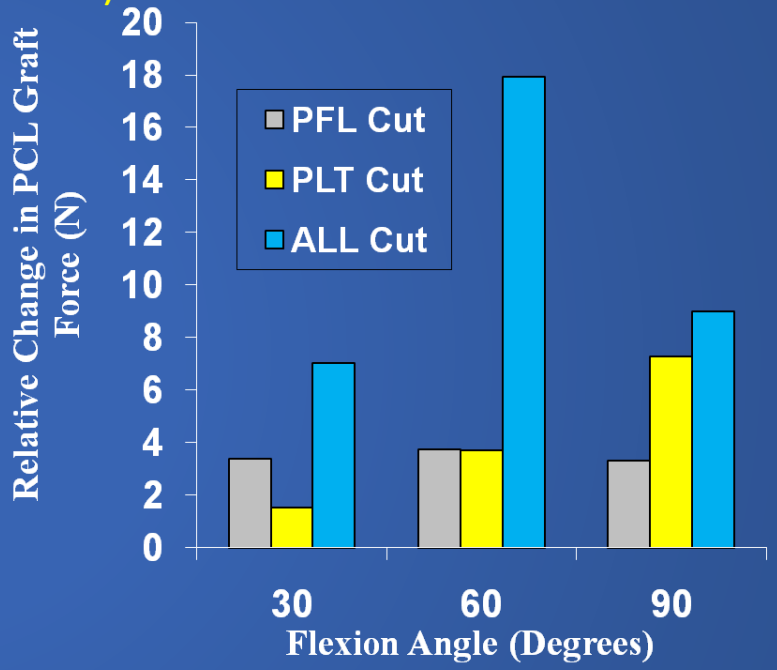
Effect of PLC Injuries on PCL Reconstructions

(LaPrade, AJSM, 2002)

- PCL grafts loaded with varus





- PCL grafts also loaded with PD & ER

*Repair/reconstruct PCL/PLC concurrently

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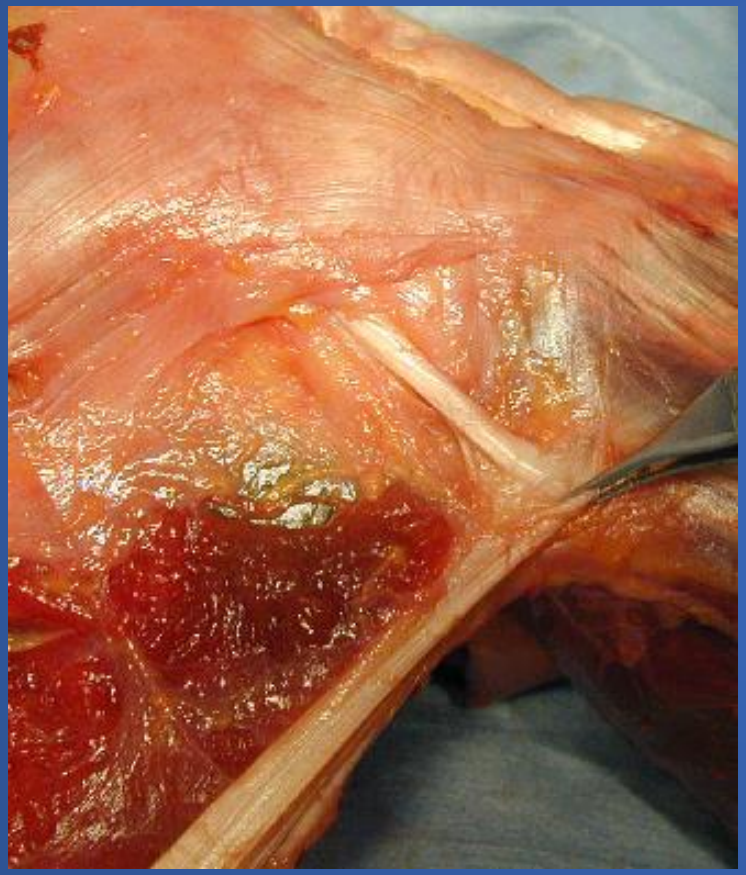
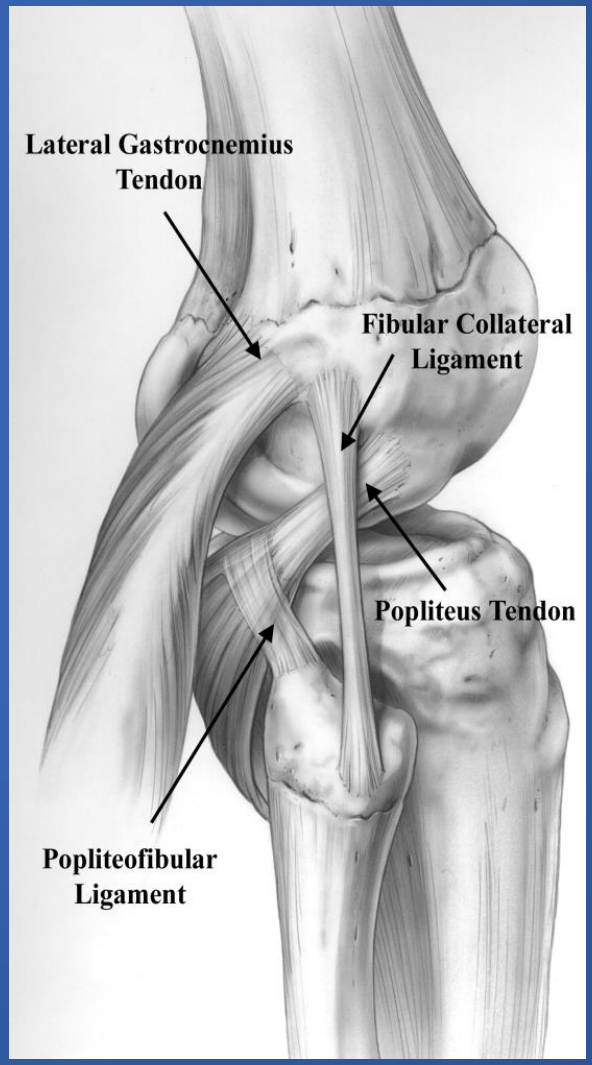
LaPrade: Defining and Quantifying the Anatomy

(Terry, 1996; LaPrade, 1998, 2002, 2003)





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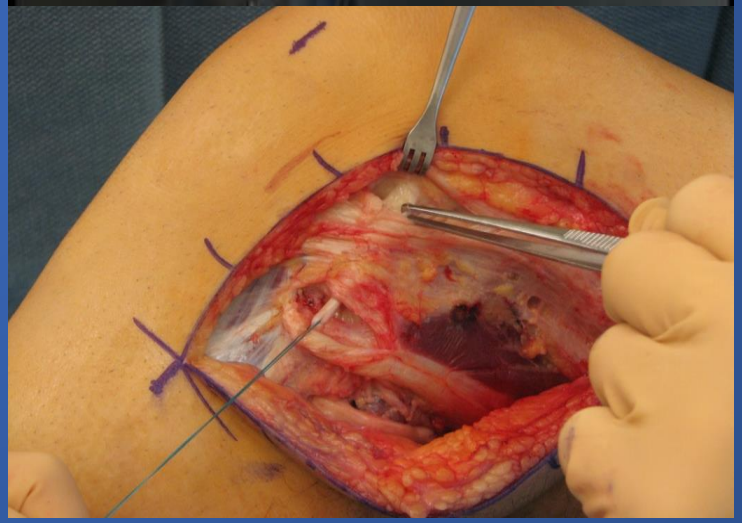
Fibular Collateral Ligament

