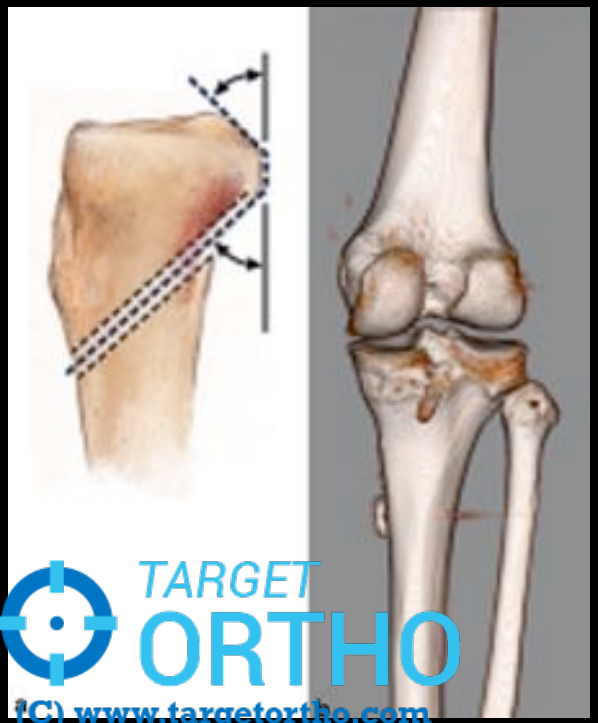
DIAGNOSIS AND MANAGEMENT IN *PCL* AND *PLC* DEFICIENT KNEE



DR.MUKUL MOHINDRA

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Safdarjung Hospital
VMM College
New Delhi

ANATOMY AND BIOMECHANICS
of
POSTERIOR CRUCIATE LIGAMENT
And
POSTERIO LATERAL COMPLEX

Quick Review

TARGET ORTHO

ANATOMY OF PCL

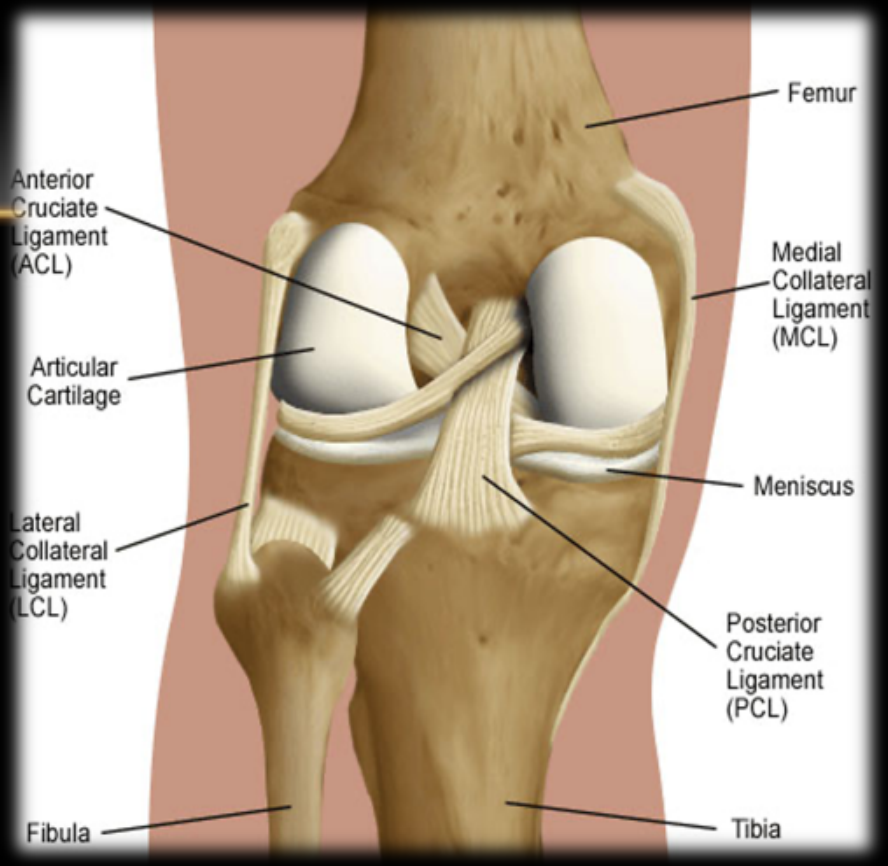
Extra-synovial structure with its own synovial sheath!

AVG. LENGTH: 38 mm
(Girgis, Clin Orthop Rel Res, 1975)

Tensile strength
1.5 x that of ACL

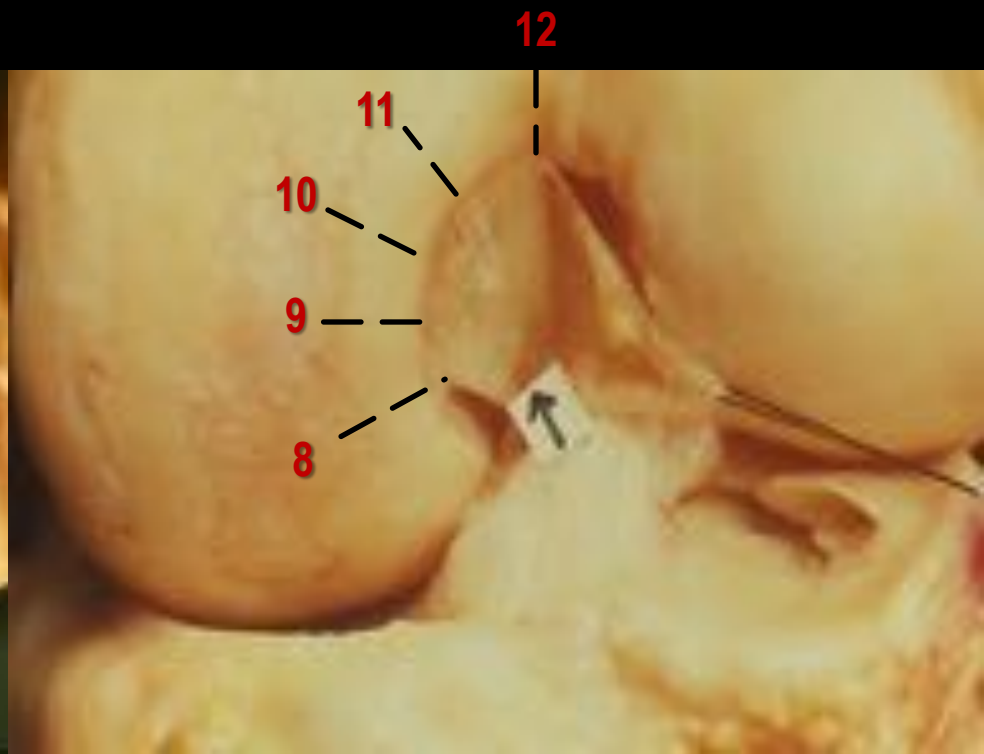
ORIGIN: Broad crescent shaped area over medial femoral condyle in the intercondylar notch

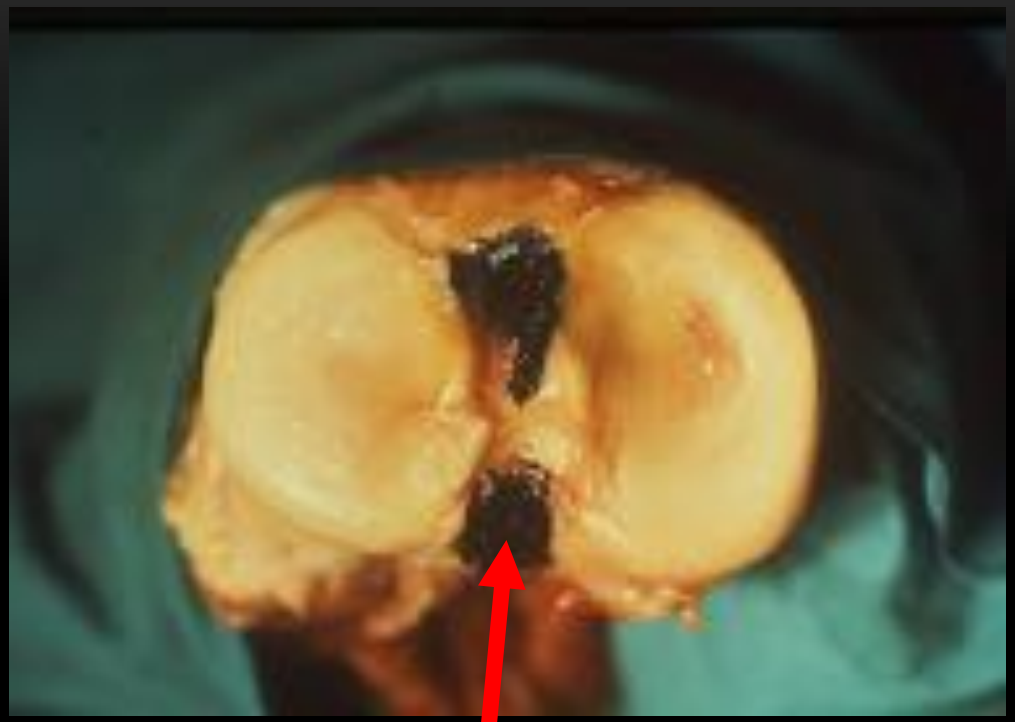
INSERTION: In a depression between two tibial plateaus *(the PCL fossa)*



FEMORAL ORIGIN

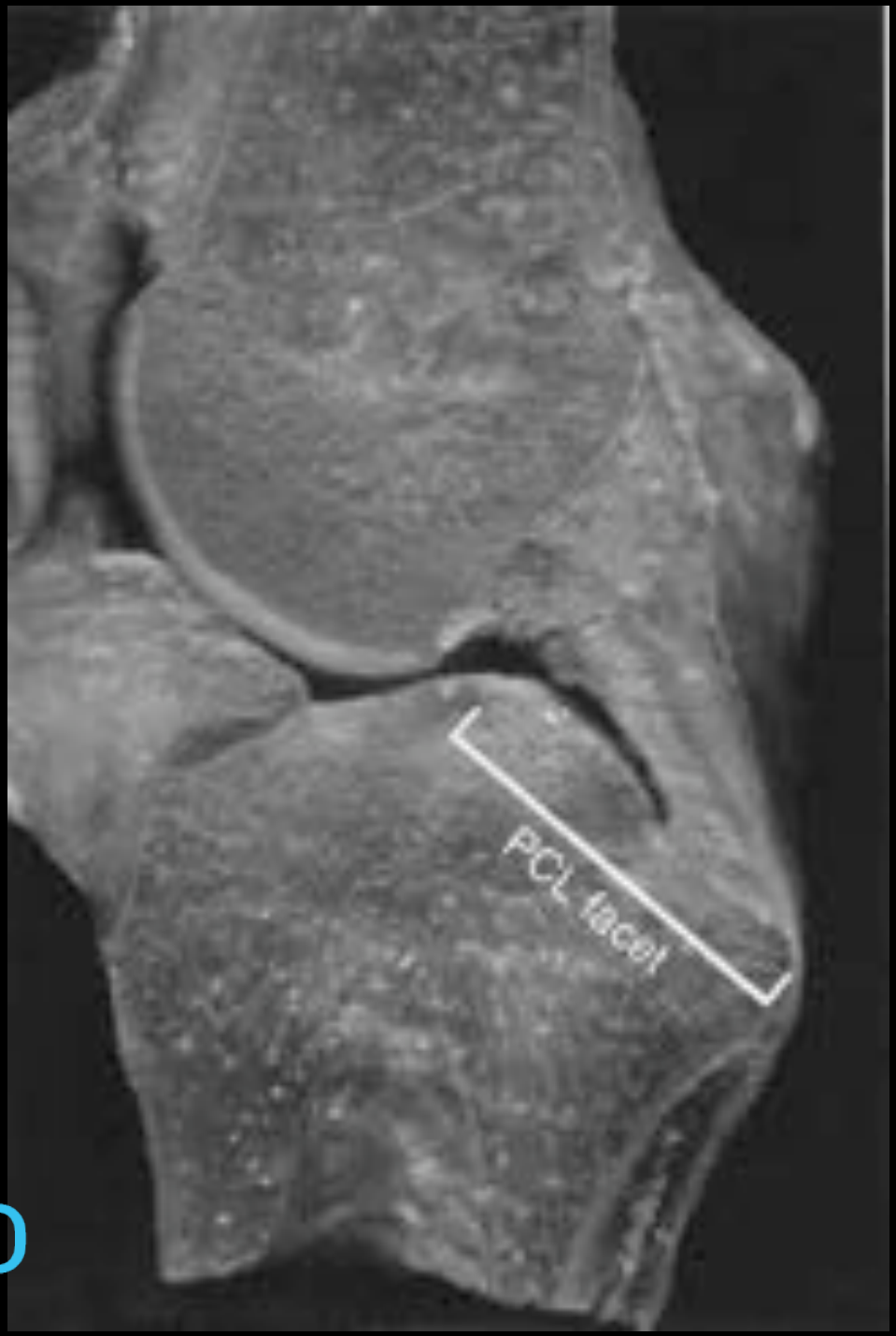
Broad crescent shaped origin!





