



Posterolateral Corner

Anatomy, Physical Examination and Imaging

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Lateral Anatomy of Knee

- Complex anatomy
- Many variations
- Inconsistent terminology

DARK SIDE OF THE KNEE



Phlogenetical Evaluation

- **360 million years ago** → **tibio-femoral joint**
fibulo-femoral joint
- **Distal migration of fibula** → **tibio-fibular joint**
 - Femoral capsular attachments → lateral collateral structure
 - Fibulofemoral meniscus → intra-articular popliteus tendon
 - Fibular attachments of popliteus → popliteofibular ligament

Dynamic Components

- **Popliteus muscle and tendon**
- **Biceps femoris muscle**
- **Lateral gastrocnemius muscle**
- **Iliotibial band**

Static Components

- **Lateral collateral ligament**
- **Fabellafibular ligament**
- **Arcuate ligament**
- **Popliteofibular ligament**
- **Posterolateral capsule**

Topographic Anatomy

Seebacher – 1982

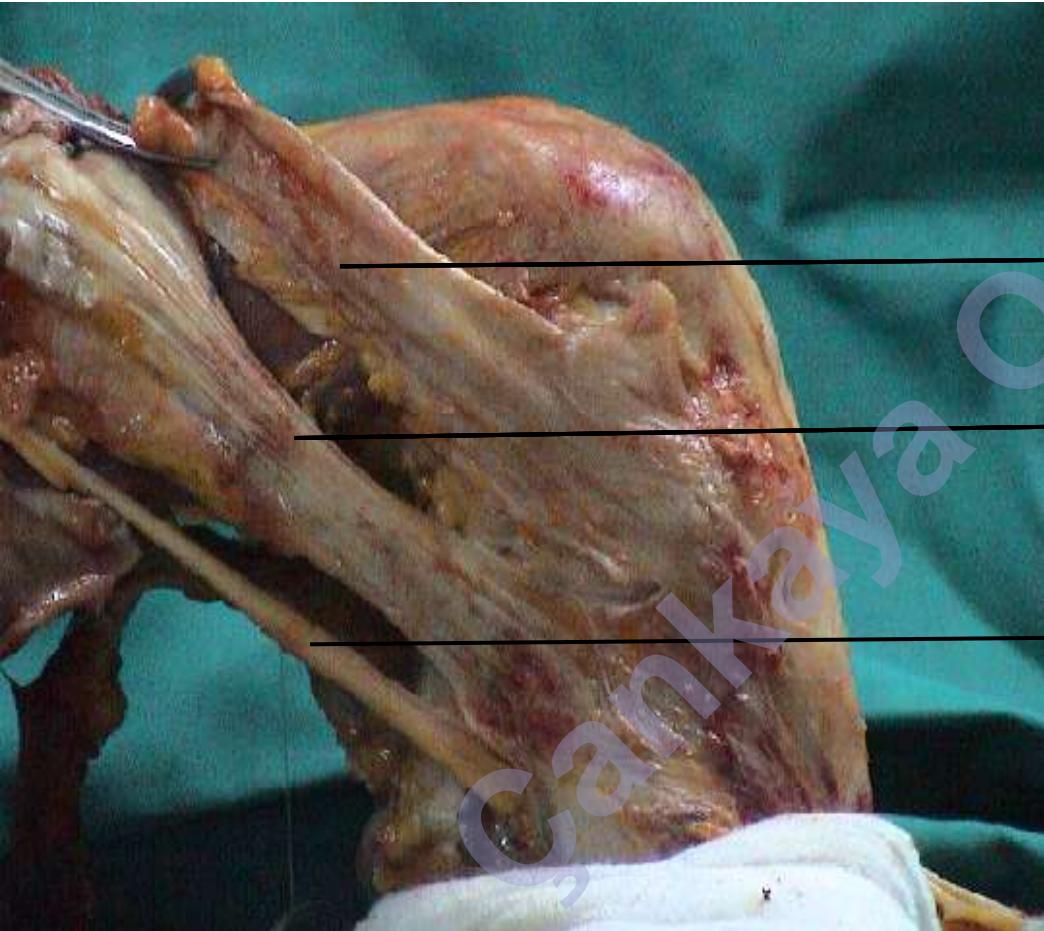
- Superficial layer
- Middle layer
- Deep layer

Superficial Layer

- Iliotibial band
- Biceps femoris



Superficial Layer



Iliotibial band

Biceps femoris

Peroneal nerve

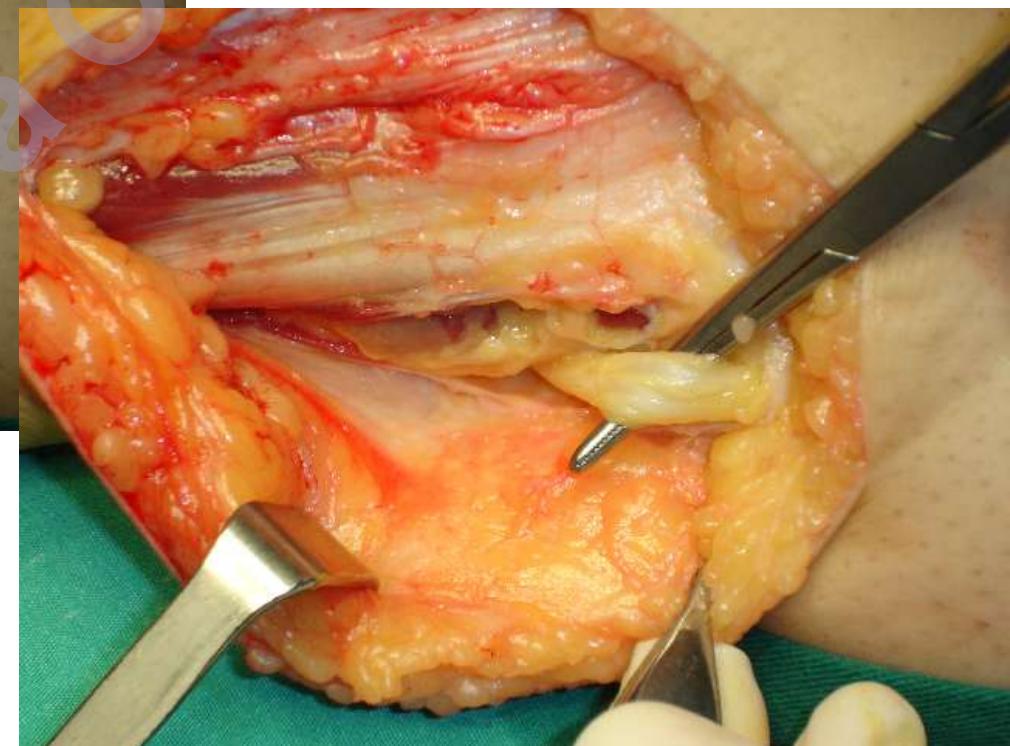
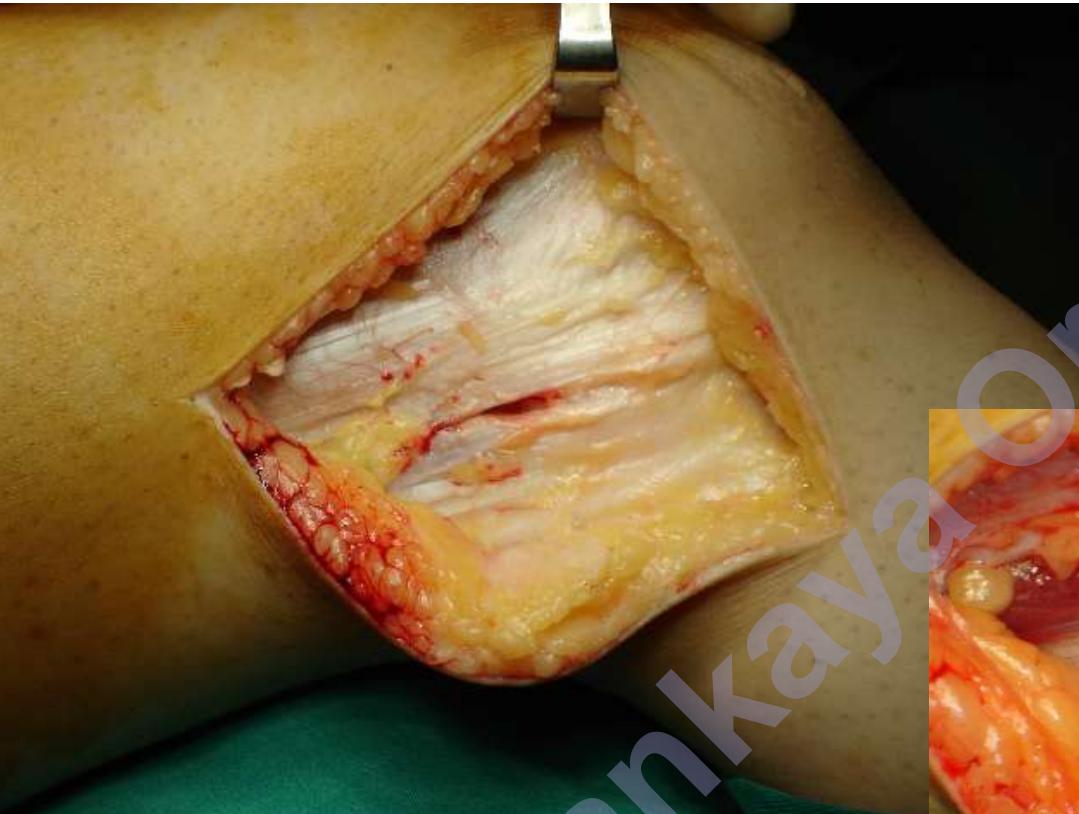
Superficial Layer