(LaPrade, 2003)

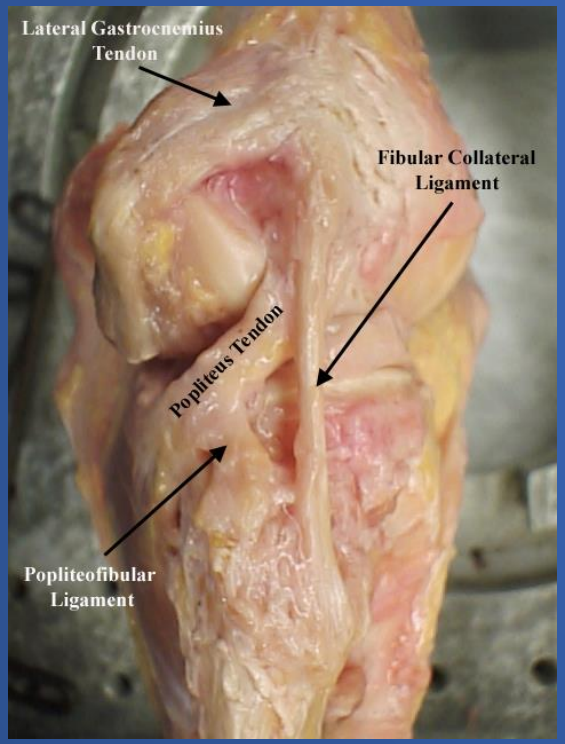
- Femoral attachment:
  - Proximal / posterior to lateral epicondyle
- Fibular attachment:
  - Midway along fibular head

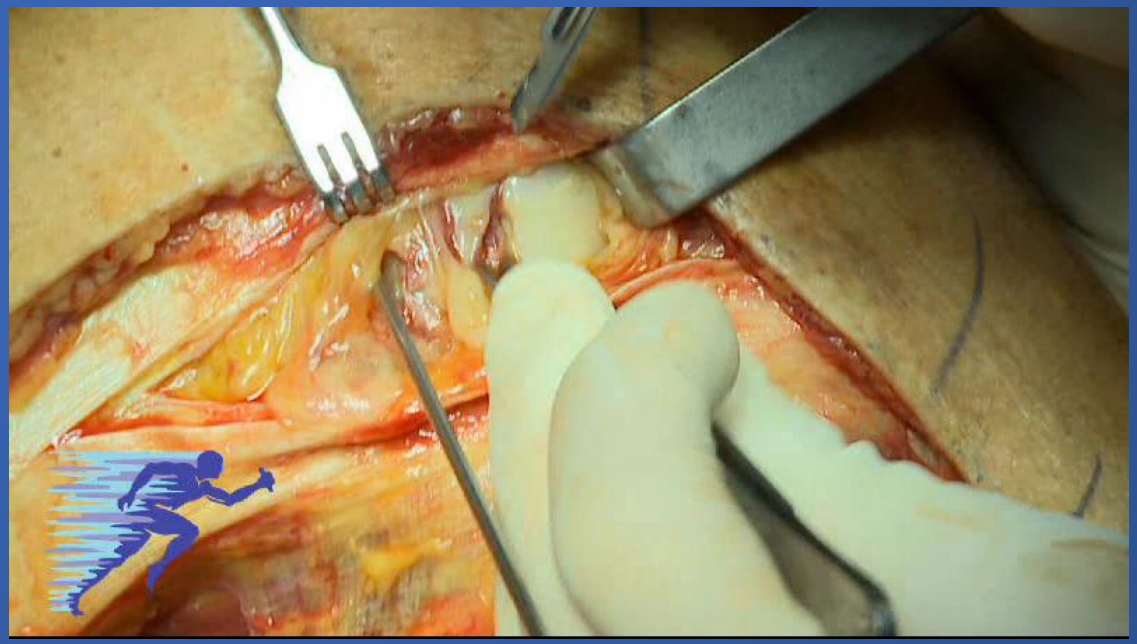


Popliteus Tendon

(LaPrade, 2003)

- Popliteus attachment on Femur
  - Attaches on anterior fifth of popliteal sulcus





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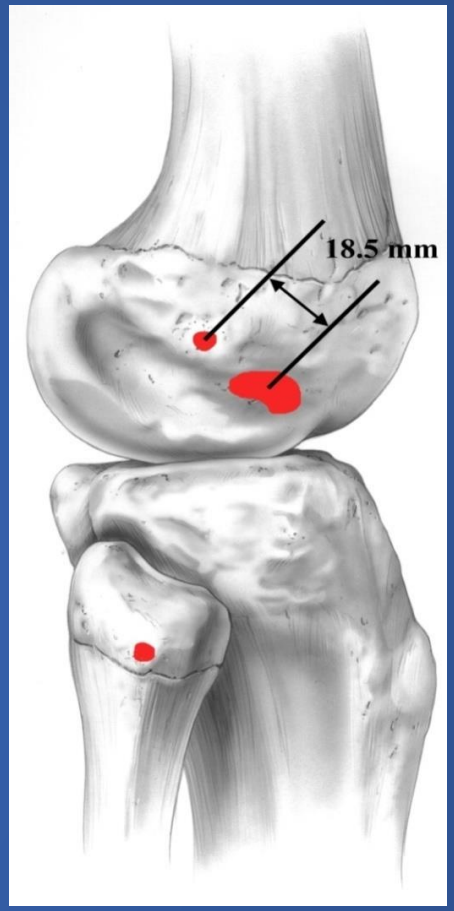
Popliteus Femoral Attachment Relationships

(LaPrade, 2003)

- Spatial Relationships
  - Average 18.5 mm distance between FCL and PLT
  - Important to recognize this relationship for repair and reconstruction procedures



HOW TO FIND THEM

External Rotation Recurvatum Test

- Lift big toe, stabilize thigh (Hughston, 1980)
- Assess recurvatum
- Indicative of combined ligament injury (usually PLC/ ACL)

(Griffith & LaPrade, AJSM, 2008)

*Measure Heel Heights

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Varus Stress Test at 20°

(Hughston, 1966)

- Put fingers over joint line
- Apply stress through foot/ankle, not the leg
- Check contralateral knee