TIBIAL INSERTION

1.0 -1.5 cm inferior to posterior rim of tibia *(PCL facet)*



Q. The thicker bundle in the PCL is

A.AL bundle

B.AM bundle

C.PL bundle

D.PM bundle

PCL Complex

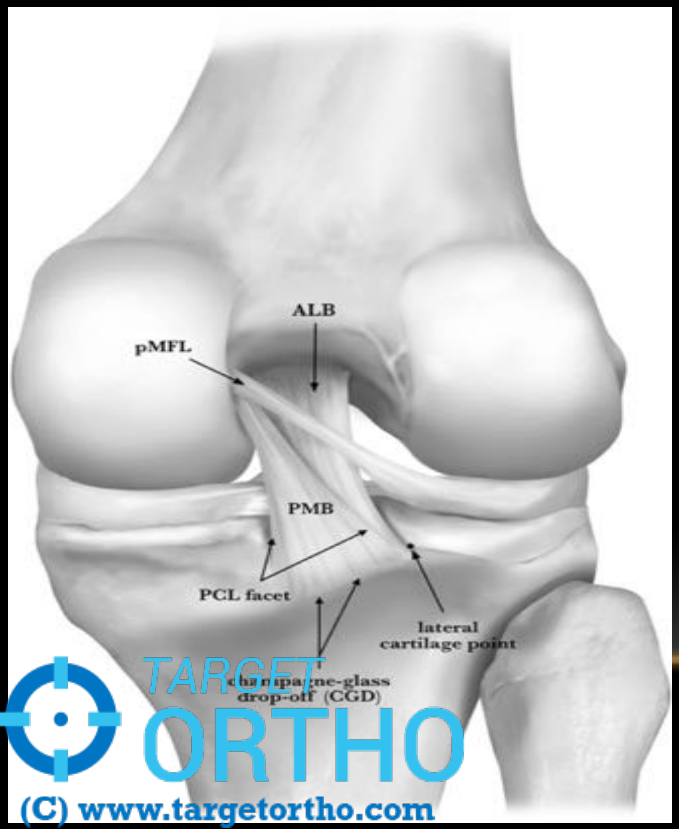
90 degree

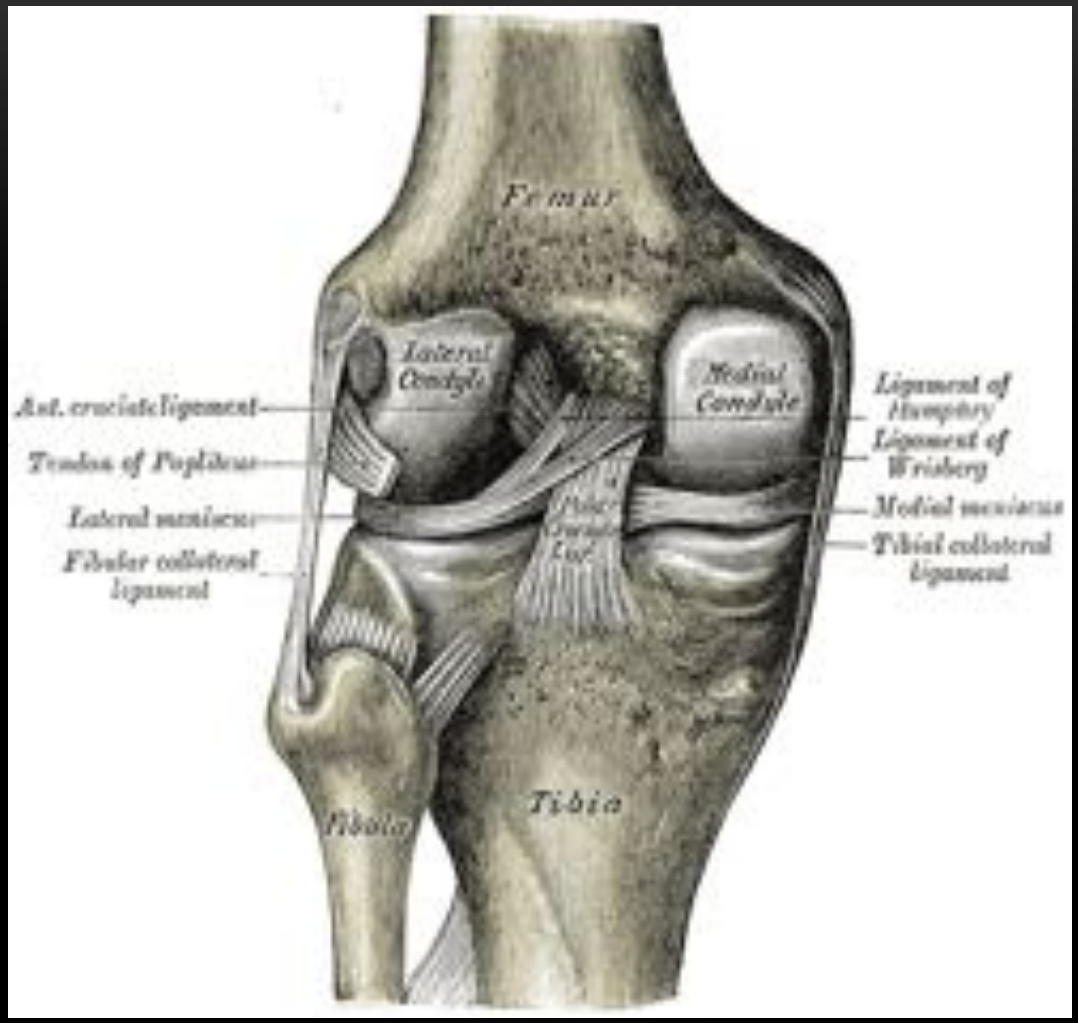
30 degree

PCL BUNDLES: AL and PM

MENISCO-FEMORAL LIGAMENTS

(have significant contribution to posterior drawer stability)





17.2% femoral footprint of PCL can be meniscofemoral ligaments

Nagasaki AJSM 2006

BIOMECHANICS

Primary restraint to
posterior translation of tibia

Secondary restraint to external rotation

(Fox RJ, AJSM, 1998)

Q. Not a part of PLC

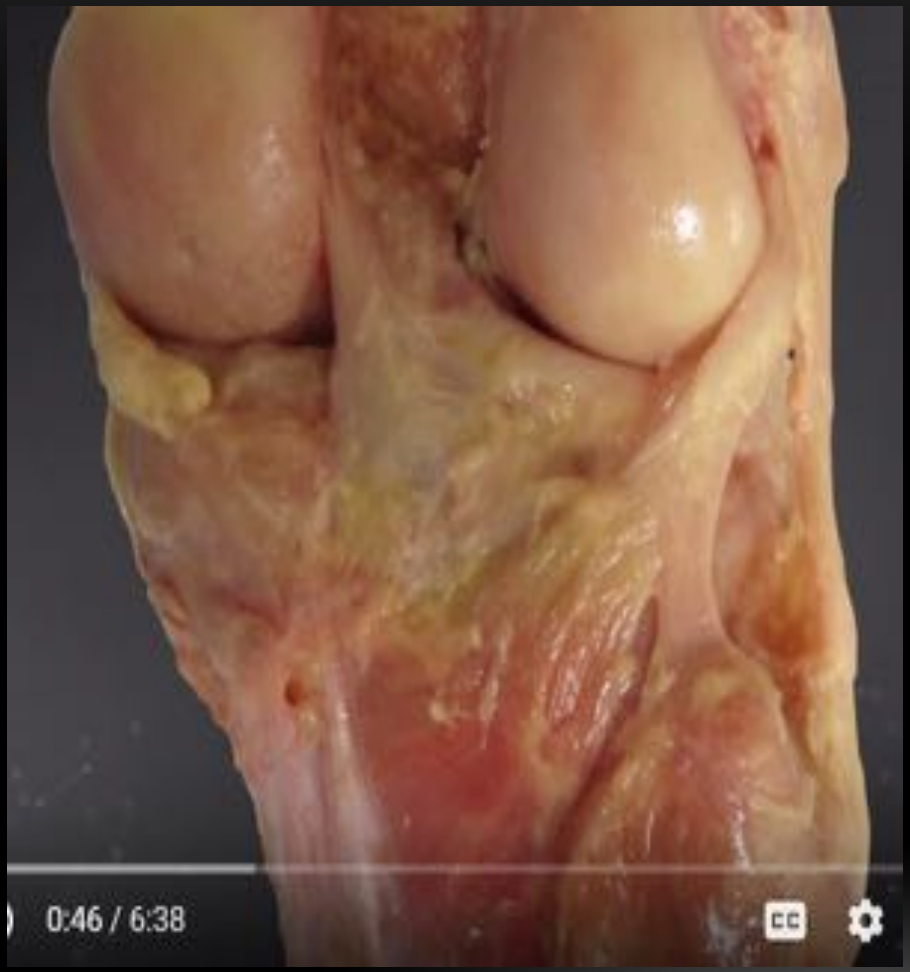
A.Arcuate ligament

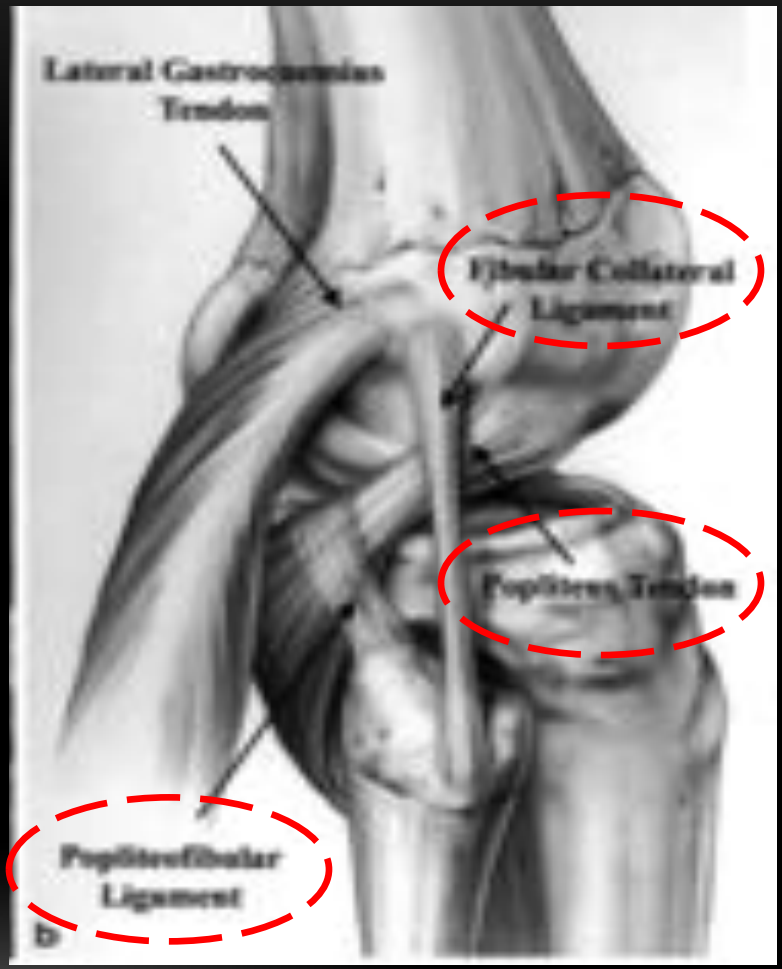
B.POL

C.PF ligament

D.Popliteus tendon

PLC Complex





THREE PRIMARY COMPONENTS plus PL Capsule

BIOMECHANICS OF PCL AND PCL DEFICIENT KNEE

Primary restraint to VARUS and EXTERNAL ROTATION

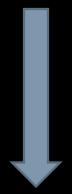
100 N posterior tibial load given — *Gollehon et al*

- Isolated PLC sectioned: 3-5 mm posterior tibial translation *maximum increase at 30° knee flexion)*
- PCL sectioned: 8-10 mm of posterior tibial translation *(maximum increase at 90° knee flexion)*
- PCL + PLC sectioned: > 15 mm translation

BIOMECHANICS OF PLC DEFICIENT KNEE

PLC sectioned and 5 N-m external tibial torque given: *in situ forces in PCL increased by 2-6 times*

(Fox and Harner, 1998)