Gerdy tubercle

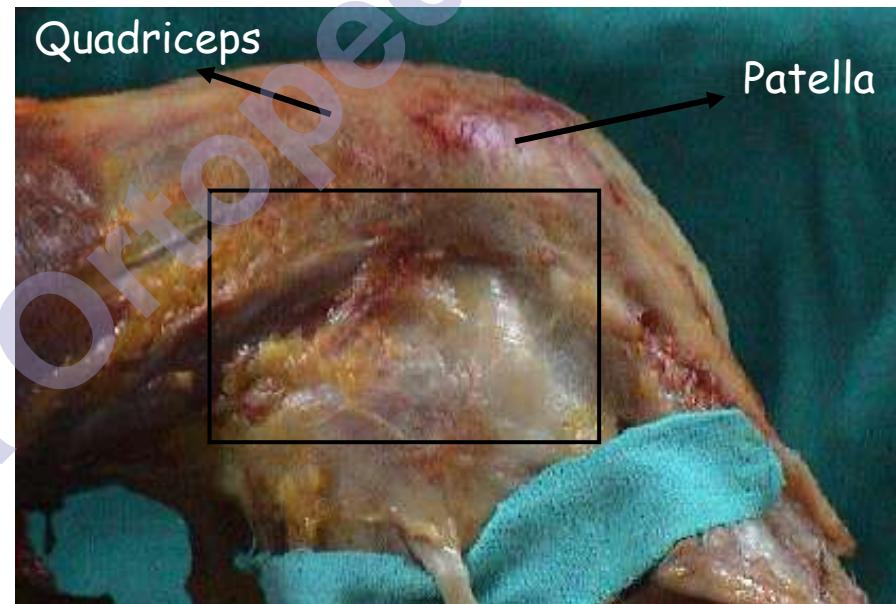
Lateral fibular head

Superficial Layer



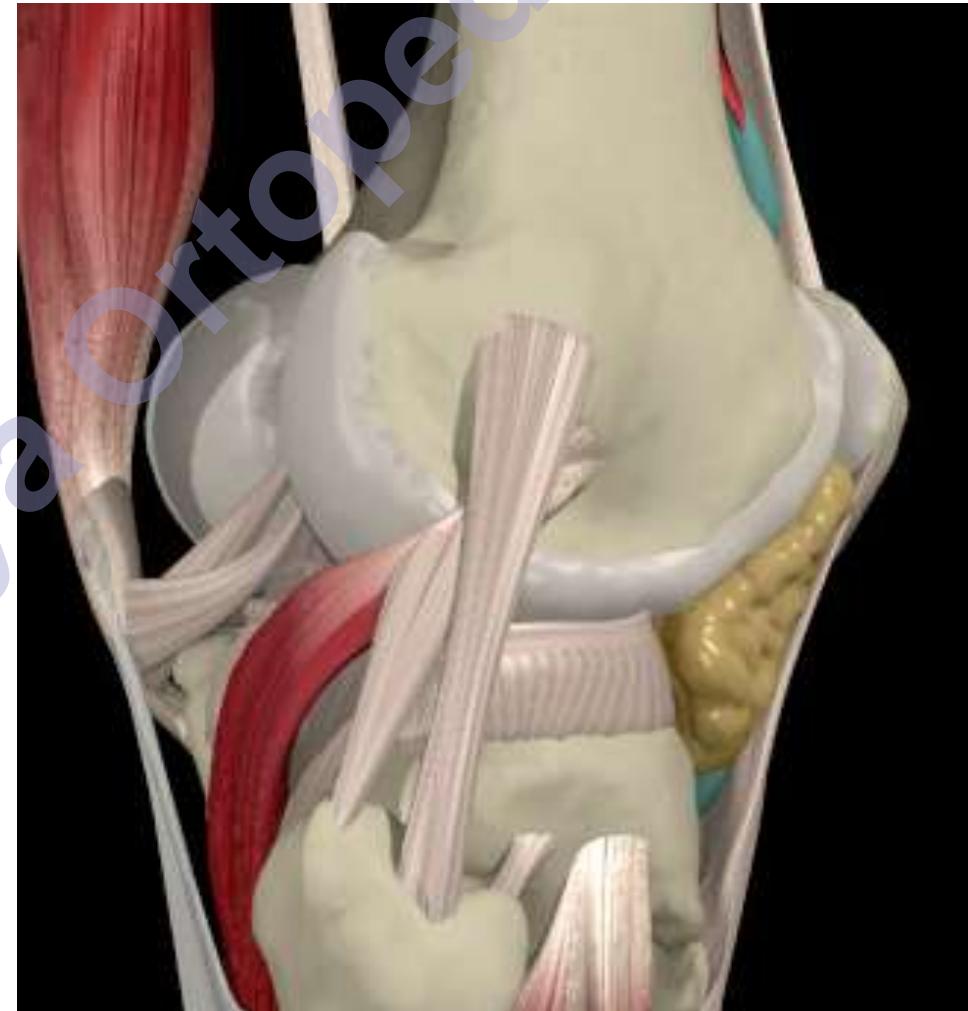
Middle Layer

- **Quadriceps retinaculum**
- **Patellofemoral ligaments**
 - Proximal
 - Distal
- **Patellomeniscal ligament**



Deep Layer

- **Lateral collateral lig.**
- **Popliteal complex**
 - Popliteus tendon
 - Popliteal hiatus
 - Popliteofibular lig.
- **Fabellofibular lig.**
- **Arcuate lig.**
- **Lateral capsule**
 - Coronary lig.
 - Midlateral capsular lig.

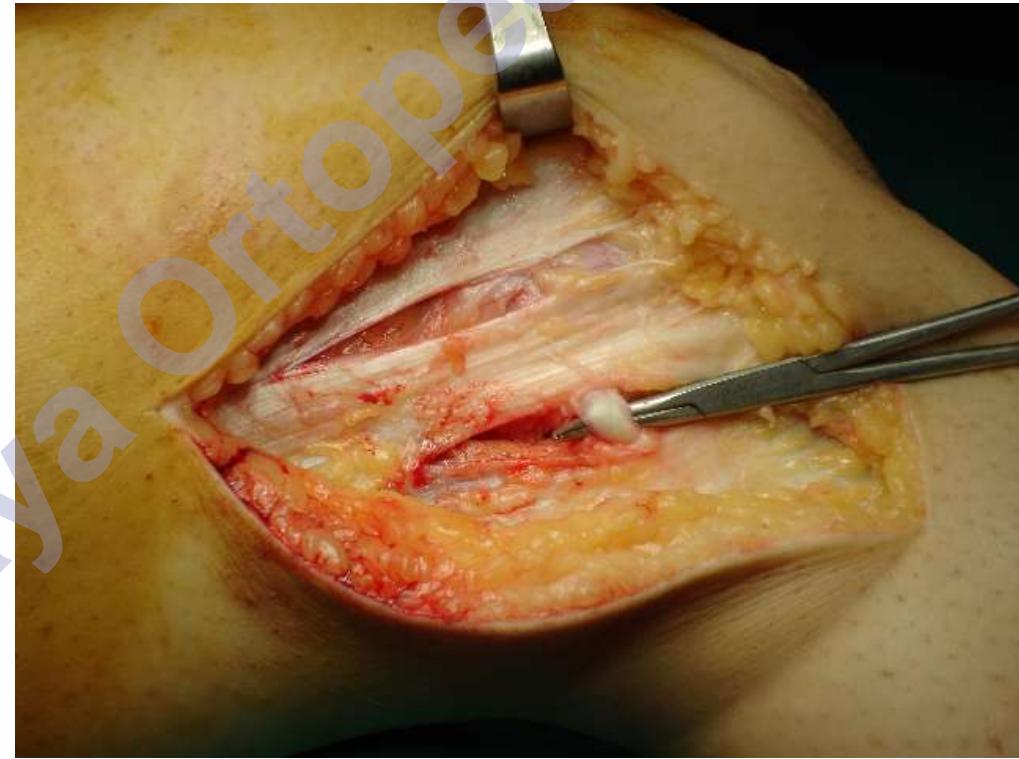


Lateral Collateral Lig.

- **Lateral epicondyle**
 - 1.4 mm prox., 3.1 mm post.
- **Lateral fibular head**
 - 8 mm posterior to ant. border
- **~ 6-7 cm length**
~ 0.5-1 cm width
- **Prox-ant → distal-post**

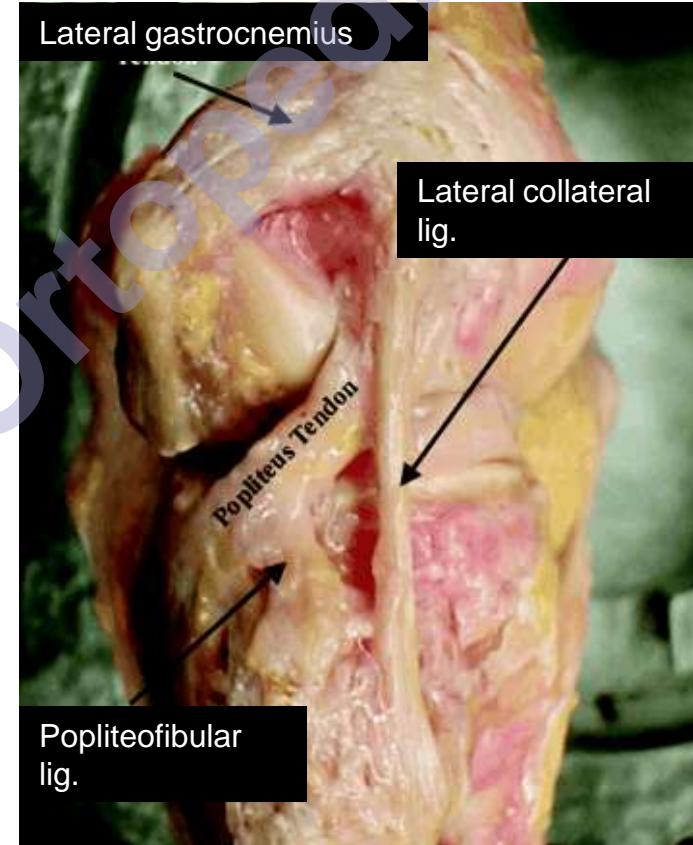


Lateral Collateral Lig.



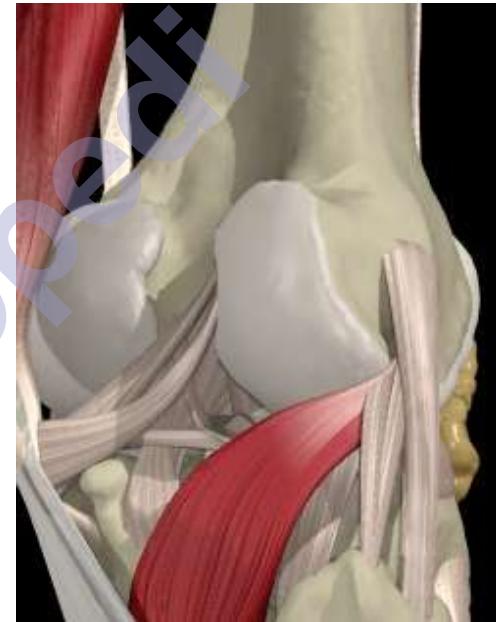
Popliteus Complex

- **Dynamic component**
 - Popliteus muscle
 - Popliteus tendon
- **Static component**
 - Popliteomeniskal fascicle
 - Popliteofibular lig.