*Assess for mm of gapping

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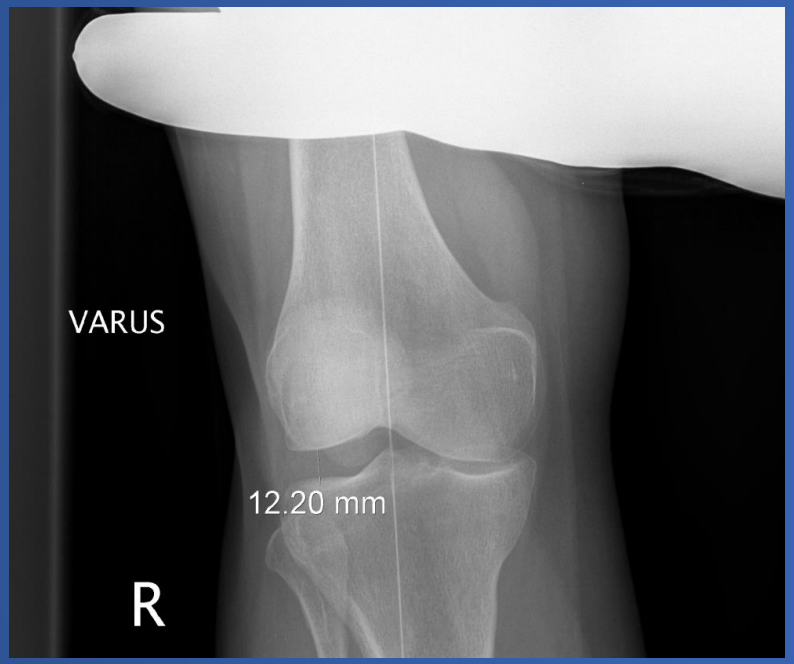
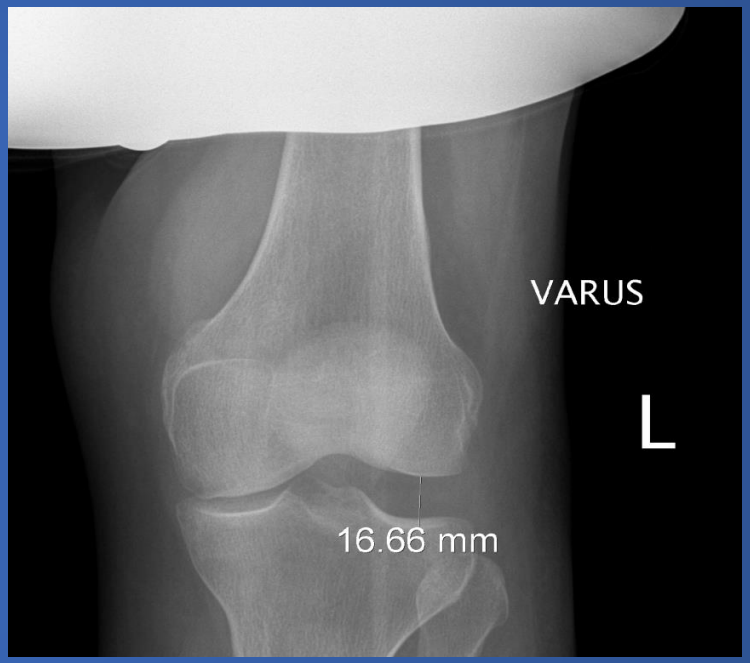
Varus Stress X-rays (Objective)

(LaPrade, JBJS, 2008)





- Side – to – side difference
- > 2.7* mm – FCL tear
- > 4 mm – complete posterolateral tear

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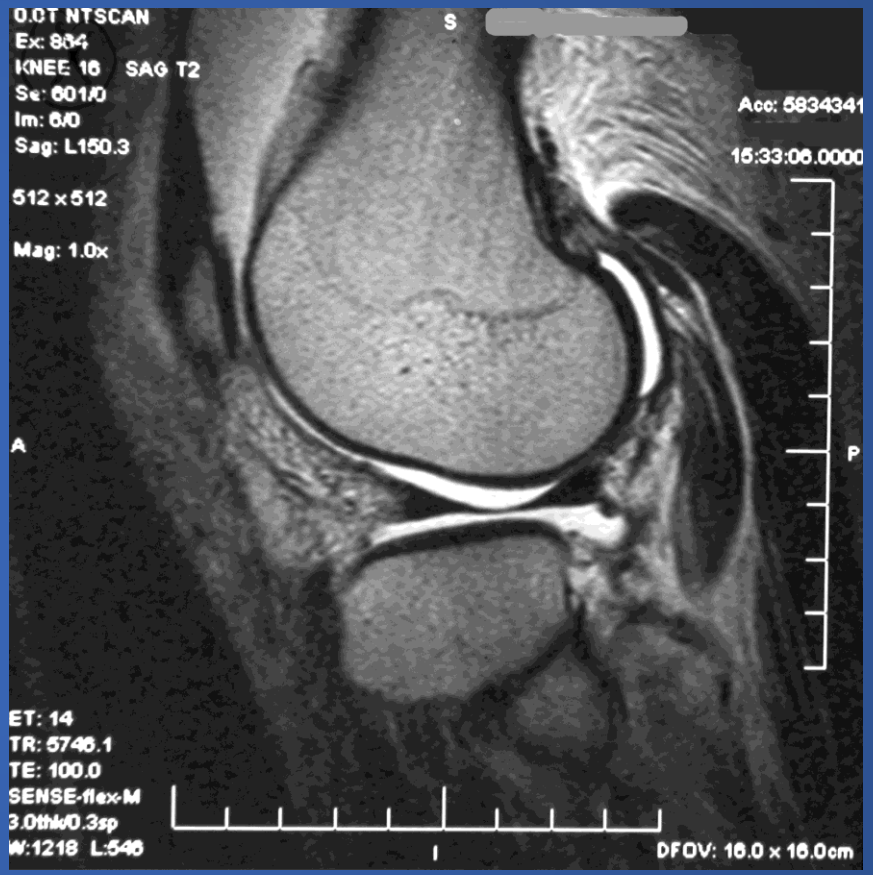
What to Look for on MRI



*Lateral gapping, biceps avulsions, bone bruises, etc

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Location of PLC Bone Bruises

(Geeslin and LaPrade, AJSM, 2010)