So must to reconstruct PLC when performing PCL reconstruction

CLINICAL DIAGNOSTIC ASPECTS
of
POSTERIOR CRUCIATE LIGAMENT
And
POSTERIO LATERAL COMPLEX

History and Examination

CLINICAL TESTS

TESTING FOR PCL

Posterior drawer teSt

CLINICAL TESTS

TESTING FOR PCL

TARGET ORTHO

POSTERIOR DRAWER TEST

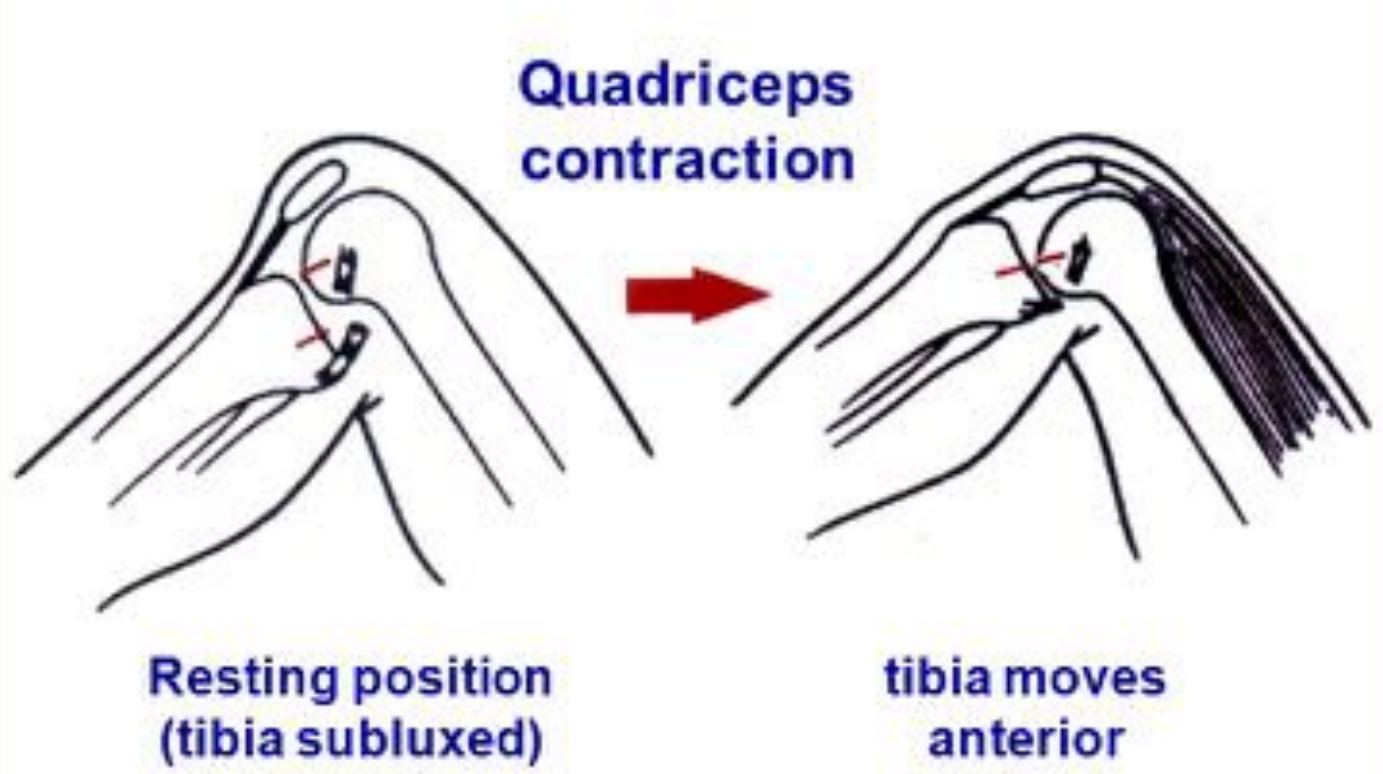
CLINICAL TESTS

TESTING FOR PCL

GODFREY'S POSTERIOR SAG

CLINICAL TESTS

TESTING FOR PCL



QUADRICEPS ACTIVE TEST

Q. The most reliable test for PCL tear is

A. Posterior drawer test

B. Godfrey's posterior sag

C. Quadriceps active test

D. Dial test

Rubinstein RA Jr, Shelbourne KD, McCarroll JR, VanMeter CD, Rettig AC. The accuracy of clinical examination in the setting of posterior cruciate ligament injury. Am J Sports Med. 1994; 22:550–7