Popliteus Tendon

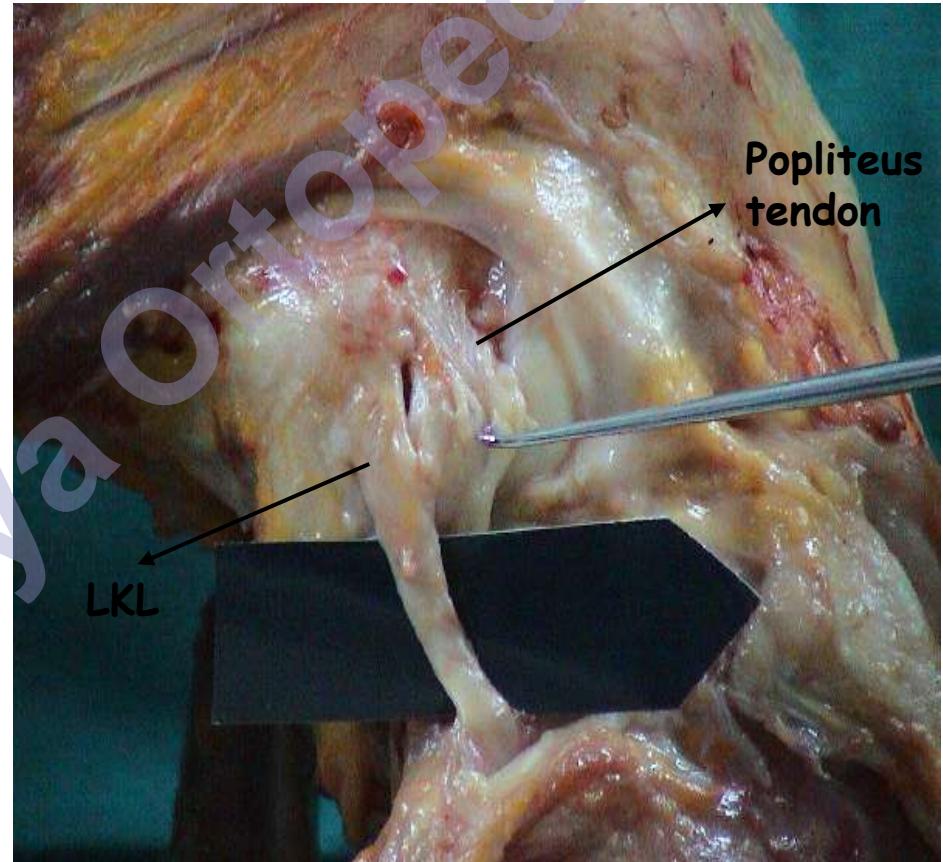
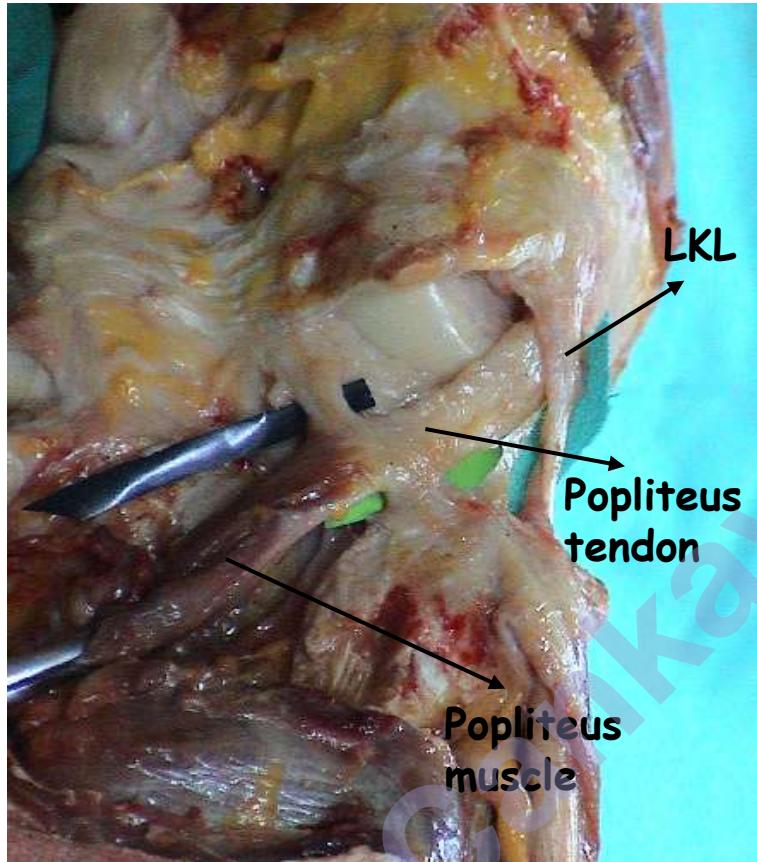
- 45° at coronal and sagittal plane
- Popliteus muscle → tibia post.
- LFC → ant. 1/5 of popliteal sulcus
- Popliteal hiatus → intraarticular