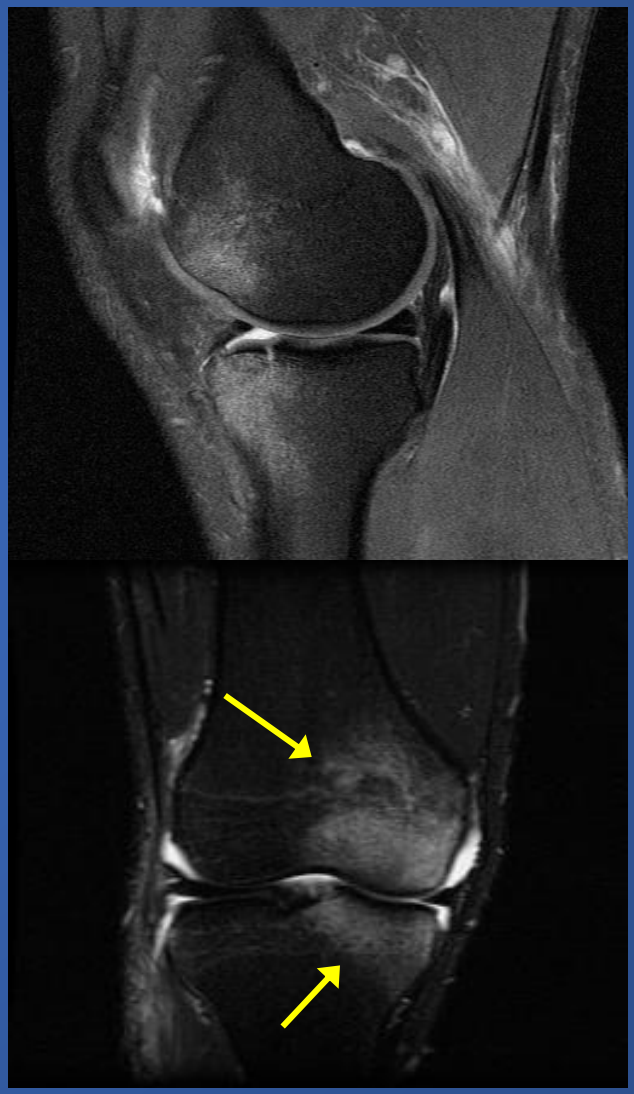
102 acute patients

55% Anterior MFC bone bruises

11% Anterior MTP fractures

29% Posteromedial bruises with ACL/PLC

AM bone bruise R/O PLC tear



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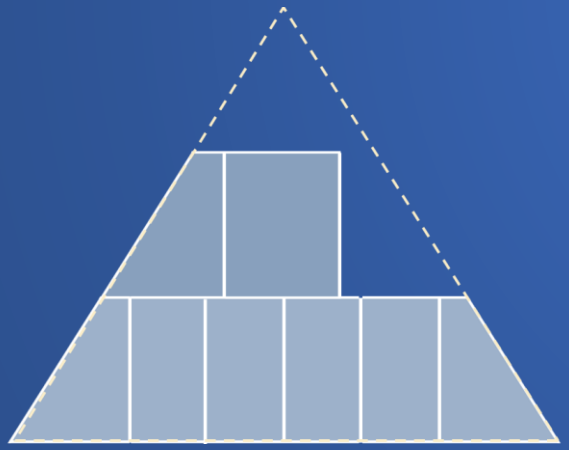
HOW TO FIX THEM

Development of Anatomic Reconstruction of FCL / PLT / PFL

Identified need for anatomic reconstruction

Built on previous studies



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Outcomes of an Anatomic Posterolateral Knee Reconstruction

By Robert F. LaPrade, MD, PhD, Steinar Johansen, MD, Julie Agel, MA, May Arna Risberg, PT, PhD, Havard Moksnes, PT, and Lars Engebretsen, MD, PhD

Background: Chronic posterolateral knee injuries often result in substantial patient morbidity and functional instability. The clinical stability and functional outcomes following anatomic reconstructions in patients with a chronic posterolateral knee injury have not been determined, to our knowledge.

Methods: A two-center outcomes study of sixty-four patients with grade-3 chronic posterolateral instability was performed. The patients were evaluated subjectively with the modified Cincinnati and International Knee Documentation Committee (IKDC) subjective scores and objectively with the IKDC objective score.

Results: Eighteen patients had an isolated posterolateral knee reconstruction, and forty-six patients underwent a single-stage multiple-ligament reconstruction that included reconstruction of one or both cruciate ligaments along with the posterolateral knee reconstruction. The average duration of follow-up was 4.3 years. The fifty-four patients who were available for follow-up had an average total Cincinnati score of 65.7 points. A significant improvement was found between the preoperative and postoperative IKDC objective scores for varus opening at 20°, external rotation at 30°, reverse pivot shift, and single-leg hop.

Conclusions: An anatomic posterolateral reconstruction resulted in improved clinical outcomes and objective stability for patients with a grade-3 posterolateral knee injury.

Level of Evidence: Therapeutic Level IV. See Instructions to Authors for a complete description of levels of evidence.

Primary repair of posterolateral knee injuries has been reported to yield good results if performed acutely within the first three weeks after the injury[1-4]. However, primary repair is not always performed or possible, given a delay in the diagnosis or treatment, and various reconstructions, tenodeses, osteotomies, and advancement procedures have been described for chronic posterolateral knee injuries. These include reconstruction of the fibular collateral ligament[5], fibular collateral ligament allograft reinforcement[3], femoral bone-block advancement[2,6], biceps femoris tenodesis[8-13], proximal tibial osteotomy[4,14,17], reconstruction of the popliteus tendon and popliteofibular ligament with use of a split patellar tendon graft[3], popliteus recess procedures[18], and use of a central slip iliotibial band or biceps femoris graft[3,13,19]. The goal of all of these reconstructions is to reproduce the function of the posterolateral knee structures. However, they do not anatomically reconstruct the main posterolateral structures, and we theorized that, in order to restore optimal stability, the procedure should be based on the normal anatomy.

To our knowledge, there have been no clinical outcome studies of an anatomic posterolateral knee reconstruction. In 2004, we described an anatomic posterolateral reconstruction

Disclosure: In support of their research for or preparation of this work, one or more of the authors received, in any one year, outside funding or grants of less than $10,000 from the University of Oslo School of Medicine Orthopaedic Center. Neither they nor a member of their immediate families received payments or other benefits or a commitment or agreement to provide such benefits from a commercial entity.

A video supplement to this article will be available from the *Video Journal of Orthopaedics*. A video clip will be available at the JBJS web site, www.jbjs.org. The *Video Journal of Orthopaedics* can be contacted at (805) 962-3410, web site: www.vjortho.com.

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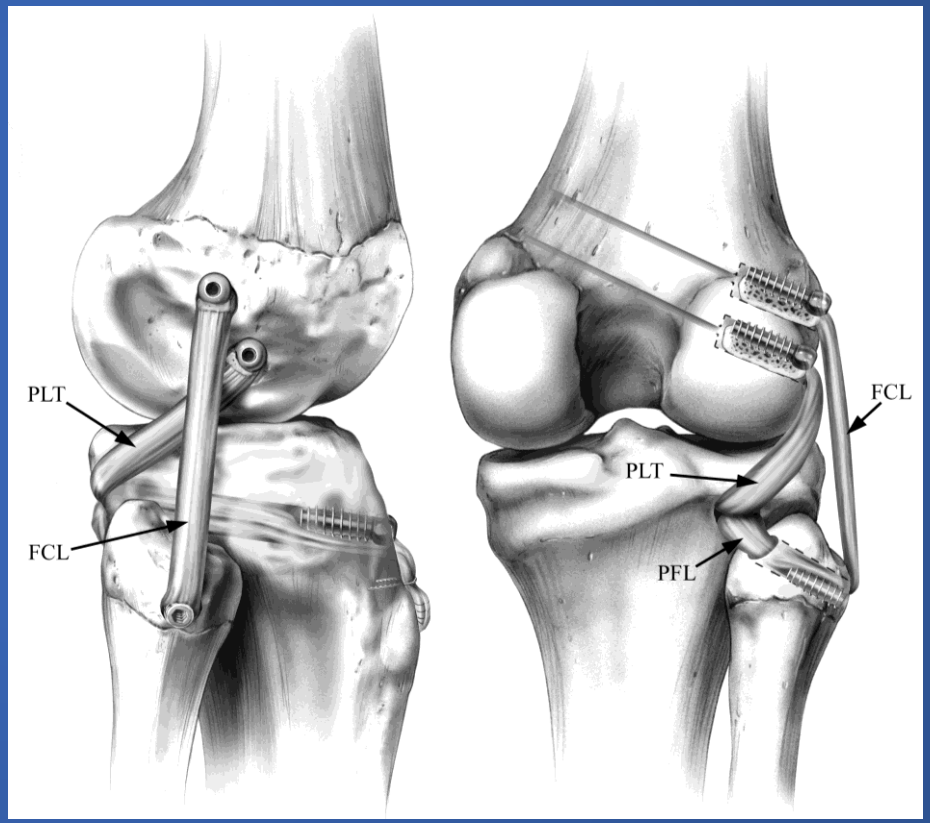
Anatomic PLC Reconstruction