CLINICAL TESTS

TESTING FOR PCL + PLC

KNEE FLEXION 90°

KNEE FLEXION 30°

TARGET ORTHO

DIAL TEST

CLINICAL TESTS

TESTING FOR PCL + PLC

TARGET ORTHO

ER- RECURVATUM TEST

CLINICAL TESTS

TESTING FOR PCL + PLC

TARGET ORTHO

REVERSE PIVOT SHIFT TEST

CLINICAL TESTS

ASSISTIVE TESTS

VARUS STRESS TEST

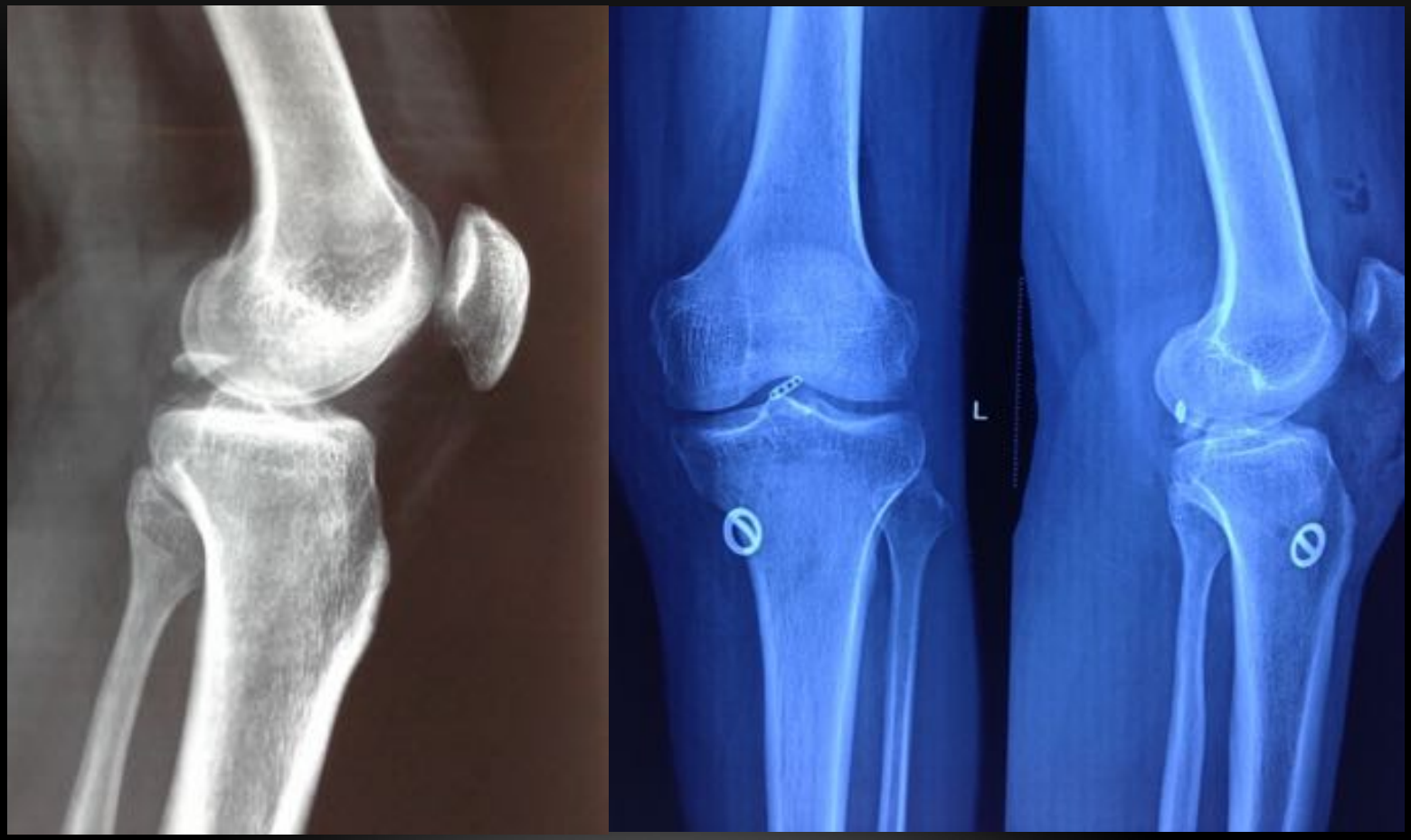
VALGUS STRESS TEST

STRESS TESTS

ROLE OF IMAGING
in
POSTERIOR CRUCIATE LIGAMENT
And
POSTERIO LATERAL COMPLEX

RADIOGRAPHY, CT AND MRI

RADIOGRAPHY



TARGET ORTHO

PCL INJURY

Q. Arthritis secondary to a deficient PCL would generally involve

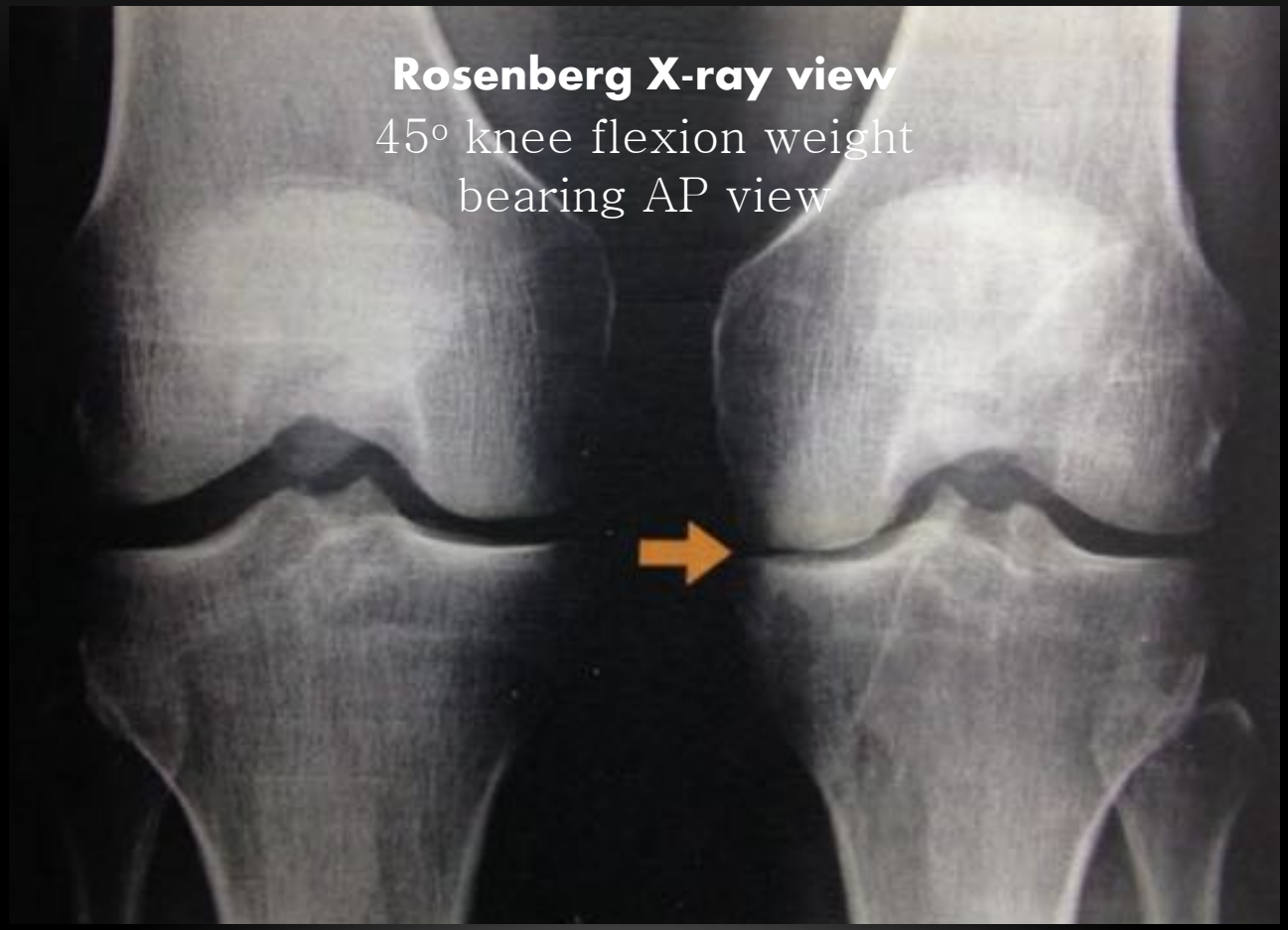
A. Patello femoral compartment

B. Anterio medial compartment

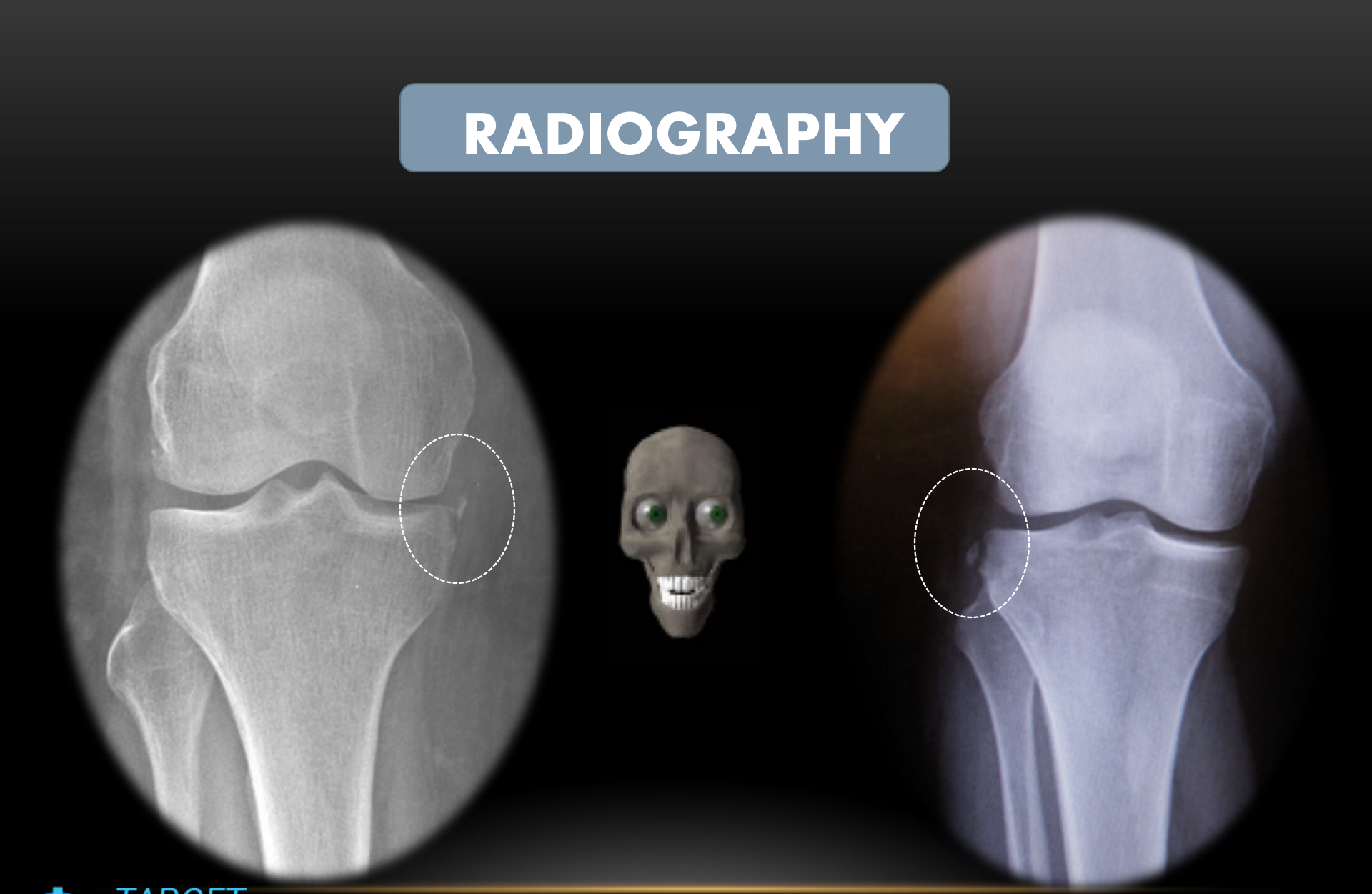
C. Both A and B

D. Postero medial compartment

RADIOGRAPHY



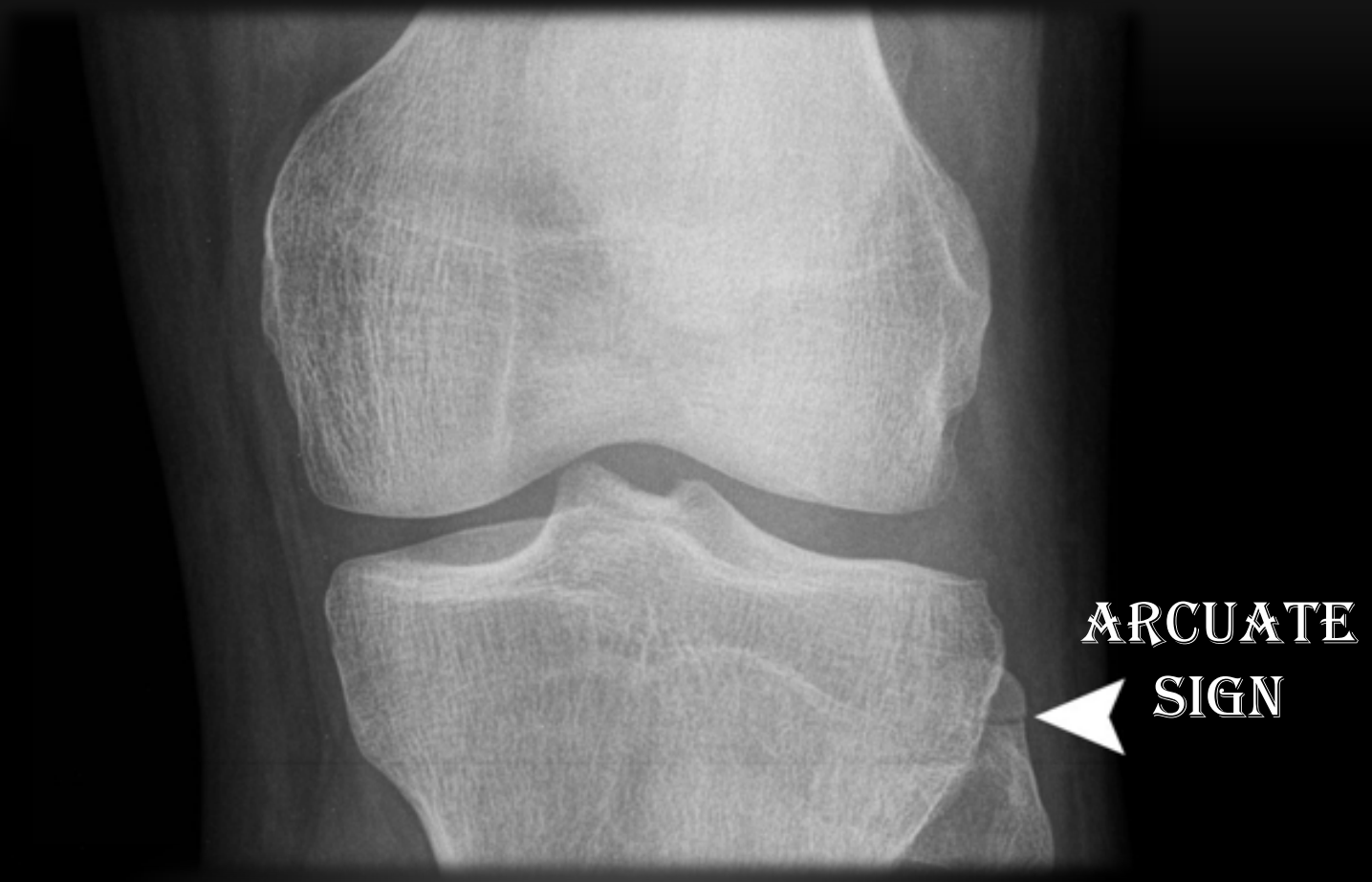
RADIOGRAPHY



TARGET ORTHO

PCL INJURY

RADIOGRAPHY



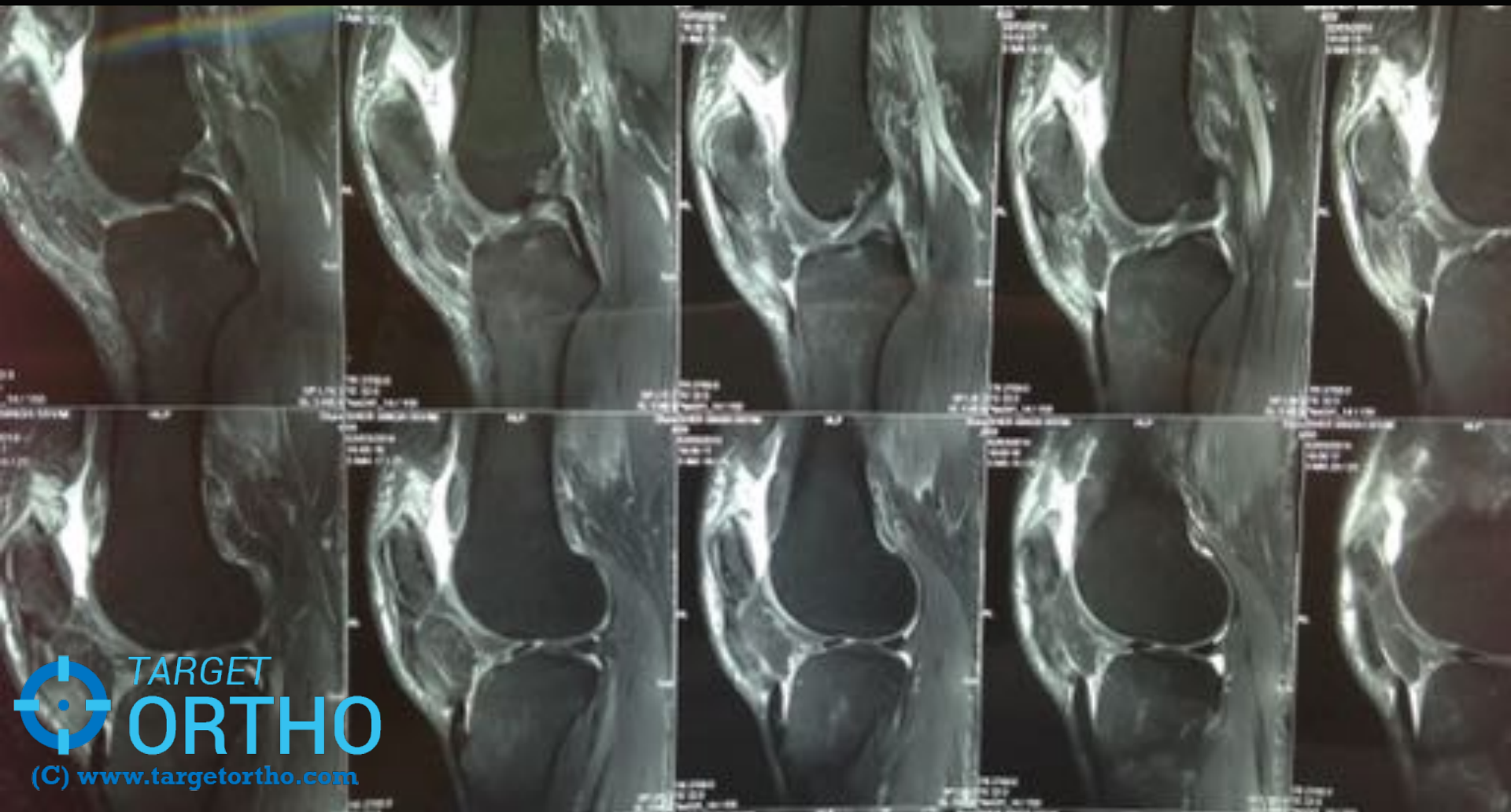
TARGET ORTHO

Postero-Lateral Corner injury

> 1.5 T, Small FOV

MRI

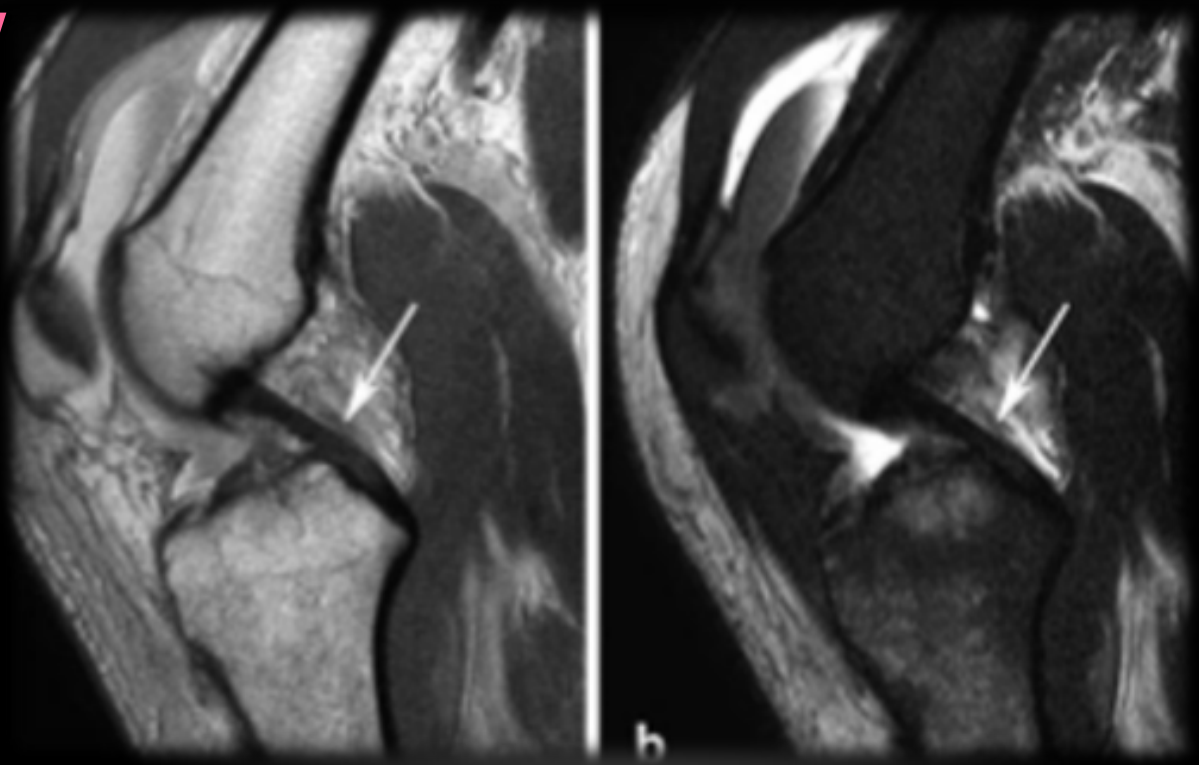
SAGITTAL OBLIQUE IMAGES



MRI

NORMAL PCL

T_1 W

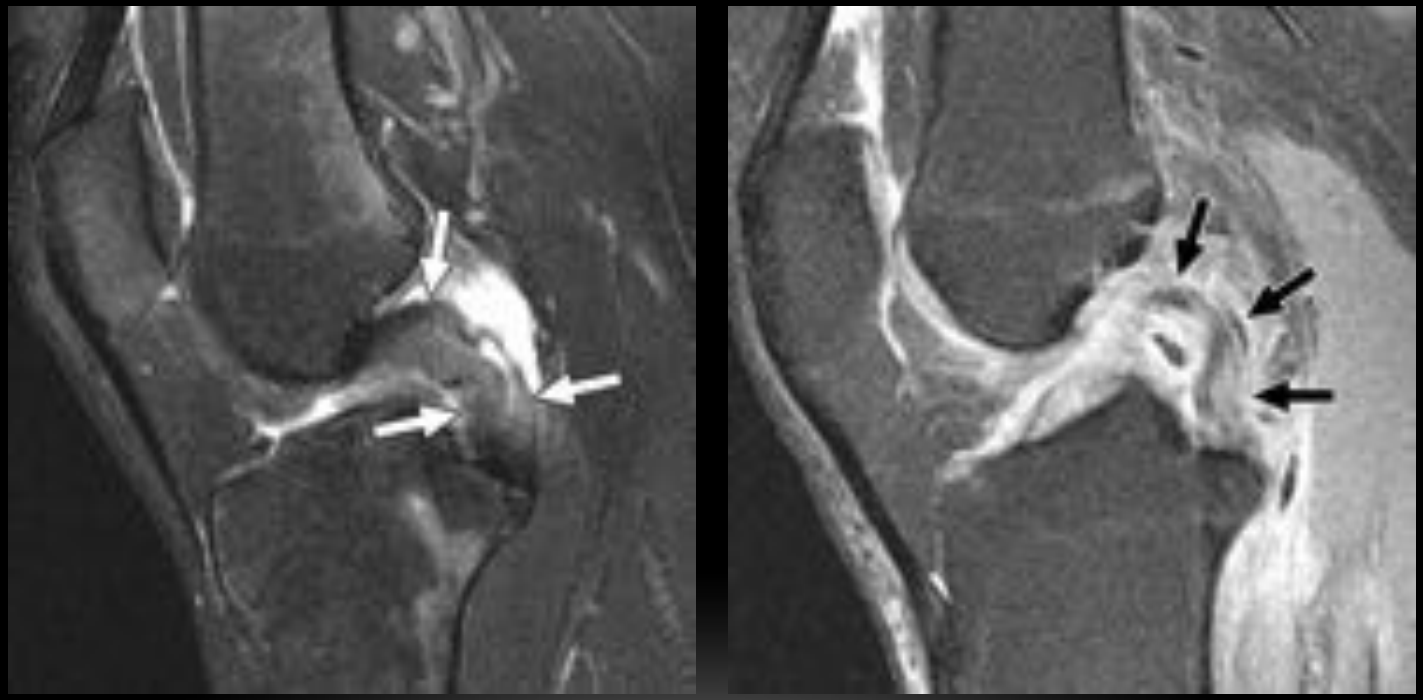


T_2 W
[PD]