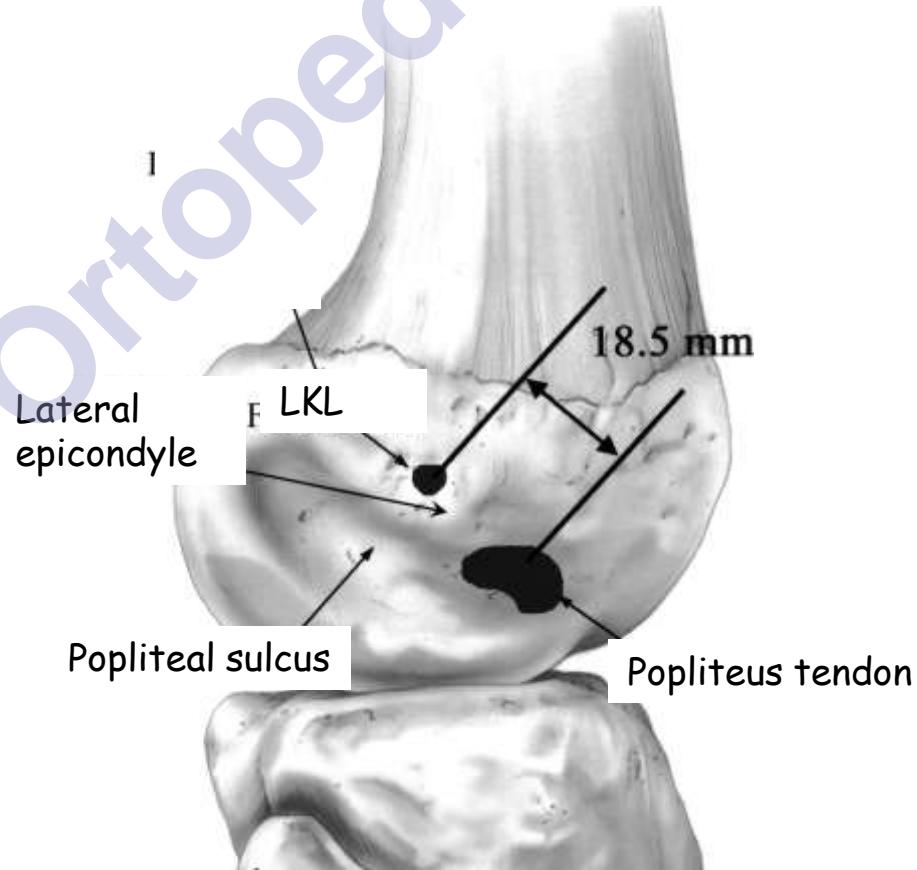
CANKAYA ORTOPEDI

Popliteus Tendon



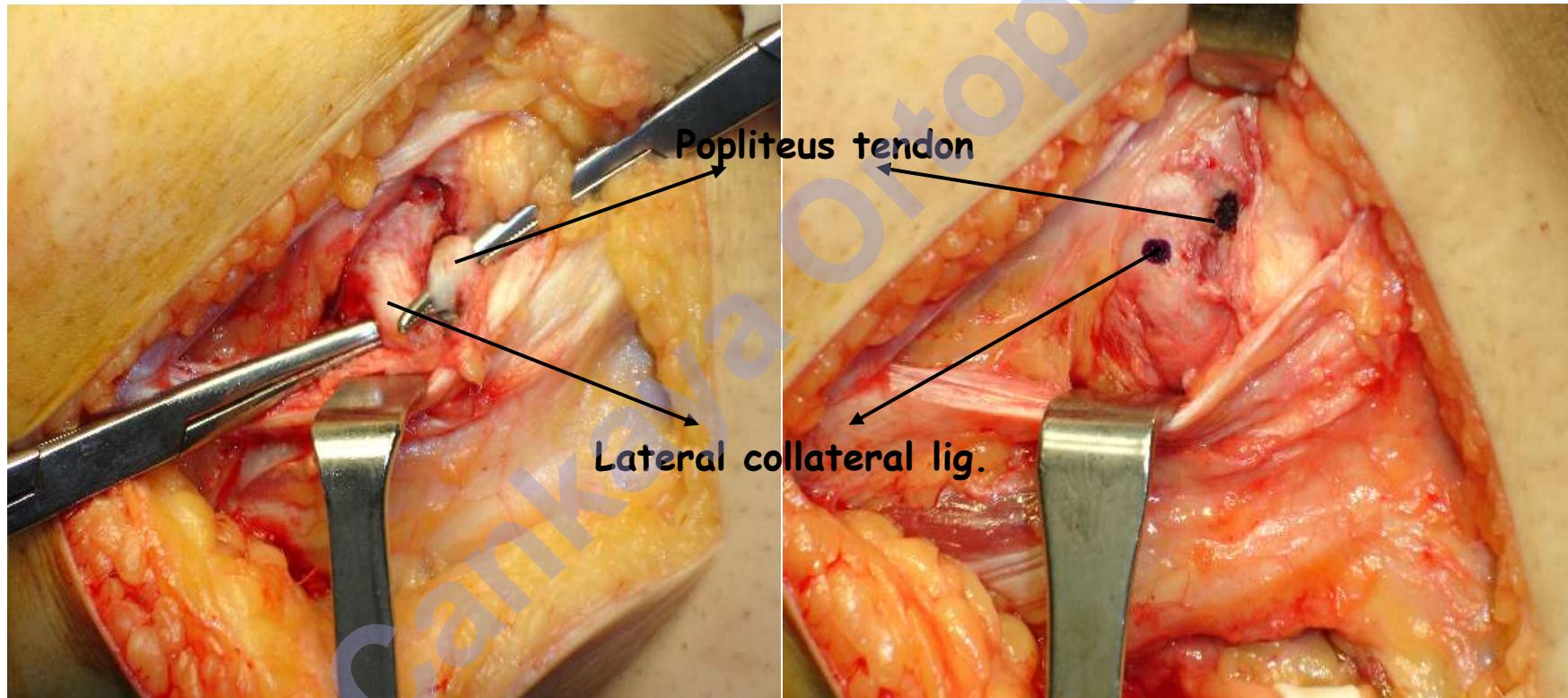
Popliteus Tendon

- Wider insertion
- Anterior and distal to LKL
- 18.5 mm distance

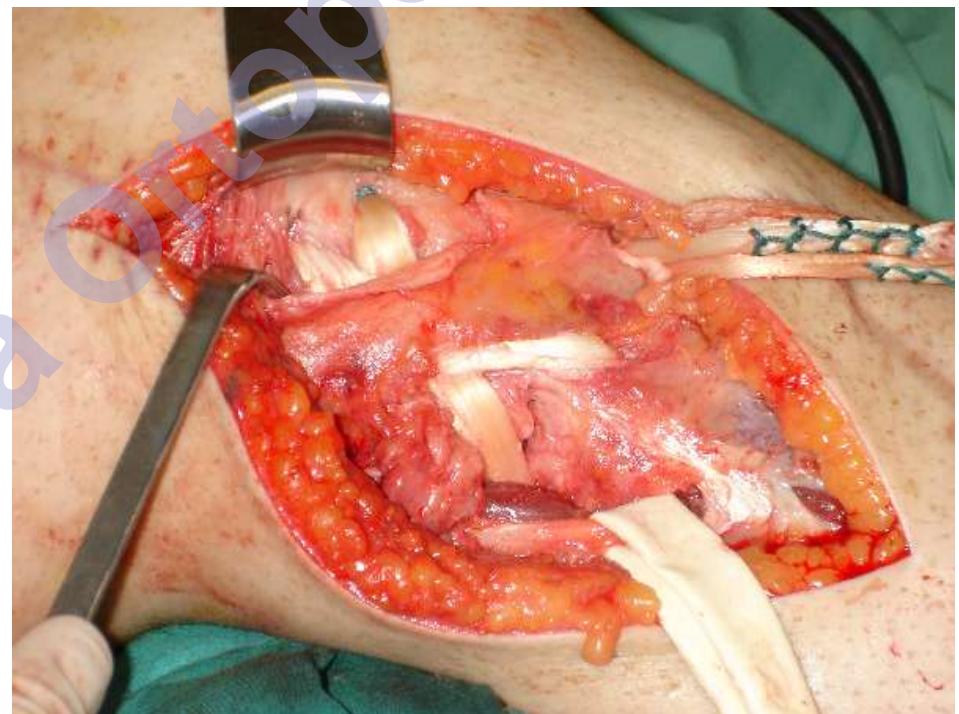


LaPrade RF, Am J Sports Med, 2003

Popliteus Tendon

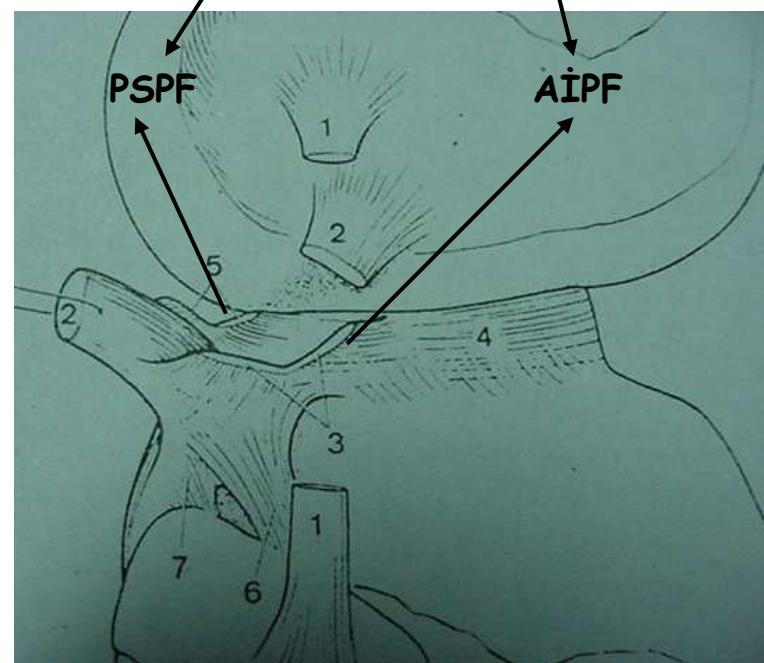
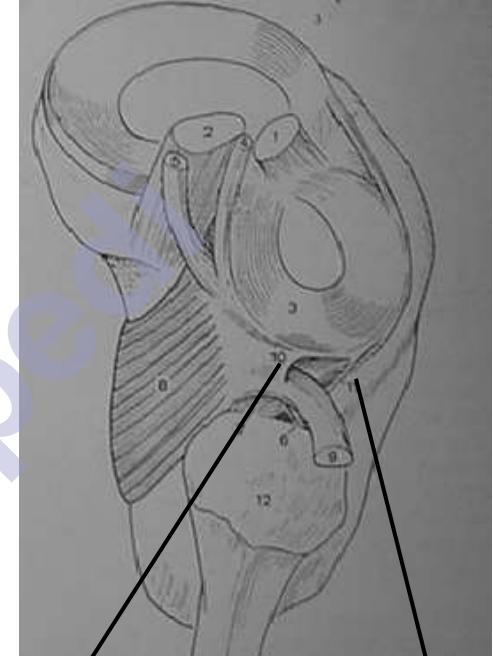


Popliteus Tendon

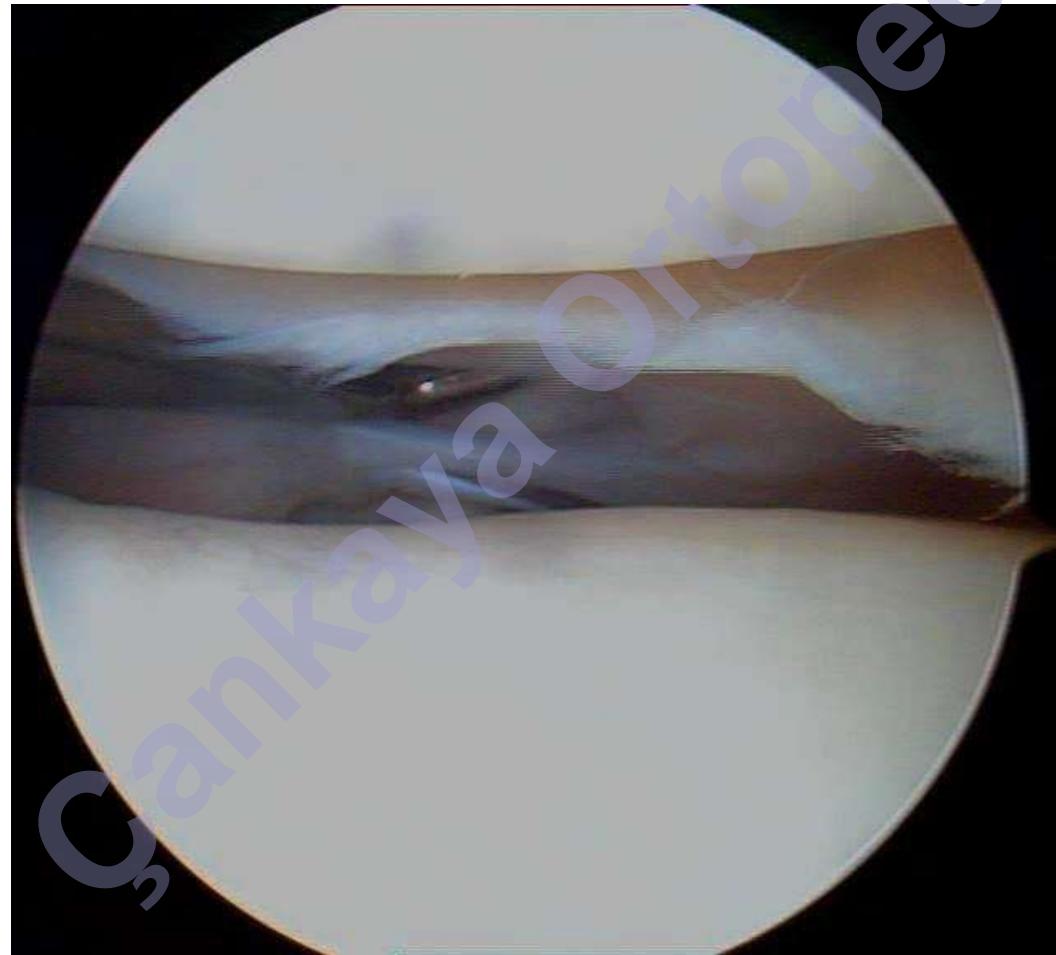


Popliteal Hiatus

- **Posterior border**
 - Posterosuperior popliteomeniscal fascicle
- **Anterior border**
 - Anteroinferior popliteomeniscal fascicle
- **Stabilization of lat. meniscus**