(LaPrade, AJSM, 2004)

- FCL, PLT, PFL anatomically reconstructed
- Split achilles allograft



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Treatment of Acute Posterolateral Knee Injuries

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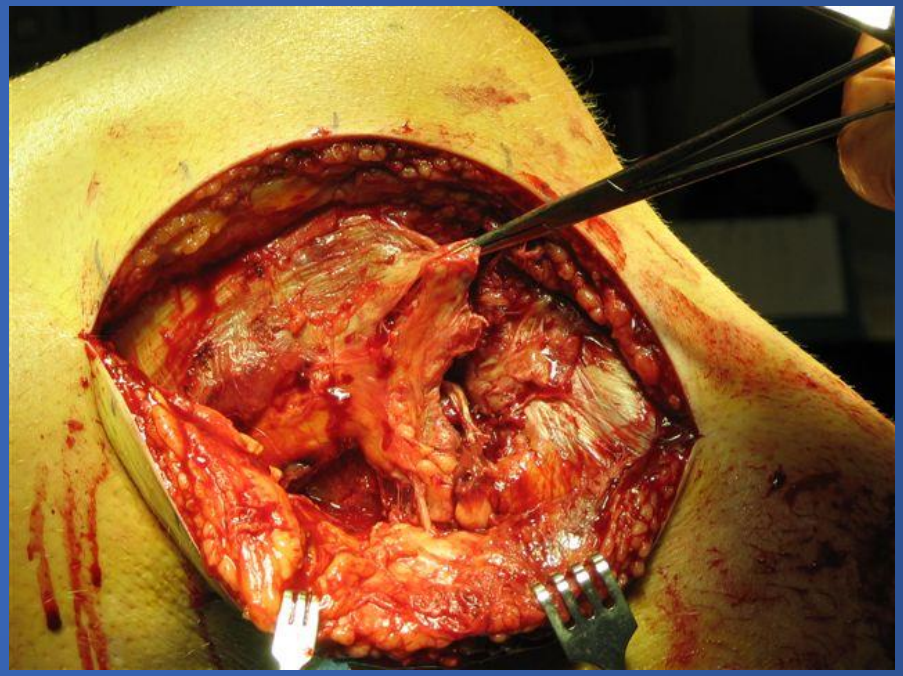
Preoperative Planning

- Identify injury pattern (exam, MRI)
- Try to operate within first 2-3 weeks
- ID peroneal nerve injuries
- Address all torn structures



***Send to PT if stiff**

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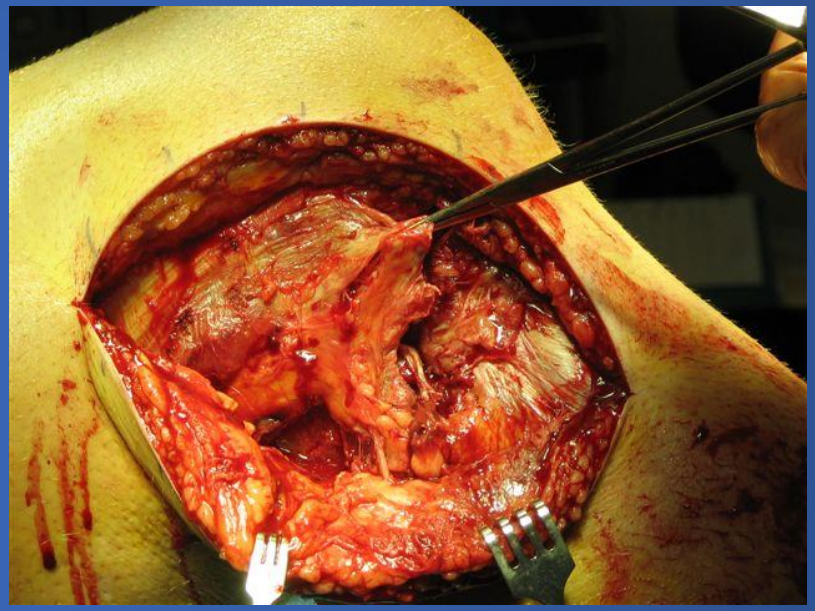
Surgical Steps

1. Posteriorly based flap
2. Peroneal neurolysis
3. Prepare tunnels at attachment sites
4. Address intra-articular pathology
5. Prepare grafts
6. Pass / fix grafts



*** No tourniquet needed**

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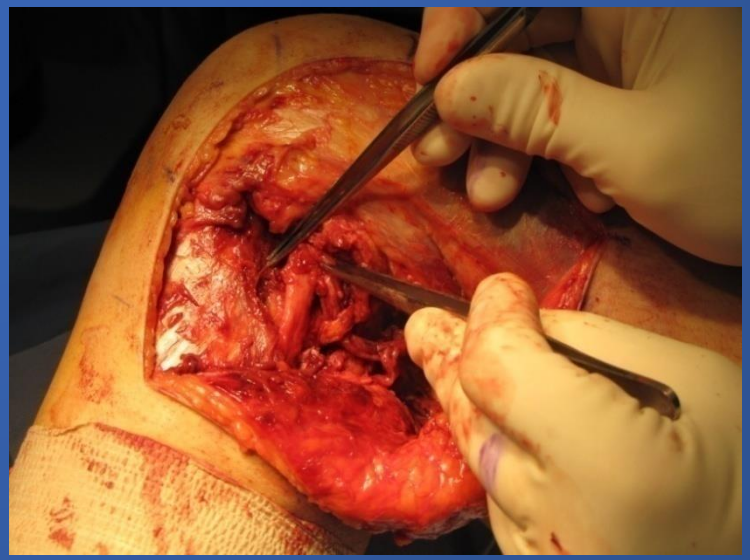
Peroneal Neurolysis

- Along posterior border of long head of biceps
- Gain Access to PFL / posterior knee
- Use caution for biceps avulsions



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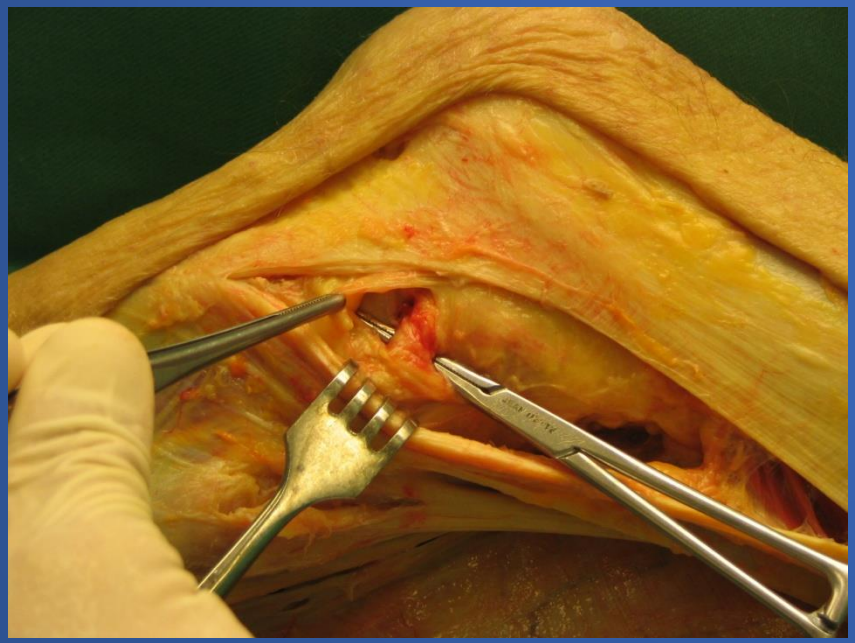
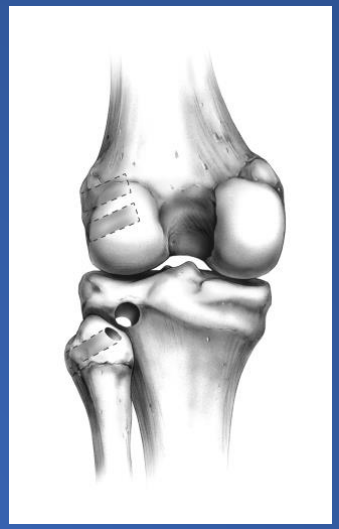
Identify Fibular FCL / PFL Attachments