Broad curvilinear band of low signal intensity usually 6 mm or less in thickness

MRI

ABNORMAL PCL



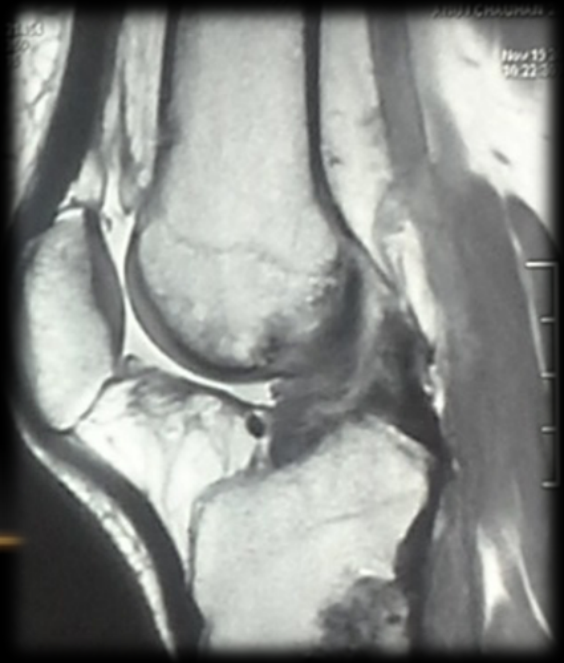
Stretched appearance with intra-substance signal changes
AND Thickening > 6mm

MRI

AVULSION

INTRA-SUBSTANCE TEAR

FULL THICKNESS TEAR

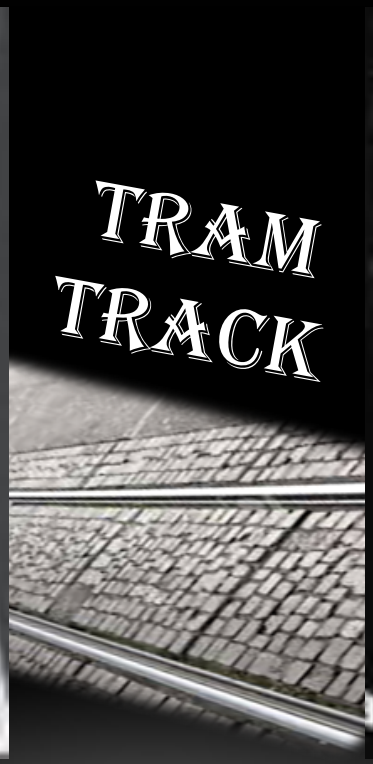


MRI

COMPLETE vs PARTIAL TEAR

MRI

MUCOID DEGENERATION vs PARTIAL TEAR



McMonagle JS et al . AJR Am J Roentgenol. 2013 Aug;201(2):394-9. **Tram-track appearance of the posterior cruciate ligament (PCL): correlations with mucoid degeneration, ligamentous stability, and differentiation from PCL tears.**

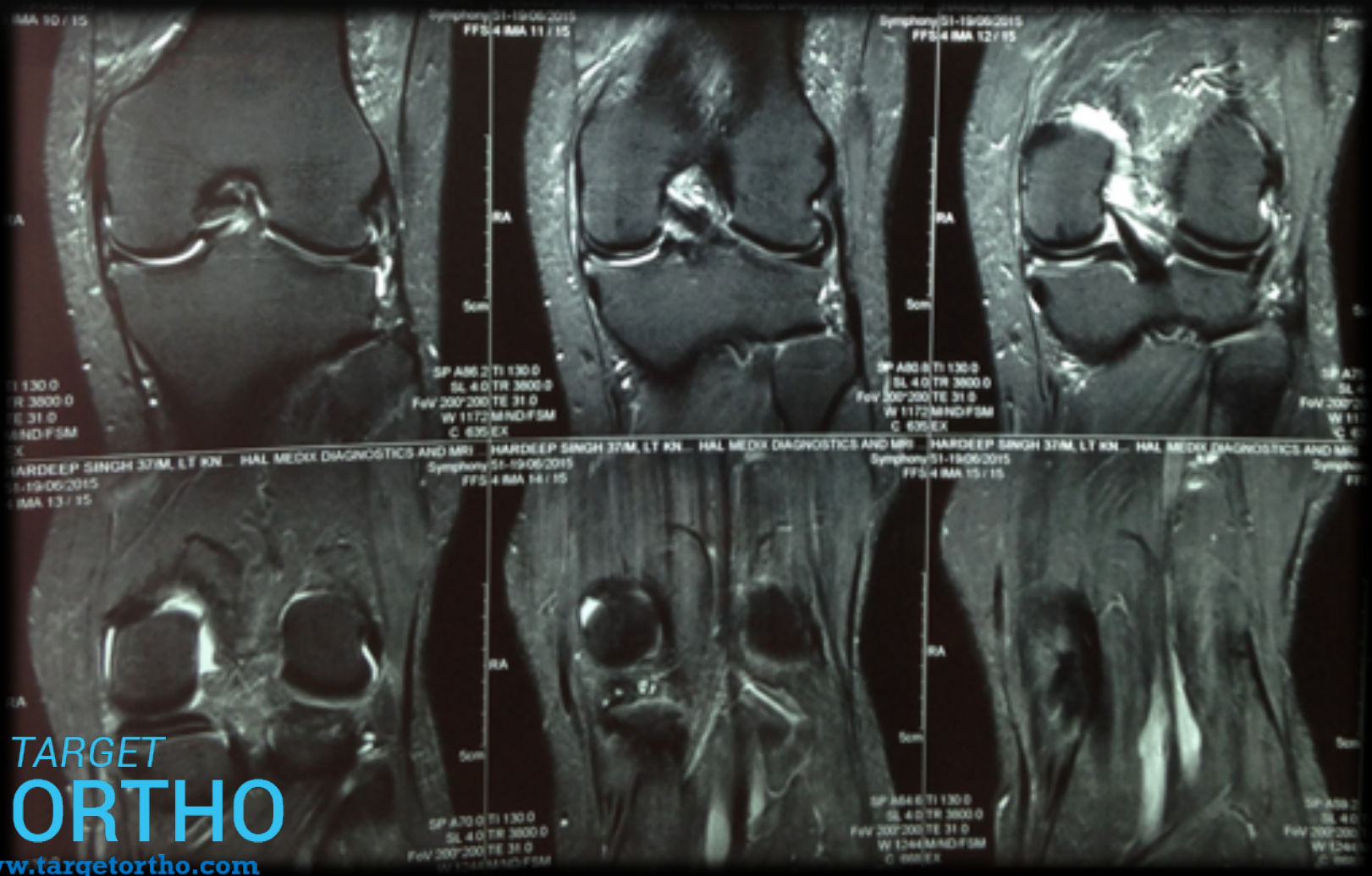
MRI

DOUBLE PCL SIGN

BUCKET HANDLE TEAR MEDIAL MENISCUS

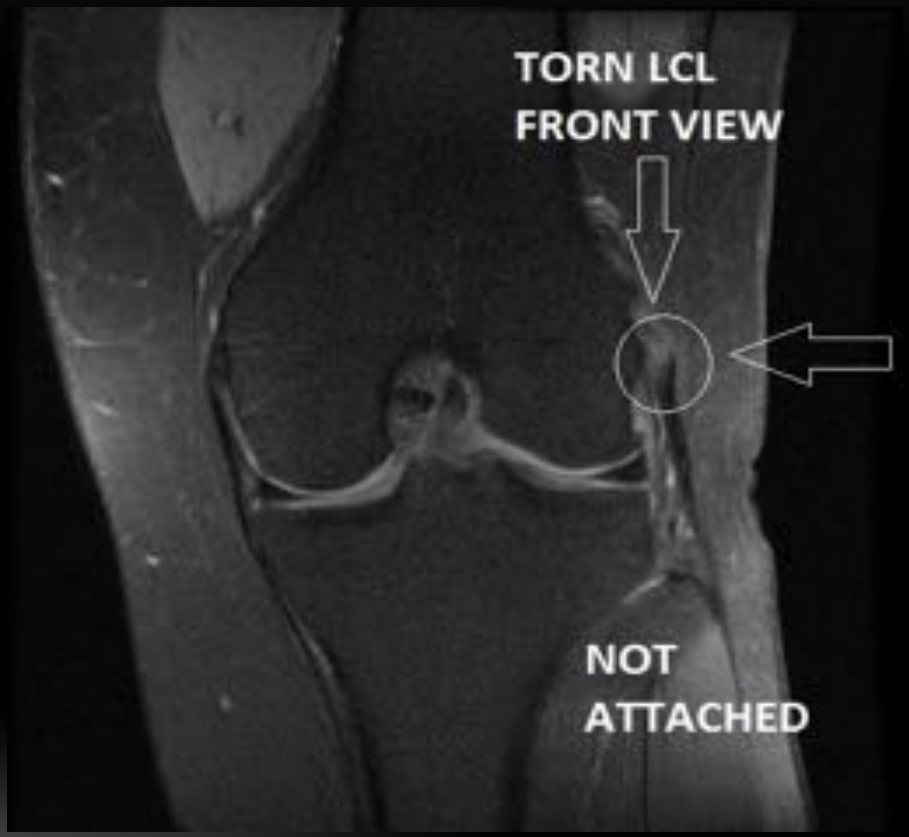
MRI

NORMAL PLC



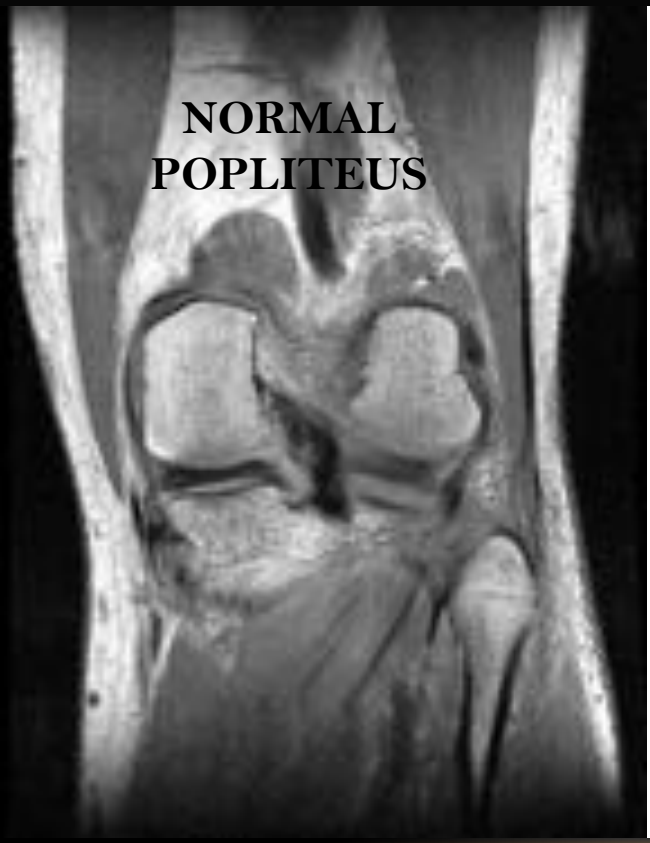
MRI

LCL TEAR



MRI

POPLITEUS TEAR



INSTRUMENTED MEASUREMENTS
in
POSTERIOR CRUCIATE LIGAMENT
And
POSTERIO LATERAL COMPLEX

Arthrometry AND Stress Radiography

ARTHROMETRY

Instrumented quantification of laxity

Posterior translation

- Knee ligament Testing platform [KT-1000/2000]
  by Medmetric, San diego
- Knee Laxity Tester
  by Stryker