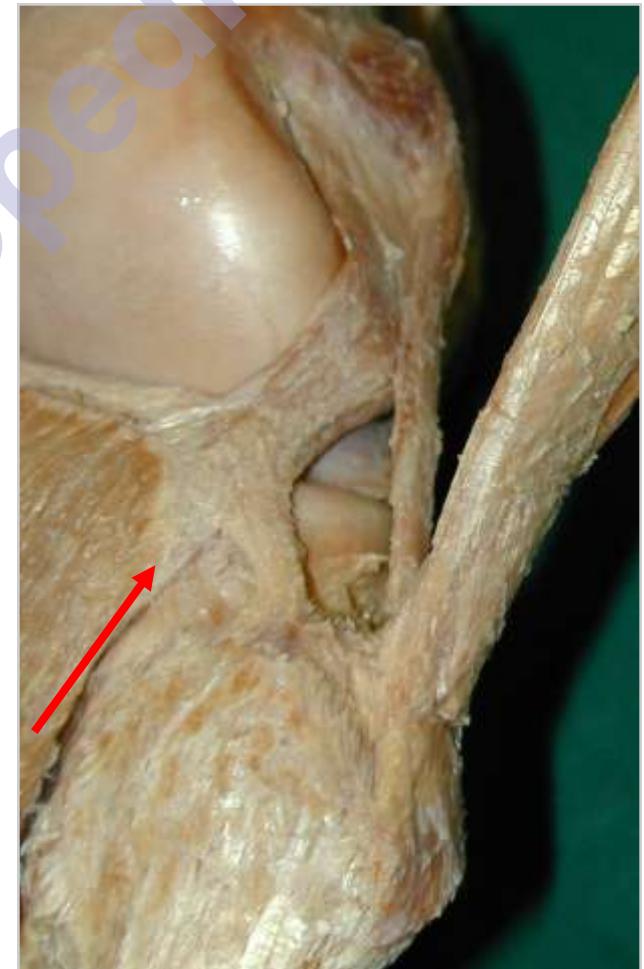


Popliteal Hiatus

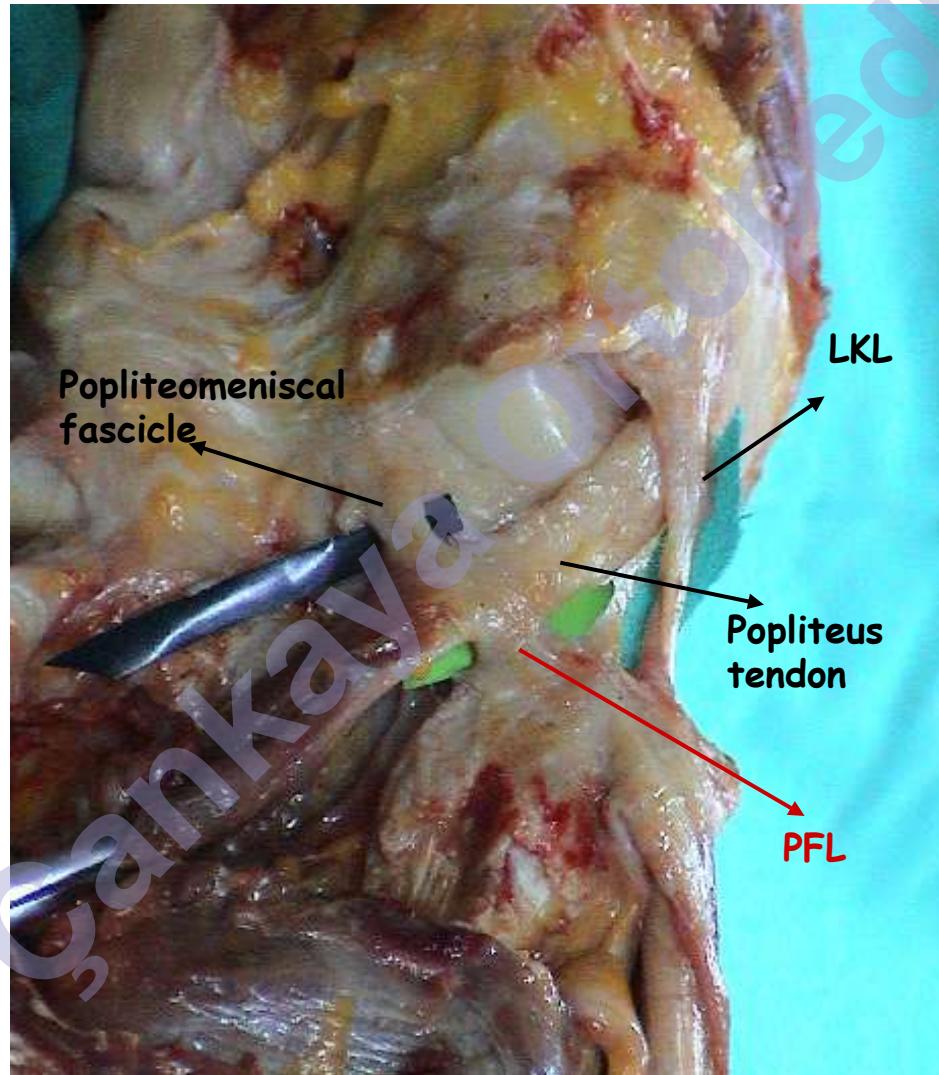


Popliteofibular Lig.

- Present in 95-100 %
- Popliteus muscle-tendon junction
- Medial fibular head
- ~ 1.5 cm length
- ~ 7 mm width
- Anterior and posterior divisions
 - Inverted Y shape

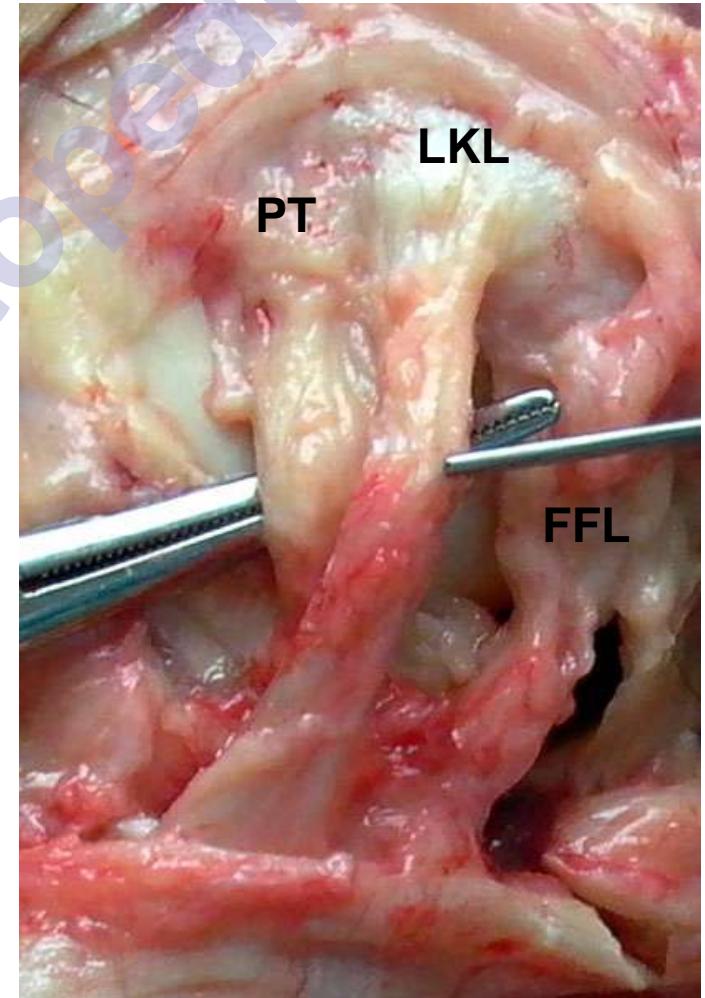


Popliteofibular Lig



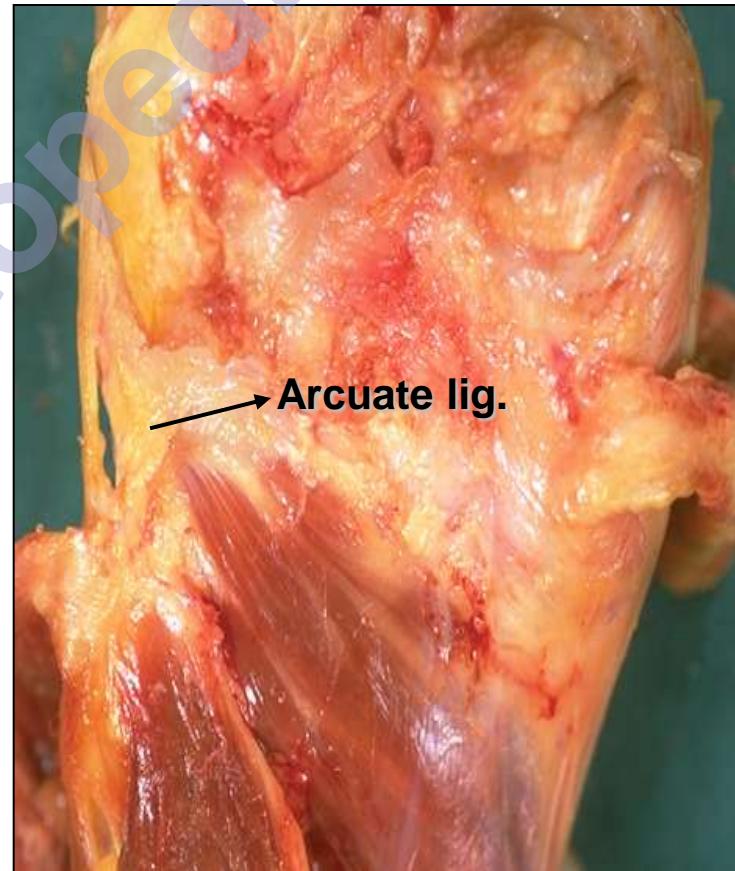
Fabellofibular Lig.

- “Short lateral ligament”
- Fabella – posterolateral styloid
- In absence of fabella
 - Posterior supracondylar process
 - Lateral gastrocnemius fibers
- Present in 40 %



Arcuate Lig.

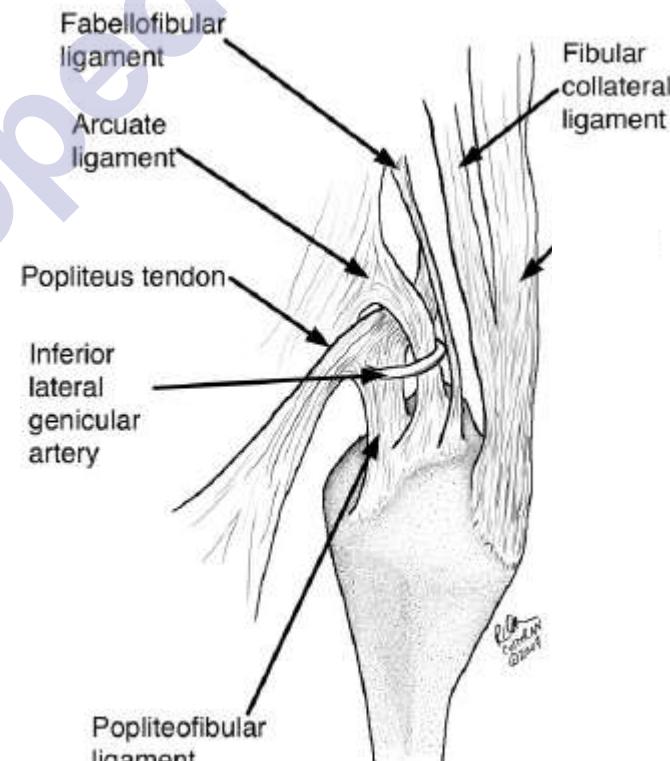
- **Lateral limb**
 - Lateral styloid → post. capsule
- **Medial limb**
 - Lateral styloid → oblique popliteal lig.
- **Present in 70 %**



Variations

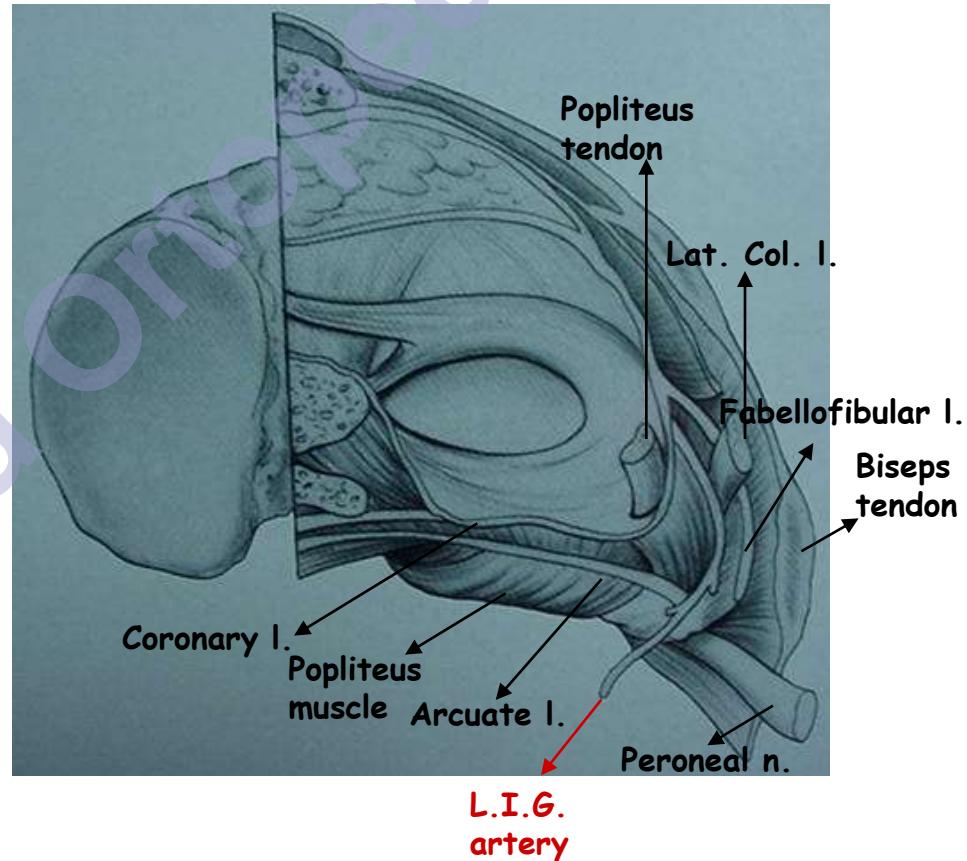
- **Bony fabella** → FFL
- **Cartilage fabella** → FFL + AL
- **Absence of fabella** → AL