- Enter biceps bursa → FCL is usually with the biceps
- ID attachment of FCL



PLCR Fibular Tunnel



Guide pin placement:

- Enter fibula at FCL attachment
- Exit at PFL attachment
- 7 mm reamer

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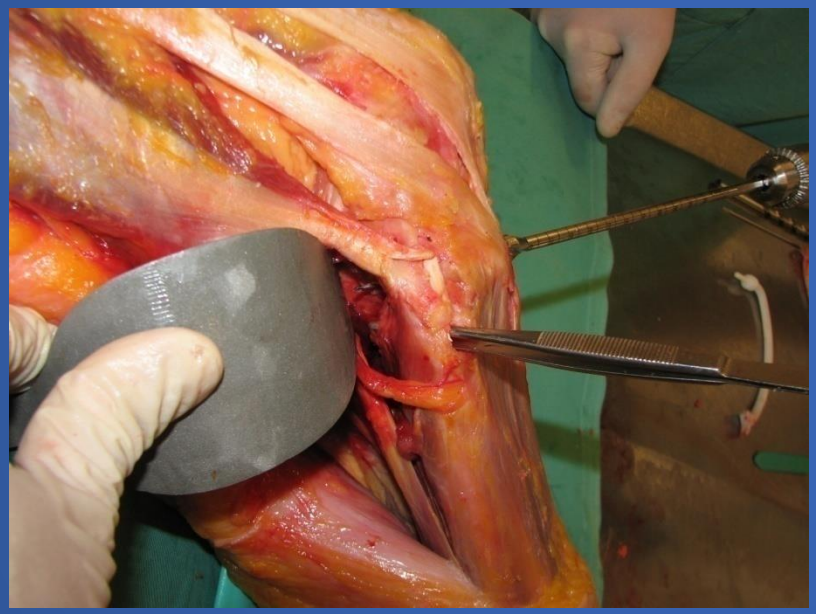
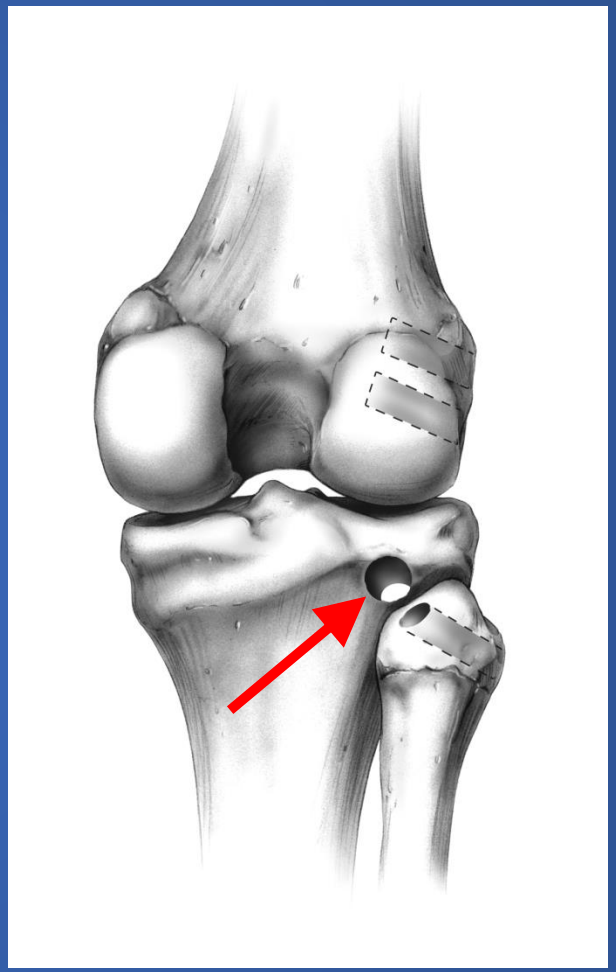
Tibial Tunnel

- Tibial tunnel (9 mm)
  - AP from Gerdy's to popliteus musculotendinous junction



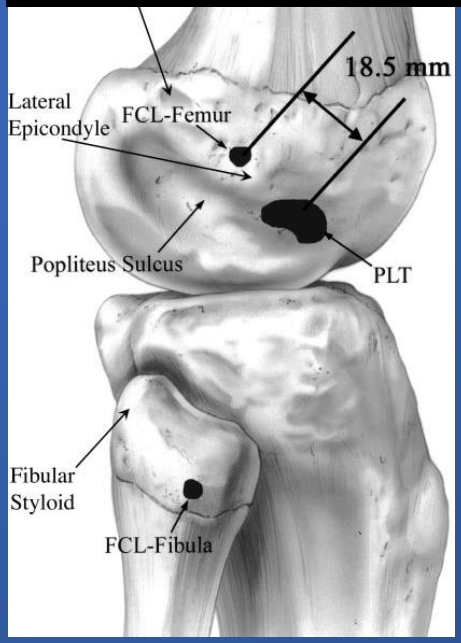


Iliotibial Band Split

(Terry and LaPrade, 1997)

- Split iliotibial band in line with its fibers (Gerdy's tubercle and proximal)

- ID FCL and PLT femoral attachments (18.5 mm apart) (LaPrade 2003)