Rotational assessment

- Rotationometer/ Laxiometer

ARTHROMETRY

KT-1000/ 2000

ARTHROMETRY

ROTATIONOMETER

LARS

STRESS RADIOGRAPHY

- Posterior laxity
- Varus/ Valgus laxity

STRESS RADIOGRAPHY

POSTERIOR LAXITY

- Hamstring contraction x-ray
- Gravity sag view
- Kneeling x-ray
- Telos stress view

STRESS RADIOGRAPHY

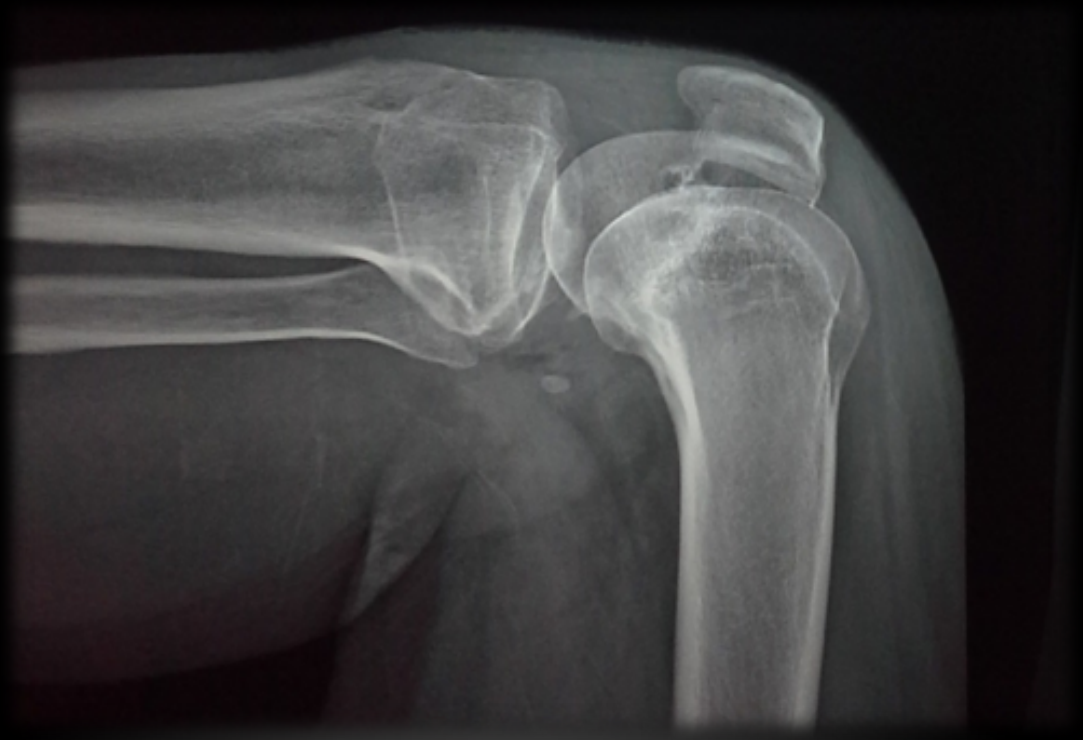
HAMSTRING CONTRACTION X RAY

TARGET ORTHO

ACCURATE AND RELIABLE

STRESS RADIOGRAPHY

GRAVITY SAG VIEW



TARGET ORTHO

QUICK AND EASY; UNRELIABLE

STRESS RADIOGRAPHY

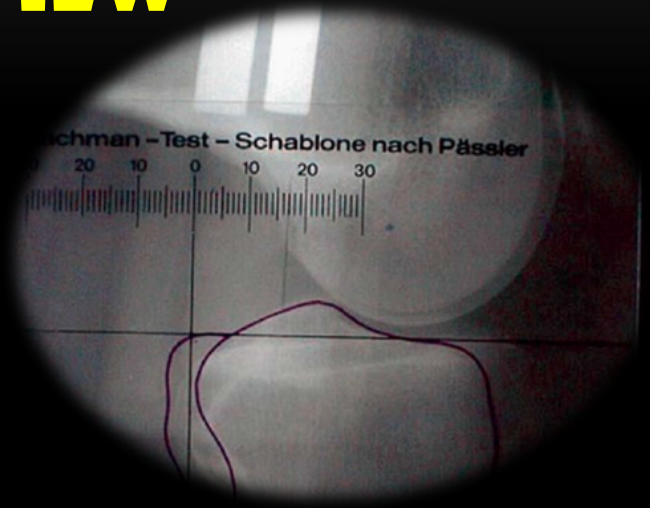
KNEELING X RAY VIEW

TARGET ORTHO

MOST RELIABLE AND EASY

STRESS RADIOGRAPHY

TELOS STRESS VIEW



TARGET ORTHO

GOLD STANDARD; DEVICE NEEDED

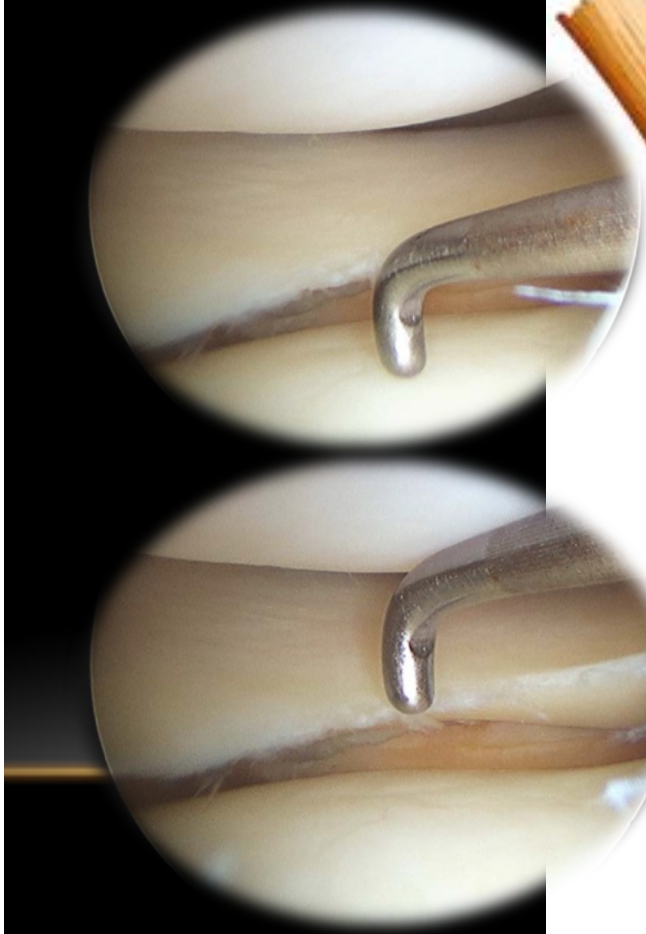
STRESS RADIOGRAPHY

VARUS/ VALGUS STRESS VIEWS

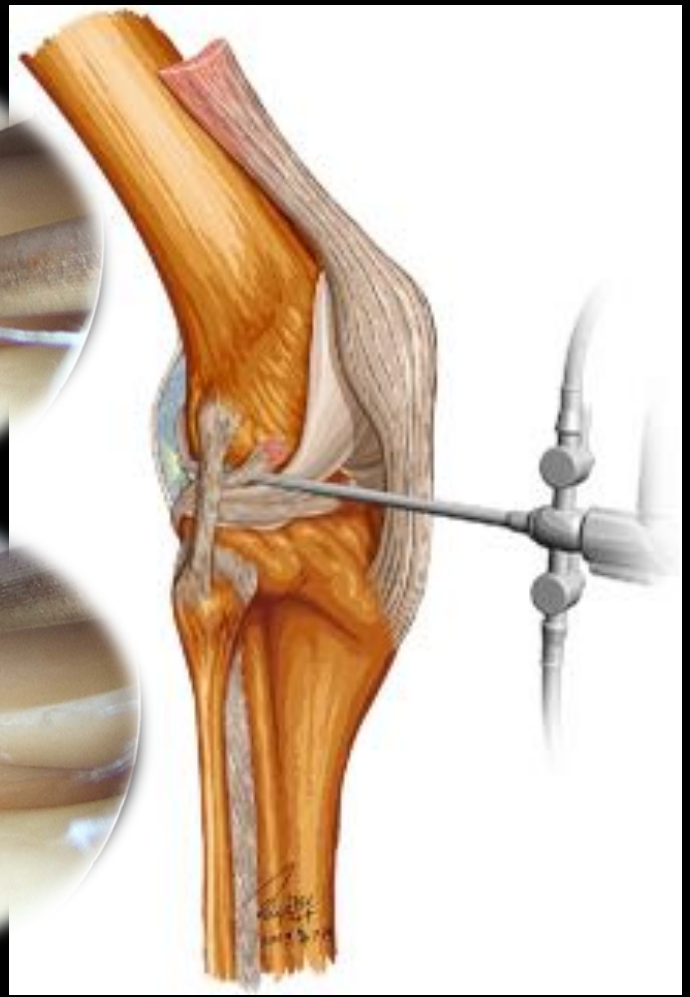
- > 11 MM or Side to side difference > 3 mm is abnormal

Indirect arthroscopic evidences of PCL injury

SLOPPY ACL SIGN



DRIVE THROUGH SIGN



MANAGEMENT

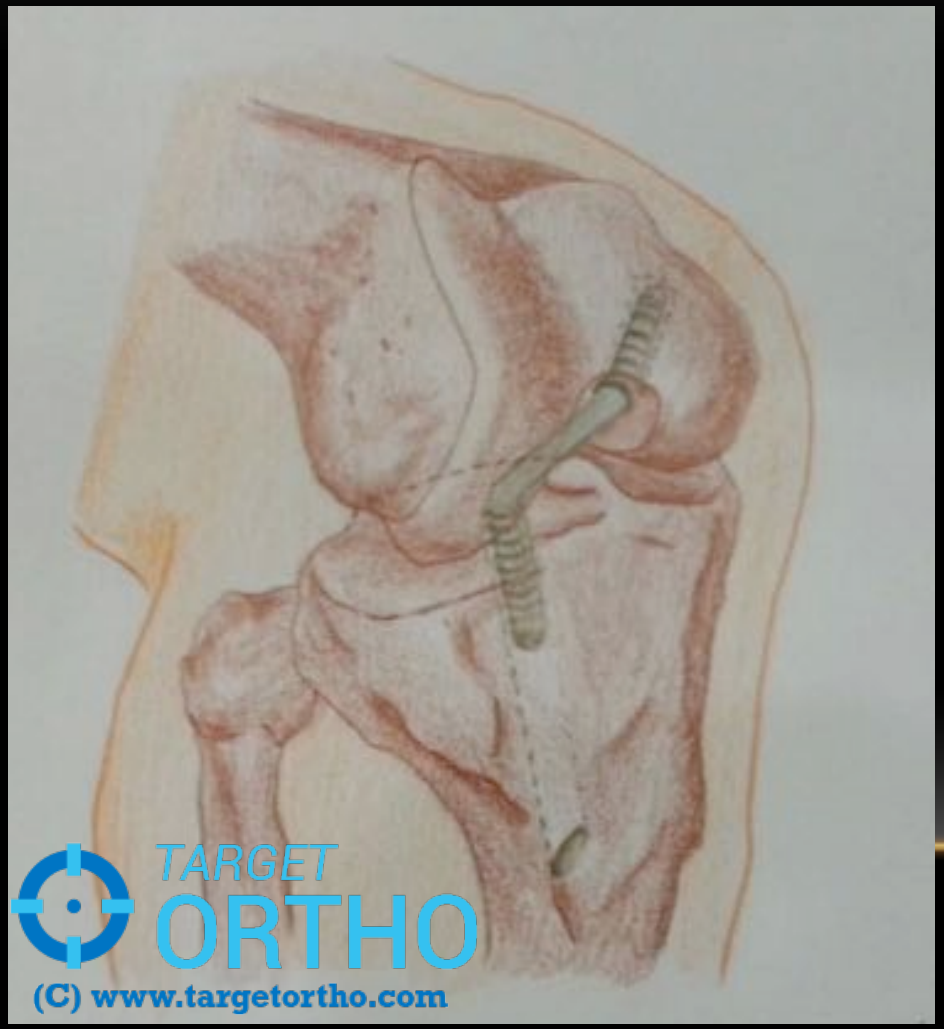
When to Operate for PCL ??