Seebacher JR, JBJS Am, 1982



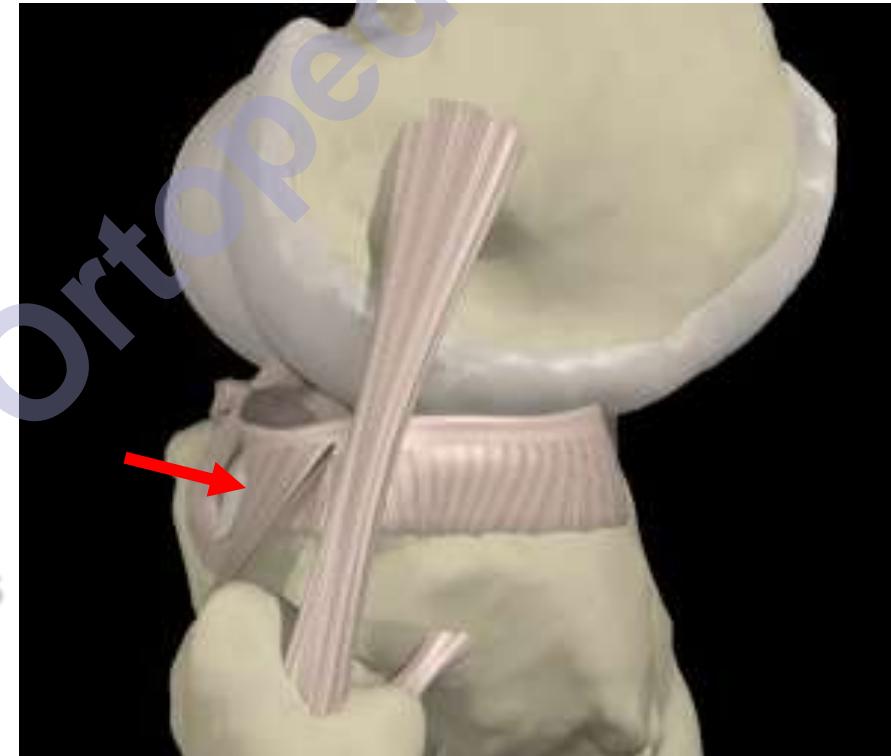
Joint Capsule

- **Superficial layer**
 - Lateral collateral lig.
 - Fabellafibular lig.
- **Deep layer**
 - Popliteal hiatus
 - Arcuate lig.
 - Popliteofibular lig.
 - Coronary lig.



Joint Capsule

- **Midlateral capsular lig.**
 - Lateral capsule
- **Coronary lig.**
 - Posterior capsule
- **Stabilization of meniscus**
 - Meniscotibial component



PLC Biomechanics

- **Main structures**
 - Lateral collateral lig.
 - Popliteus tendon
 - Popliteofibular lig.
- **Secondary structures**
 - Fabellafibular lig.
 - Arcuate lig.
 - Iliotibial band
 - Biceps femoris
 - Lateral gastrocnemius

Biomechanics

Strength

Stiffness

LKL

295 N

33.5 N/m

PFL

298 N

28.6 N/m

Popliteus

700 N

83.7 N/m

LaPrade RF, Am J Sports Med, 2005

Biomechanics

Posterolateral structures

- Varus (LKL)
- External rotation (popliteus)
- Posterior translation



Primary restraint



Secondary restraint

Posterior Cruciate lig.

- Varus-external rotation
(at 90° flexion)



Secondary restraint

LKL Biomechanics

- 0° - 30° → primary varus restraint
- 0° - 30° → ex. rotation restraint

PT Biomechanics

- **Dynamic restraint**
- 20° - 130° → **ex. rotation restraint
(more prominent at 60° flexion)**

LaPrade RF, Am J Sports Med, 2004
- 0° - 90° → **varus restraint**
- **Full ext.** → **post. translation restraint**

PFL Biomechanics

- Isometric ligament
- In all flex. degrees → ex. rotation restraint

PCL Biomechanics

- **Post. translaslayon** → **primary restraint**
- **Varus** → **secondary restraint**
 - In LKL insufficiency
- **Ex. rotation** → **secondary restraint**
 - In PLC insufficiency
 - At 90° flexion

PLC Injury

- Increased pressure at medial and patellofemoral compart.
- Increased loading of PCL at external rotation
- Increased loading of ACL at internal rotation

Functional Biomechanics

- LKL isolated → **30° flexion 1-4° varus**
- LKL + PLC → **30° flexion ↑↑ varus**
→ **30° flexion ↑↑ ext.rot.**
- LKL + PLC + PCL → **↑↑↑ varus**
→ **90° flexion ↑↑↑ ext.rot.**
→ **↑↑↑ posterior translation**
- LKL + PLC + ACL → **↑↑ anterior translation**
→ **↑↑ internal rotation**

PLC Injury

- **Hyperextension – varus loading**
 - Direct blow to ant-med tibia
 - Rotational trauma
- **Varus loading at flexion**
- **High energy injury !!**
- **Isolated PLC injury → 16 %**
 - Cruciate ligament injury
 - Reduced knee dislocation



Physical Examination

Acute period

- **Posterolateral tenderness**
- **Posterolateral echymosis**
- **Effusion → intraarticular pathology**



Soft Tissues



Vascular Injury

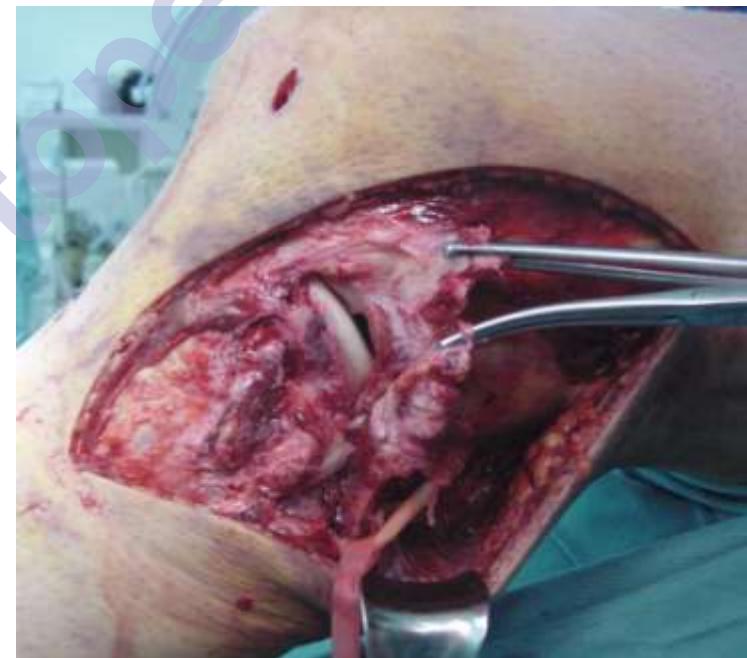
- Incidence 4 - 35 %
- Angiography
- After 6 hours → 68 % amputation



Peroneal Nerve Injury

- **Incidence 4 - 50 %**
- **Sensory / complete motor loss**
- **Recovery is not always possible**

Cush G, Sports Med Arthrosc. 2011



Associated Injuries

- **ACL and PCL**
- **Patellar tendon**
- **Examination under anesthesia**
 - Varus
 - External rotation
 - Cruciate ligaments



Chronic Period

- **Joint motion**
- **Limb alignment**
 - Varus
- **Gait**
 - Hyperextension-varus thrust
 - Gait in flexion



Rotational Instability

- **Posterolateral rotational instability**
 - PLC + PCL
- **Anterolateral rotational instability**
 - PLC + ACL

PLRI

- ↑ varus
- ↑ external rotation
- ↑ posterior translation



Varus Stress Test

- **30⁰ flexion**
 - Isolated LKL → 1-4⁰ varus
 - PLC / PCL → Varus ↑↑
- **0⁰ flexion**
 - PCL injury !!



“Dial” Test *(posterior-lateral rotation test)*

- **30° flexion**
 - PLC injury
- **90° flexion**
 - PLC + PCL injury
- **10° difference**



“Dial” Test



External Rotation Recurvatum Test

- PLC + PCL
- Posterior and lateral subluxation of tibia
 - Hyperextension
 - External rotation
 - Varus



External Rotation Recurvatum Test



Posterolateral Drawer Test

- PLC + PCL
- 90^0 knee flexion
- 15^0 ankle ext. rot.