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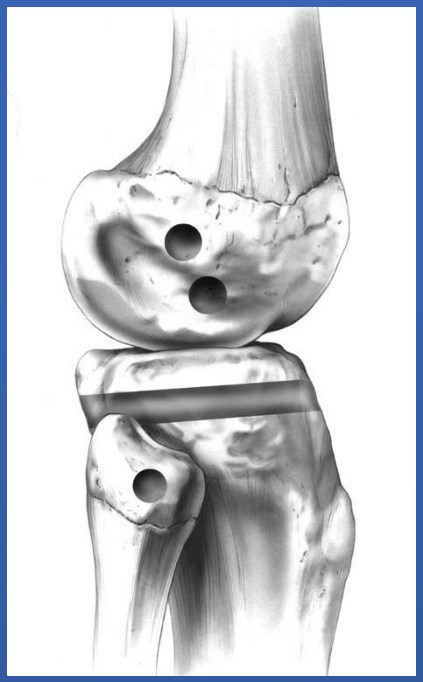
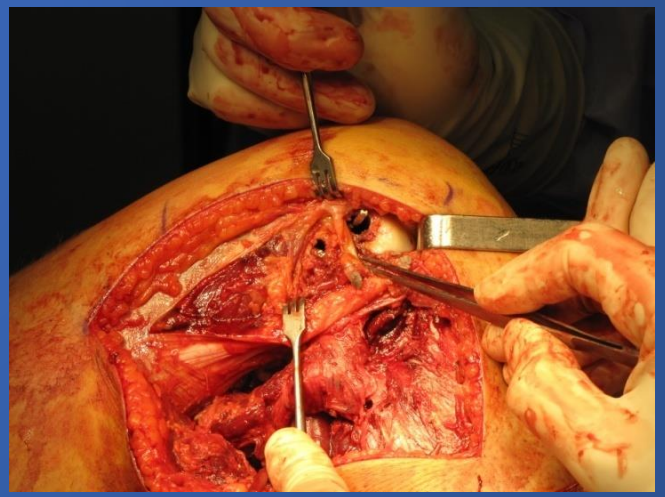
PLCR Femoral Tunnels

- Eyelet pins through femoral attachments of FCL & PLT
  - FCL - slightly proximal and posterior to lateral epicondyle
  - PLT on anterior fifth of popliteus sulcus
  - 18.5 mm between attachment sites
  - Ream (9 mm) over beath pins (20 mm deep)





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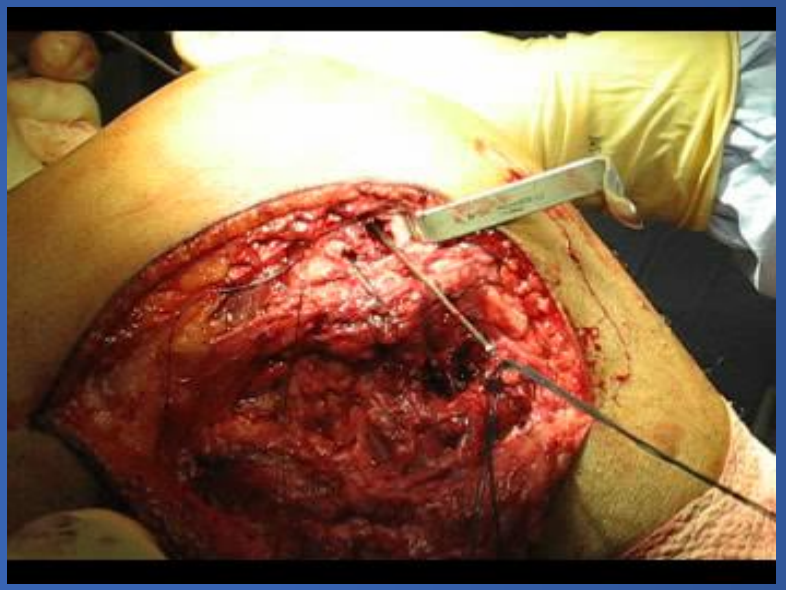
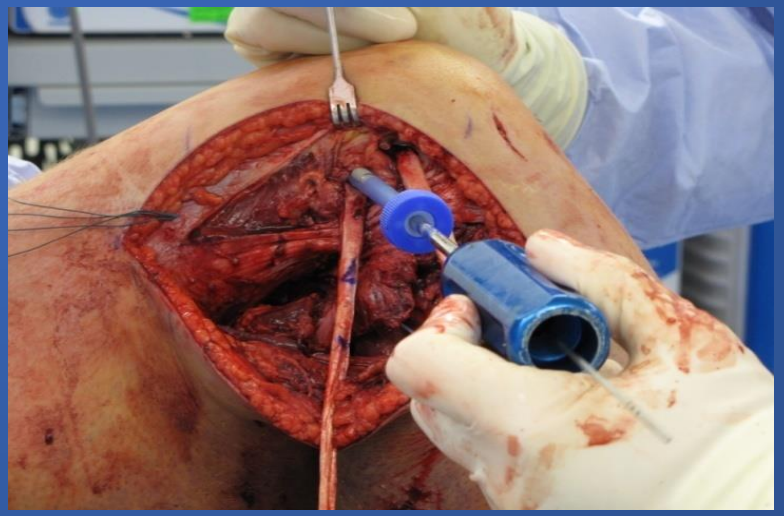
Pass Grafts Into Femur

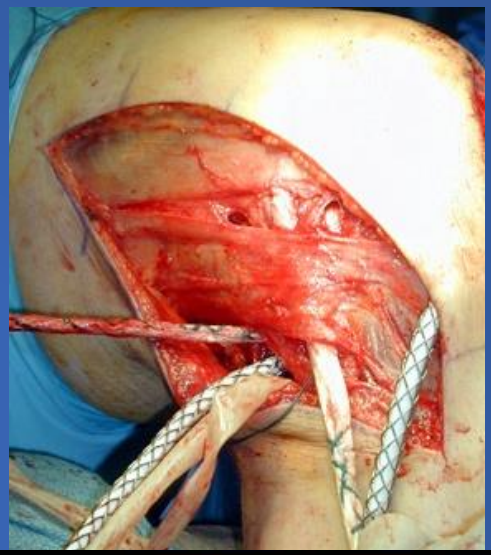
- Eyelet pins
- Secure with interference screws





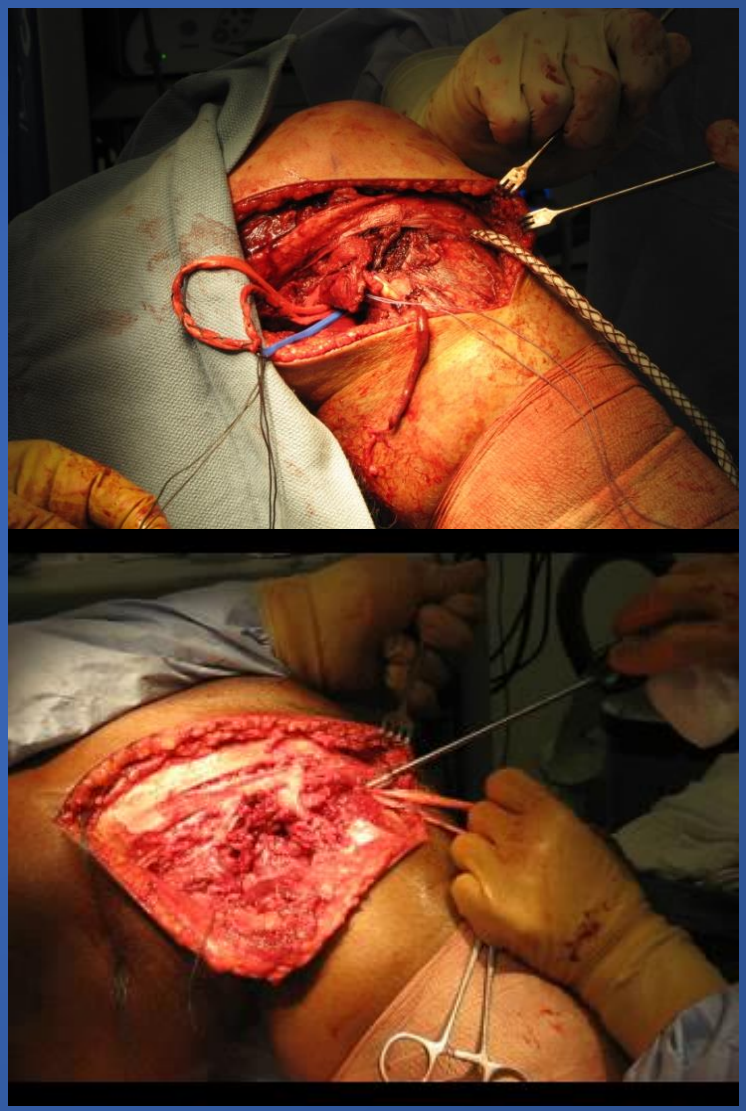
FCL Graft Passage

- Pass FCL graft under superficial layer of ITB and long head biceps, then through fibular head
- Fix FCL graft in fibular head at 20°, neutral rotation, and valgus force