- Avulsion injuries
- Isolated grade III PCL injury; acute or chronic
- Grade II in following scenarios:

✓ PCL injury in setting of multi ligamentous knee injury

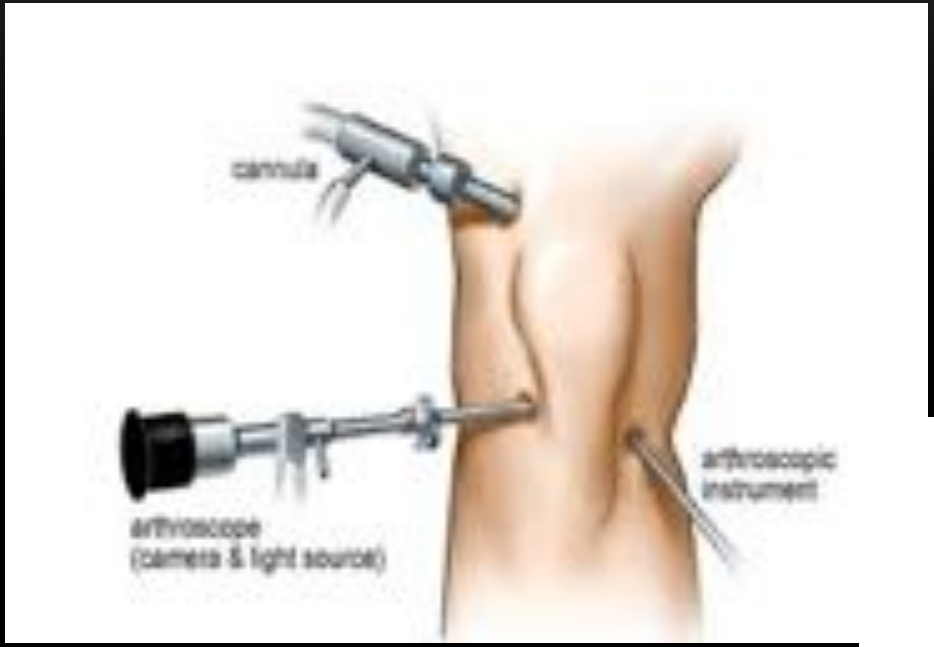
✓ Symptomatic patient who fails to respond to conservative treatment