Apprehension Test



Associated Injuries

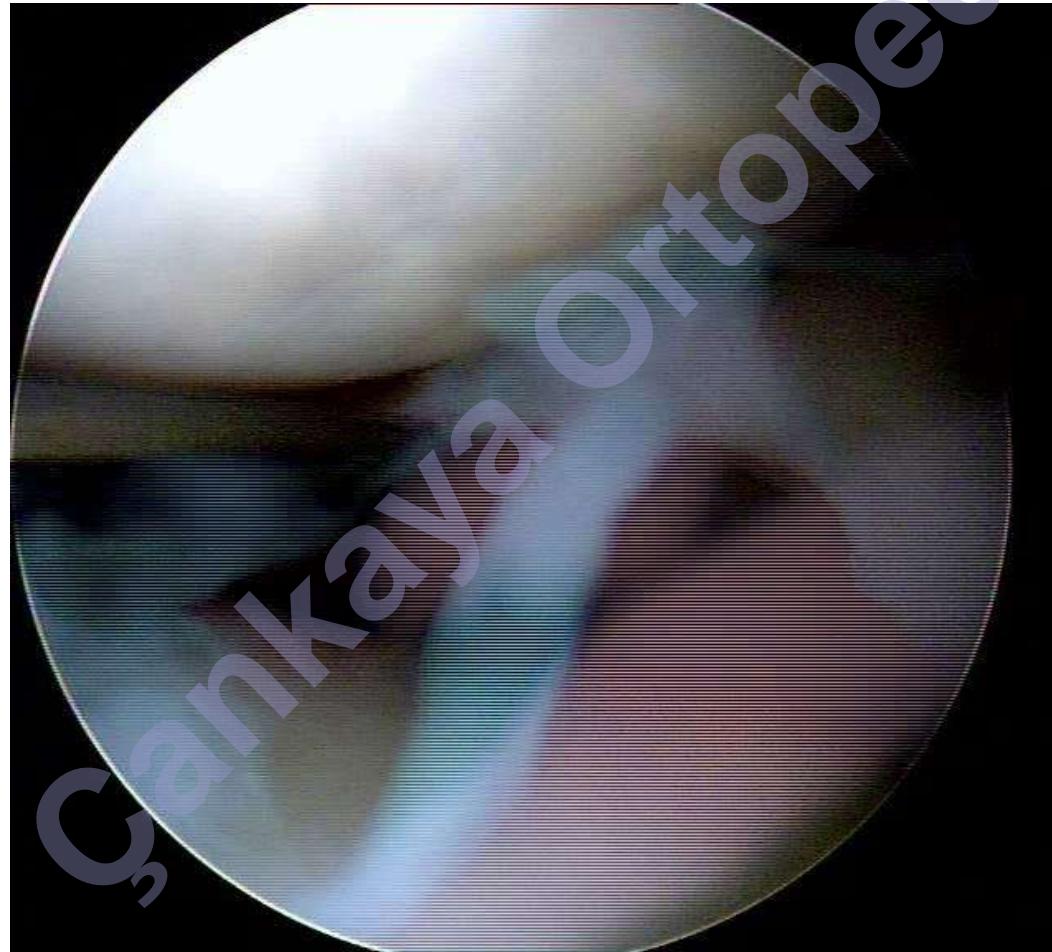
- **PCL**
 - Posterior drawer
(increases with PLC injury)
 - Reverse pivot “shift” test

- **ACL**
 - Anterior drawer
 - Pivot “shift” test



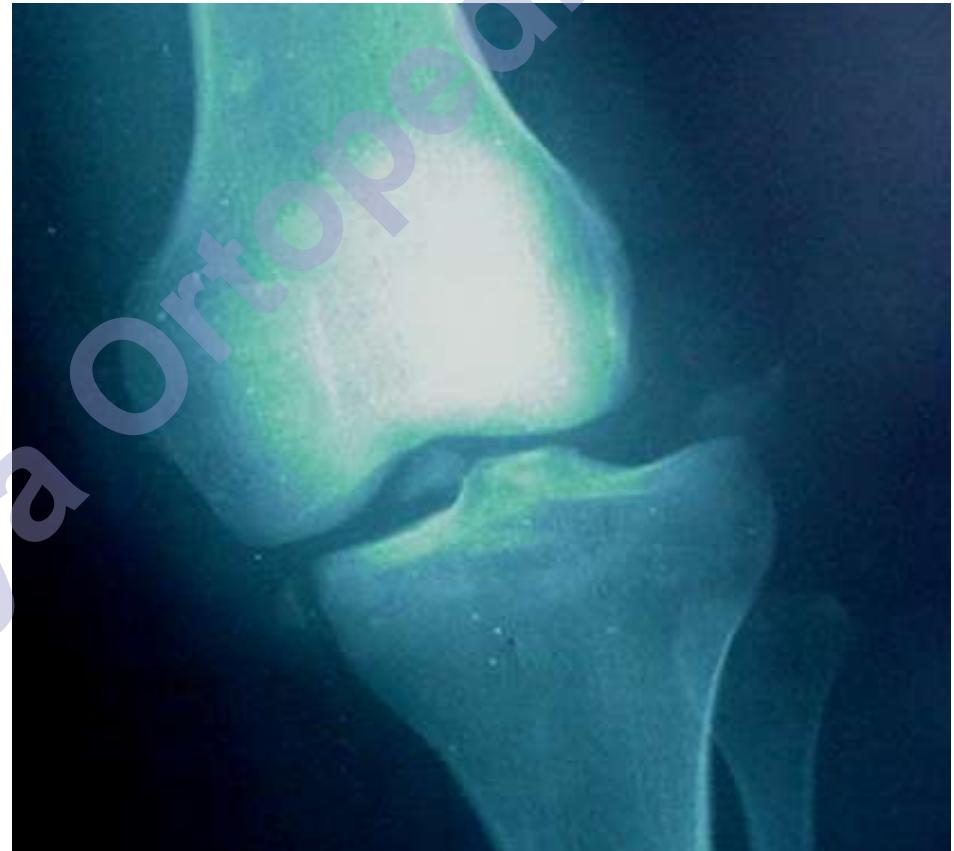


Arthroscopic Examination



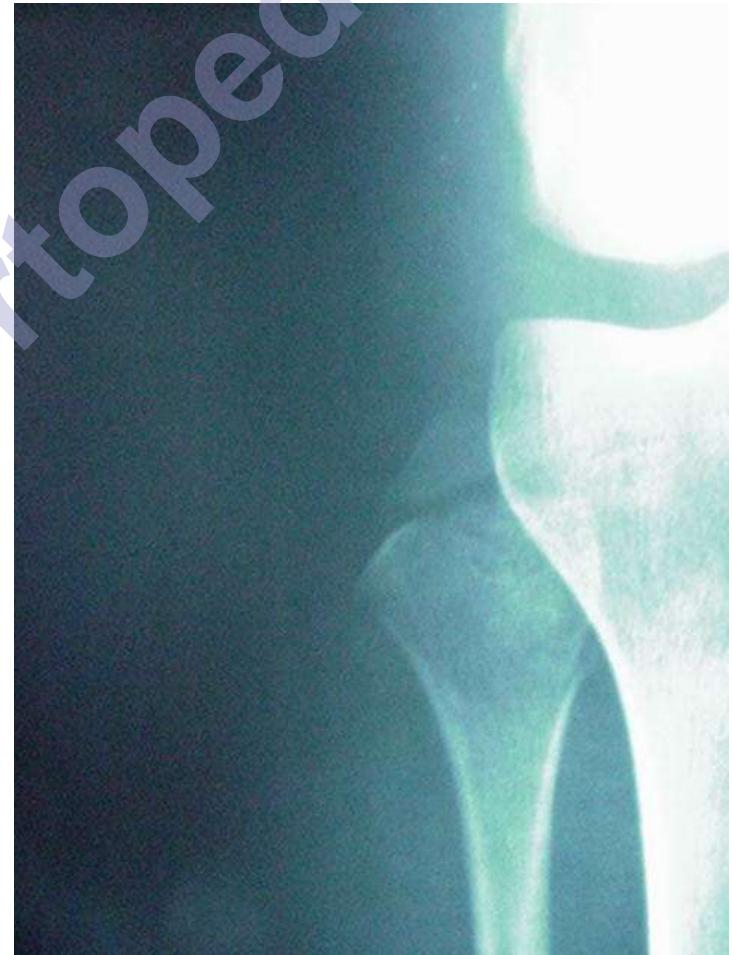
Direct Radiography

- **Knee dislocation**
- **Avulsion fractures**
 - Fibular head
 - Segond fracture
 - Femoral side
 - Gerdy tubercule
- **Tibia plateau fractures**



Fibular Head

- “Arcuate sign”
- Pathognomonic for PLC
- PFL avulsion
 - Fibular styloid
 - Small fragment
 - Displaced medially and superiorly
- LKB ve biceps avulsion
 - Fibular head
 - Bigger fragment
 - More displacement



Segond Fracture

- **Lateral Segond fracture**

- Midlateral capsular lig.
- ACL injury
- PLC injury

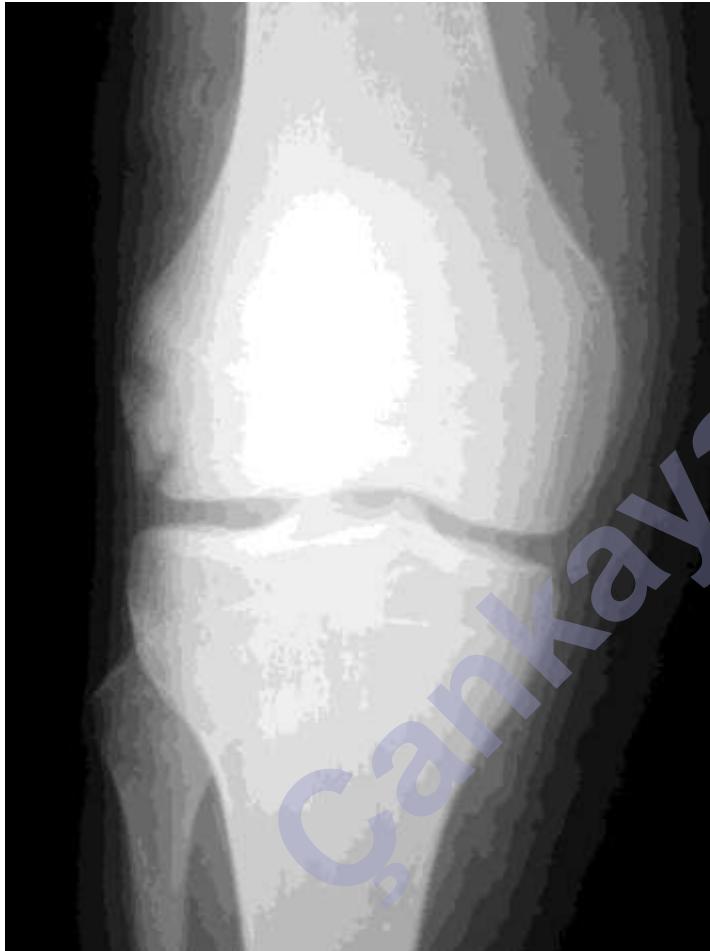


- **Medial Segond fracture**

- PCL injury
- PCL + PLC injury



Femoral Side



Stress Radiographs

- **Evaluation of LKL**
- **> 4 mm difference → PLC injury**

LaPrade RF, JBJS Am, 2008



Standing Hip-to-ankle Radiographs

- **Chronic PLC injury**
 - Varus-recurvatum
 - Varus → reconstruction failure
- **HTO first !!**
- **Open wedge HTO→increases varus and ext. rotation stability**

LaPrade, Am J Sports Med, 2008



Magnetic Resonance

- Essential for treatment planning
- All PLC structures
 - PFL → visible in 50-60 %
- Associated injuries
 - Cruciate ligaments
 - Meniscus, cartilage injury
 - Occult fractures
- Thin cut coronal oblique series !!