PLT and PFL Graft Passage - Tibia

- Pass PFL & PLT grafts anterior through tibial tunnel
- Fix on tibia with 9 mm screw



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PLCR Postop Rehab

- NWB 6 wks
- ROM as tolerated
- Exercise bike – POW #7
- Avoidance of isolated hamstrings x 4 months

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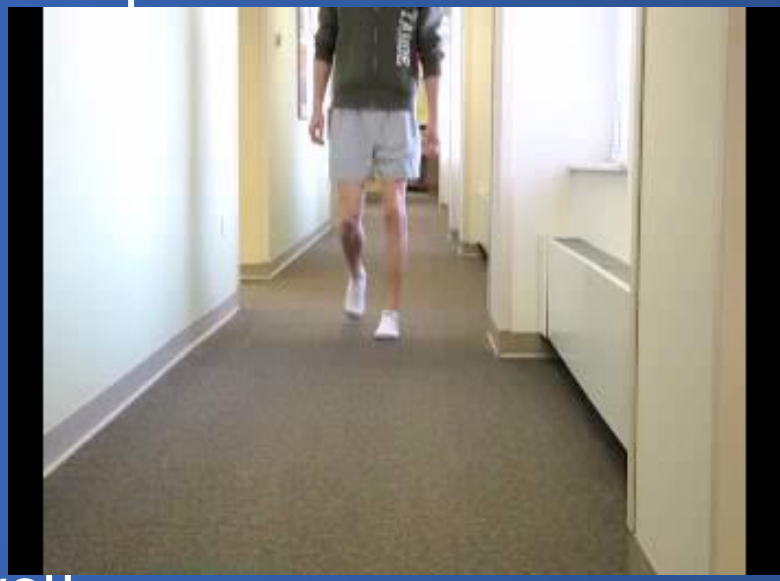
Outcomes of Acute Hybrid Repairs/Reconstructions

- Early identification and treatment important!
- Geeslin, LaPrade (JBJS, 2011)
  - 30 Knees, 2.4 yr F/U
  - IKDC Preop = 29.1,
    Postop = 81.5
  - Varus Stress Preop = 6.2 mm,
    Postop = 0.1 mm
  - 8 isolated, 22 combined
- Midsubstance repairs do not do well
  - (37- 40% failure) (Stannard 2005, Levy 2010)



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Summary: Improving PLC Treatment Outcomes

- Understand Anatomy
- FCL, PLT, & PFL main stabilizers
- Use MRI and stress x-rays to confirm Dx
- Plan hybrid repairs/reconstructions for acute treatment
- Assess for alignment in chronic PLC injuries
- Consider anatomic PLC reconstructions
- No longer the “Dark Side” of the knee

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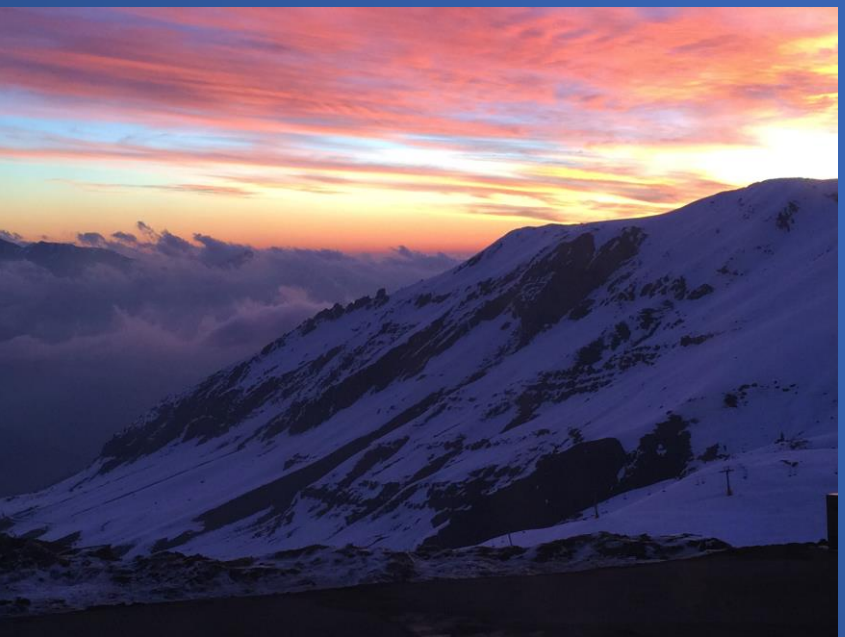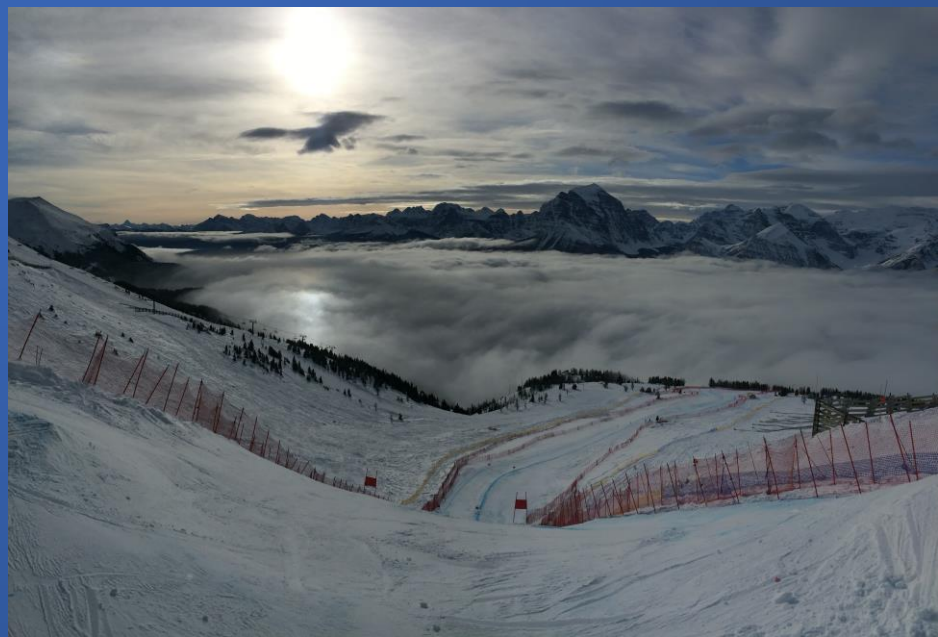
Thank You