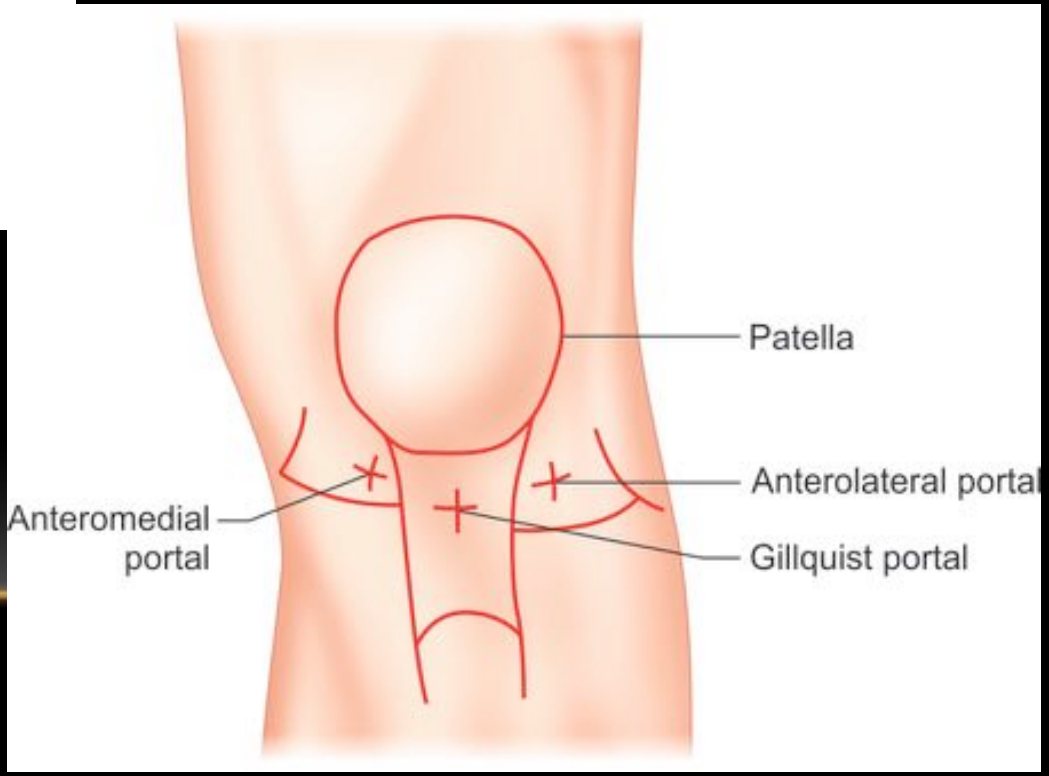
TRANSTIBIAL (T-T) TECHNIQUE

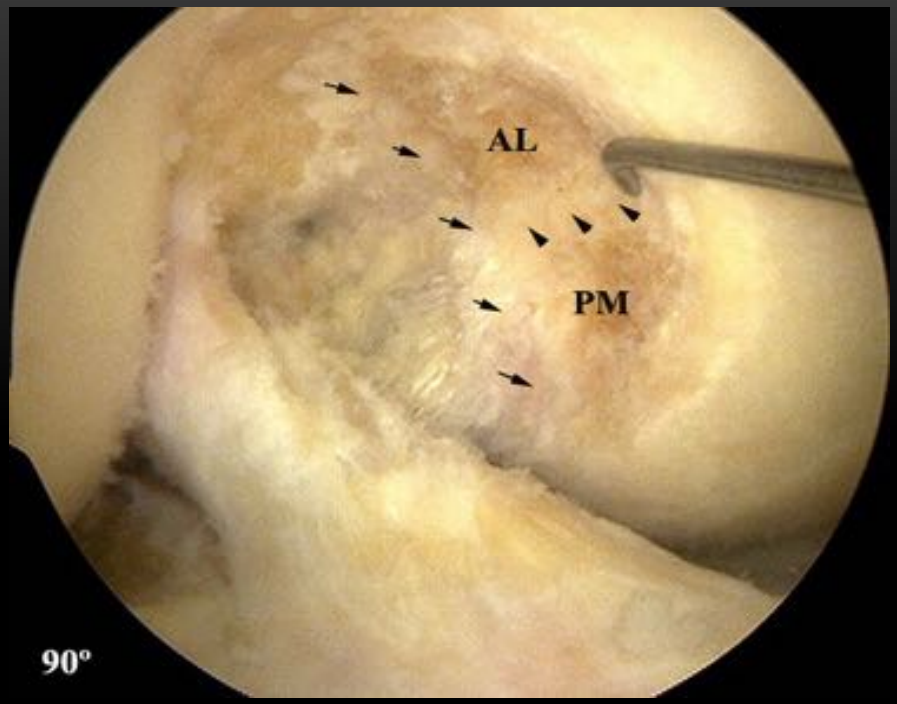


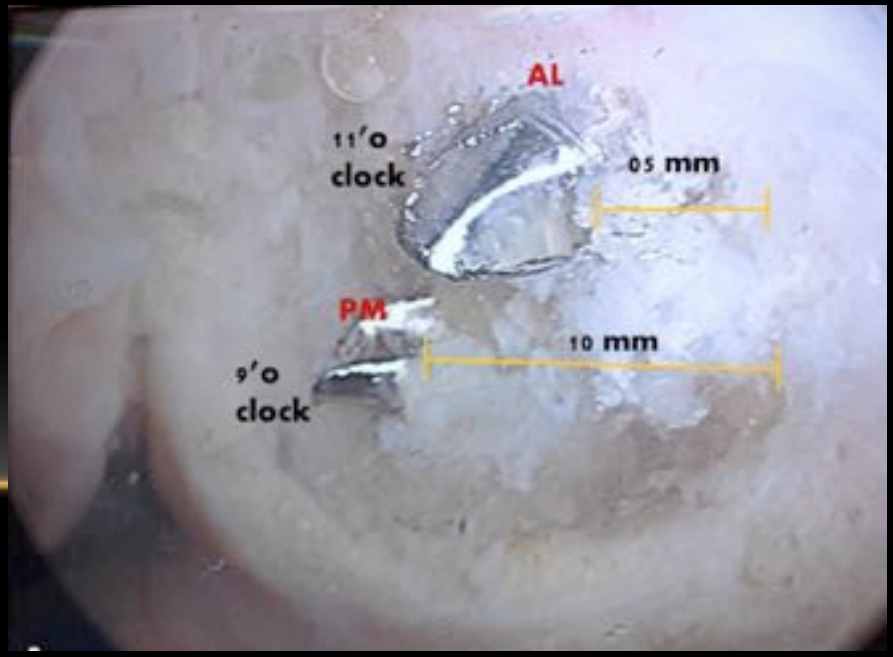
TIBIAL INLAY TECHNIQUE

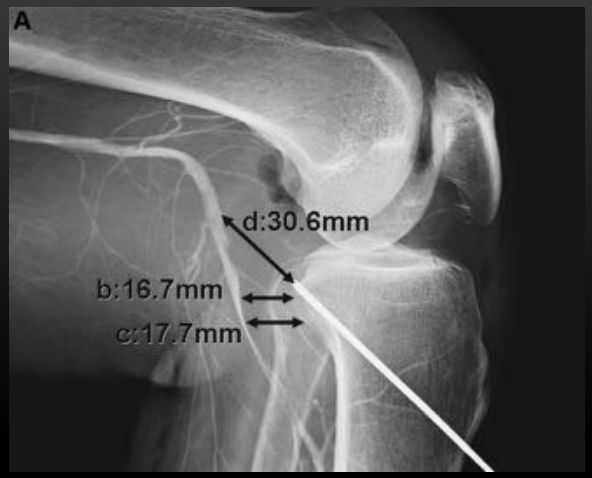
ARTHROSCOPIC (T-T) PCL RECONSTRUCTION



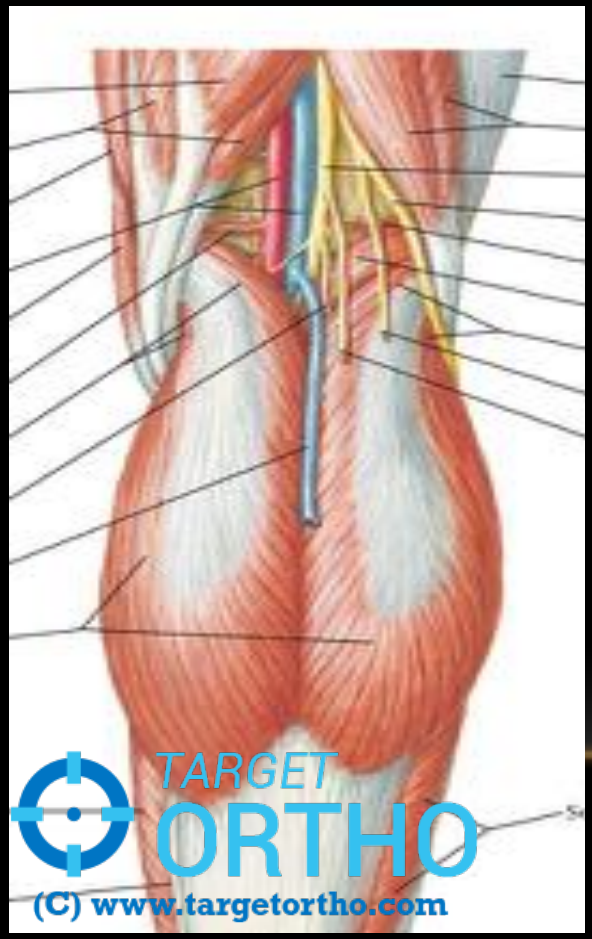


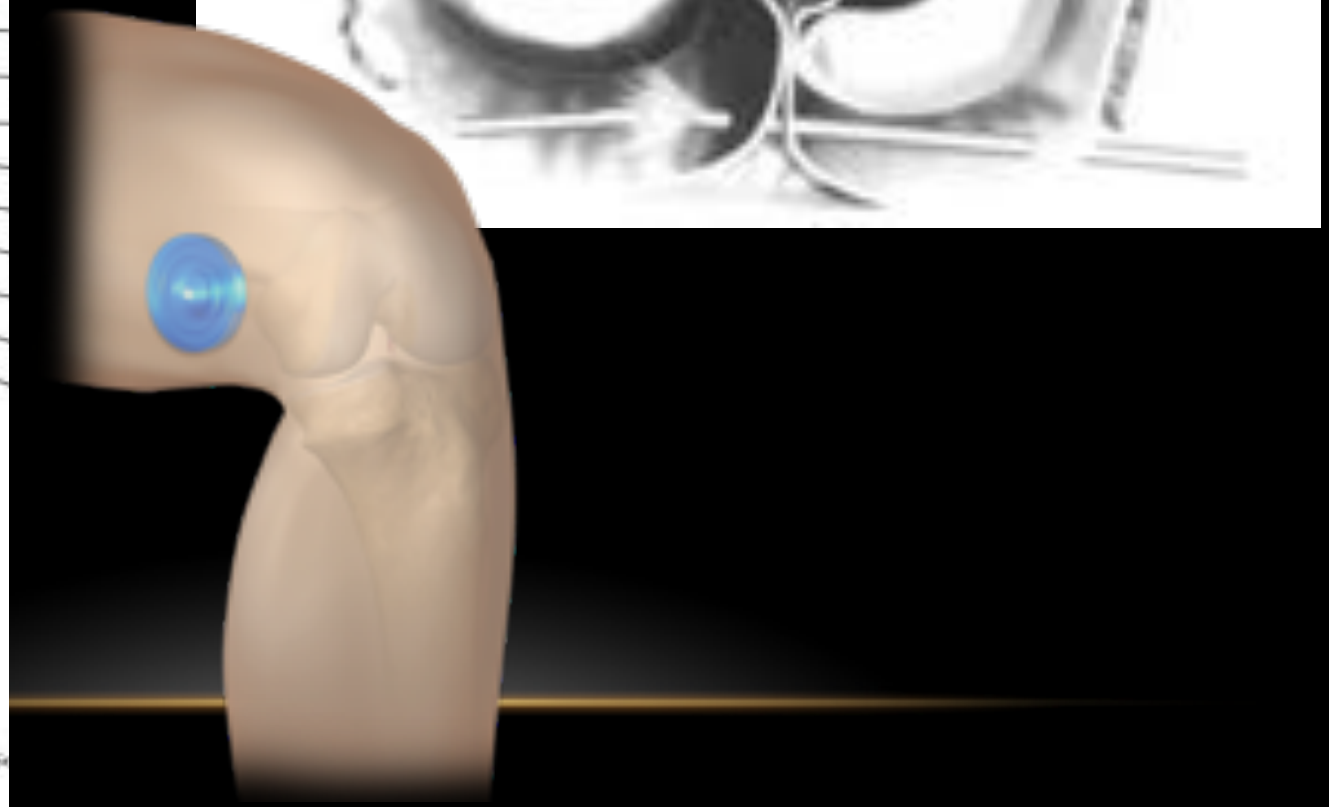





A
d:30.6mm
b:16.7mm
c:17.7mm


LAT
MED


TARGET
ORTHO
(C) www.targetortho.com



POSTERO MEDIAL SAFETY INCISION

REHABILITATION

Prone knee bend

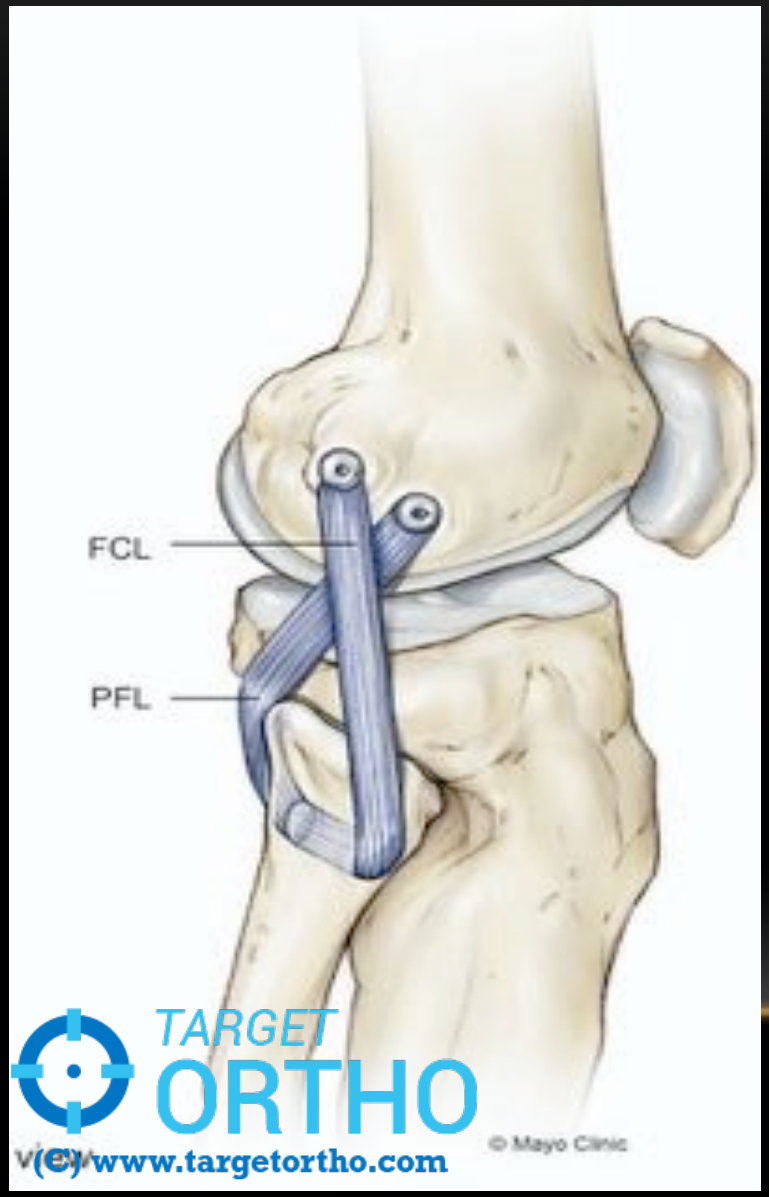
GRADING PLC (Fanelli)

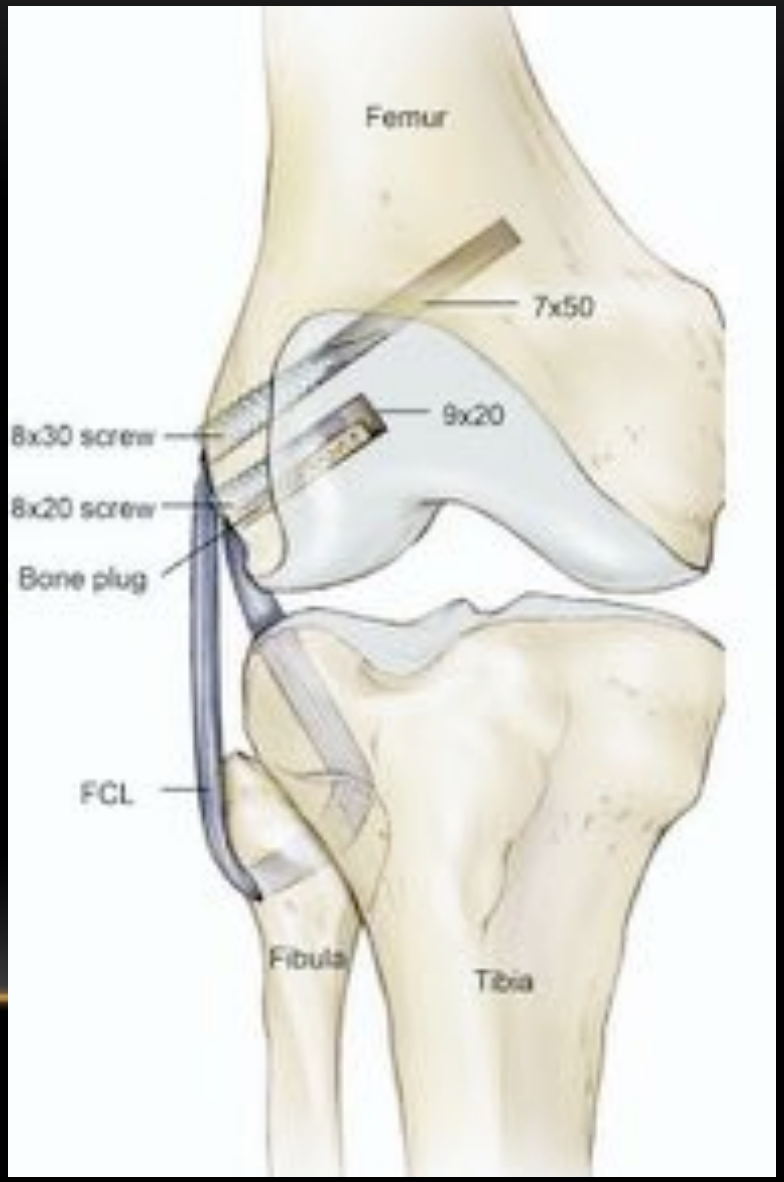
A: injury to popliteofibular ligament, popliteus tendon

B: injury to popliteofibular ligament, popliteus tendon, and FCL

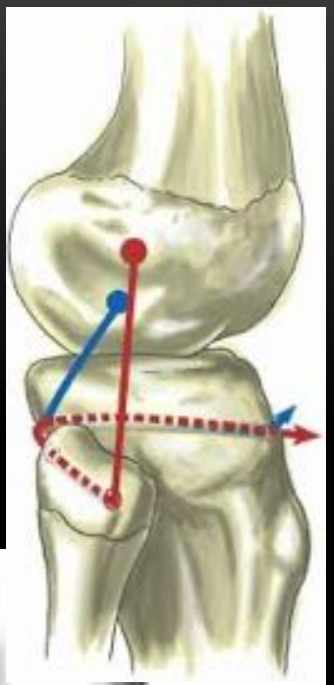
C: injury to popliteofibular ligament, popliteus tendon, and FCL, lateral capsular avulsion, and cruciate ligament disruption

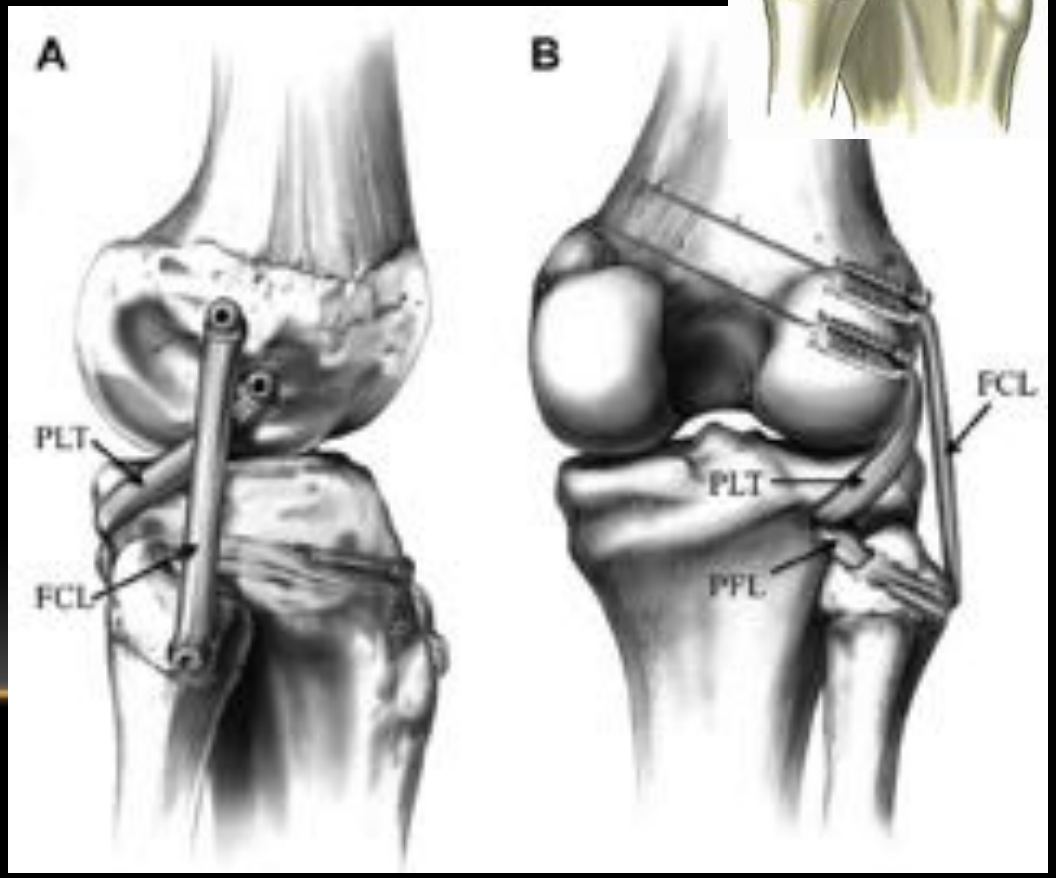
LARSON'S TECHNIQUE (MODIFIED)





LAPRADE's TECHNIQUE





Q. 30 years female athlete with chronic PCL PLC injury has come to you with varus thrust gait. Ideal management

A. Reconstruct the PCL and PLC

B. HTO

C. HTO and PCL PLC reconstruction in same sitting

D. Stage HTO and ligament reconstruction by 6 weeks

ROLE OF HTO

- HTO should be done for treatment of **CHRONIC** PCL/PLC-deficient knee associated with varus malalignment. If the knee is still unstable, soft tissue procedures should be performed 6–8 months after correction of the malalignment.

- HTO allows the surgeon to modify both the coronal and the sagittal plane of the knee; and *an increased posterior tibial slope stabilizes the joint!*

THANK YOU

TARGET ORTHO