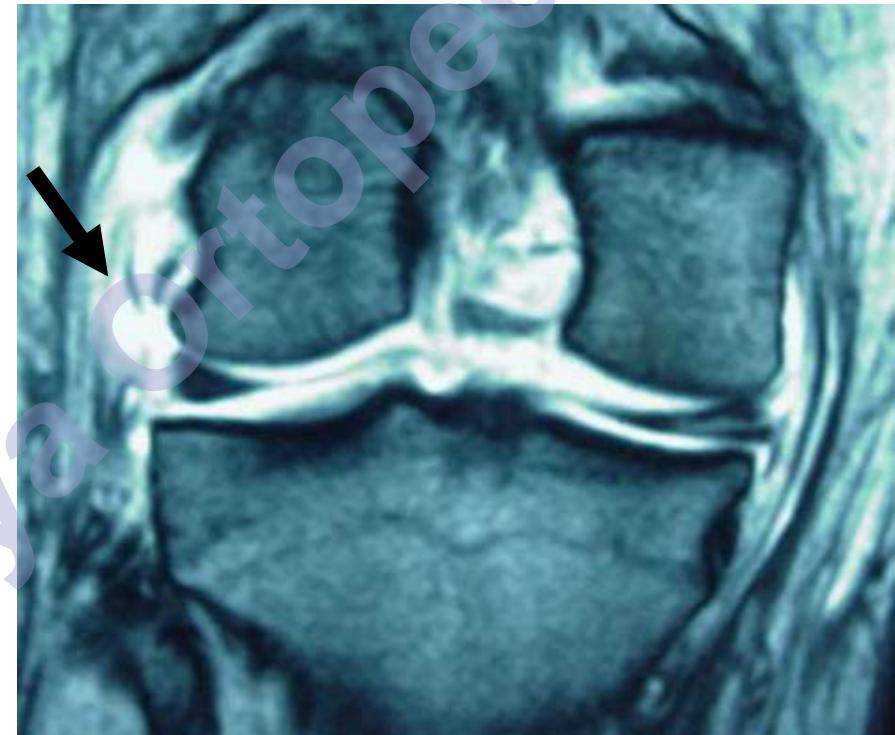
Yu JS, Radiology, 1996

LaPrade RF, Am J Sports Med, 2000

LKL

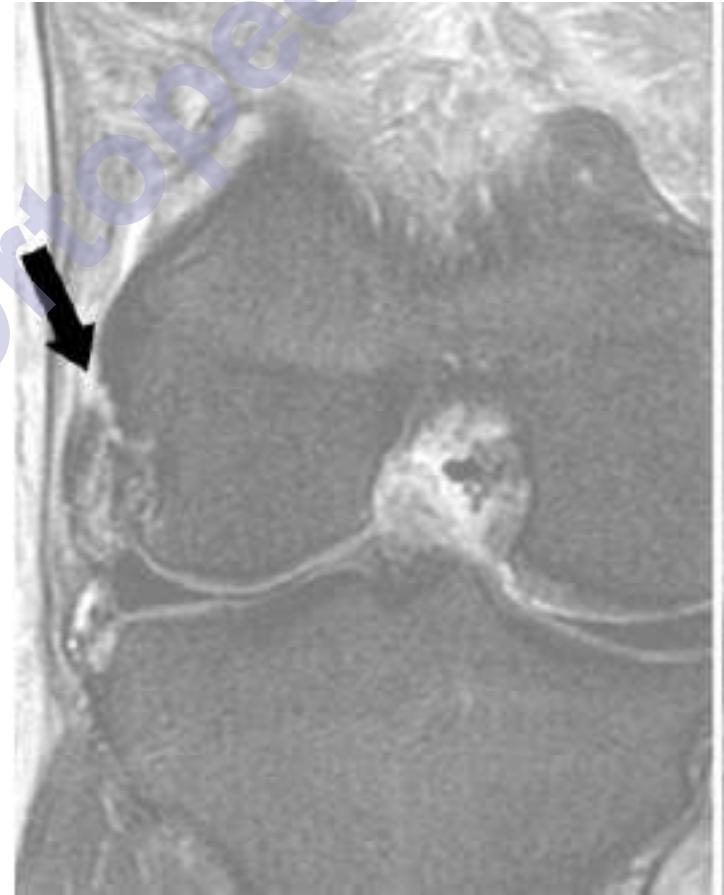
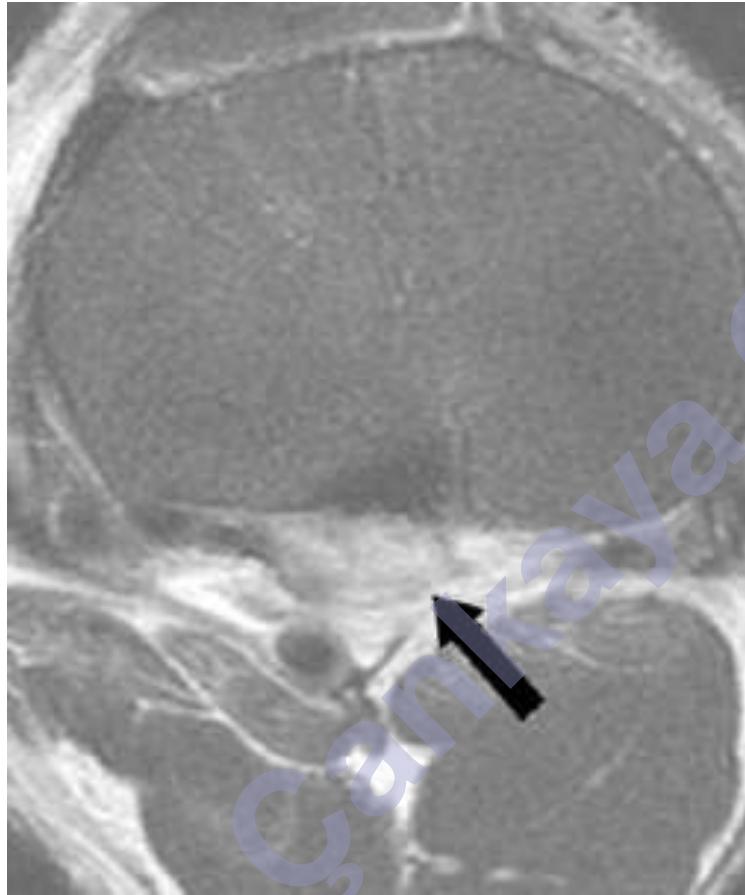


normal

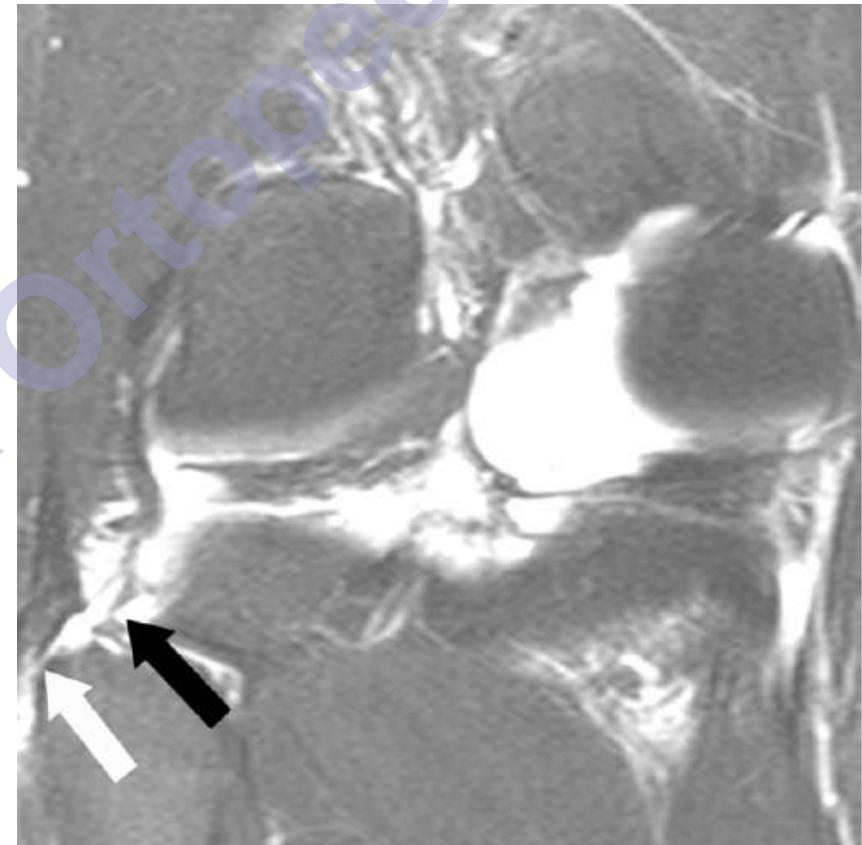


Grade III

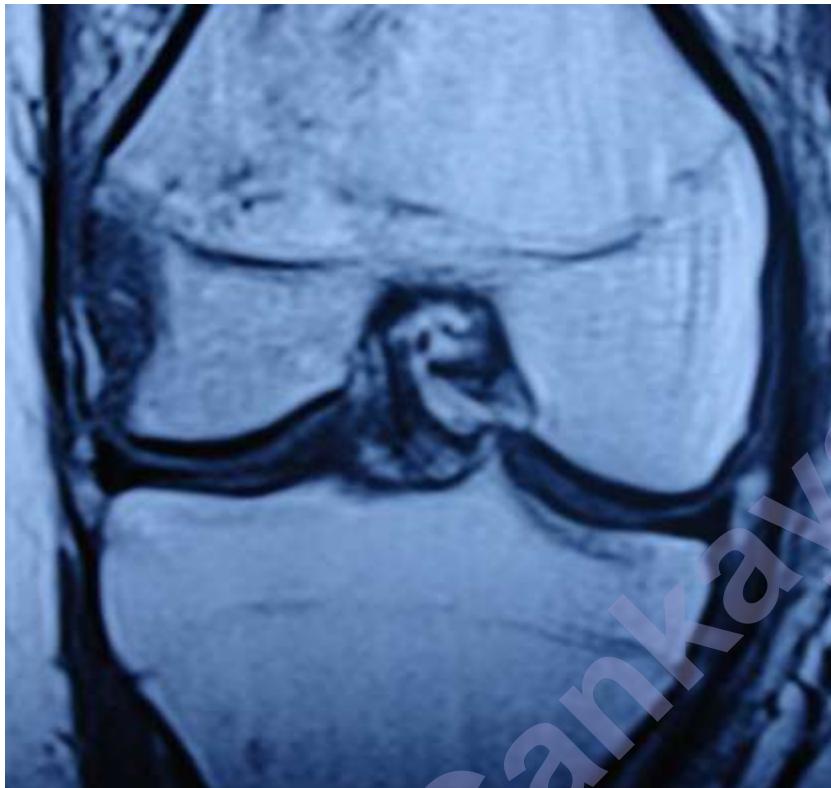
Popliteus Tendon



PFL



Occult Fractures



Posterolateral Corner

- **Complex anatomy**
- **Part of multiple ligament injuries**
 - Varus-ext.rotation deformity
- **Other reconstructions fail unless PLK is treated**
- **Physical examination**
 - PLC / PCL
 - “Dial” test
- **MR is essential for treatment planning**
 - All PLC structures can be evaluated