



# Multi-ligament injuries : Current Concepts

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# Disclosures

- Consultant, Depuy Orthopedics
  - Organizer: Depuy Meet the Experts Masterclass
- Consultant, Zimmer Orthopedics
- Consultant, AAP Trauma
- Speaker, Abdi İbrahim Drug Company
  - Organizer: Perioperative Management of TKA Courses

# Epidemiology

- High energy injuries with significant soft tissue trauma
- Associated injuries
  - Peroneal nerve 16-50%
  - Popliteal artery 4-35%
  - Tibial rim fractures
  - Patellar tendon avulsion
- Surgery indicated for almost all patients



# Schenck Classification

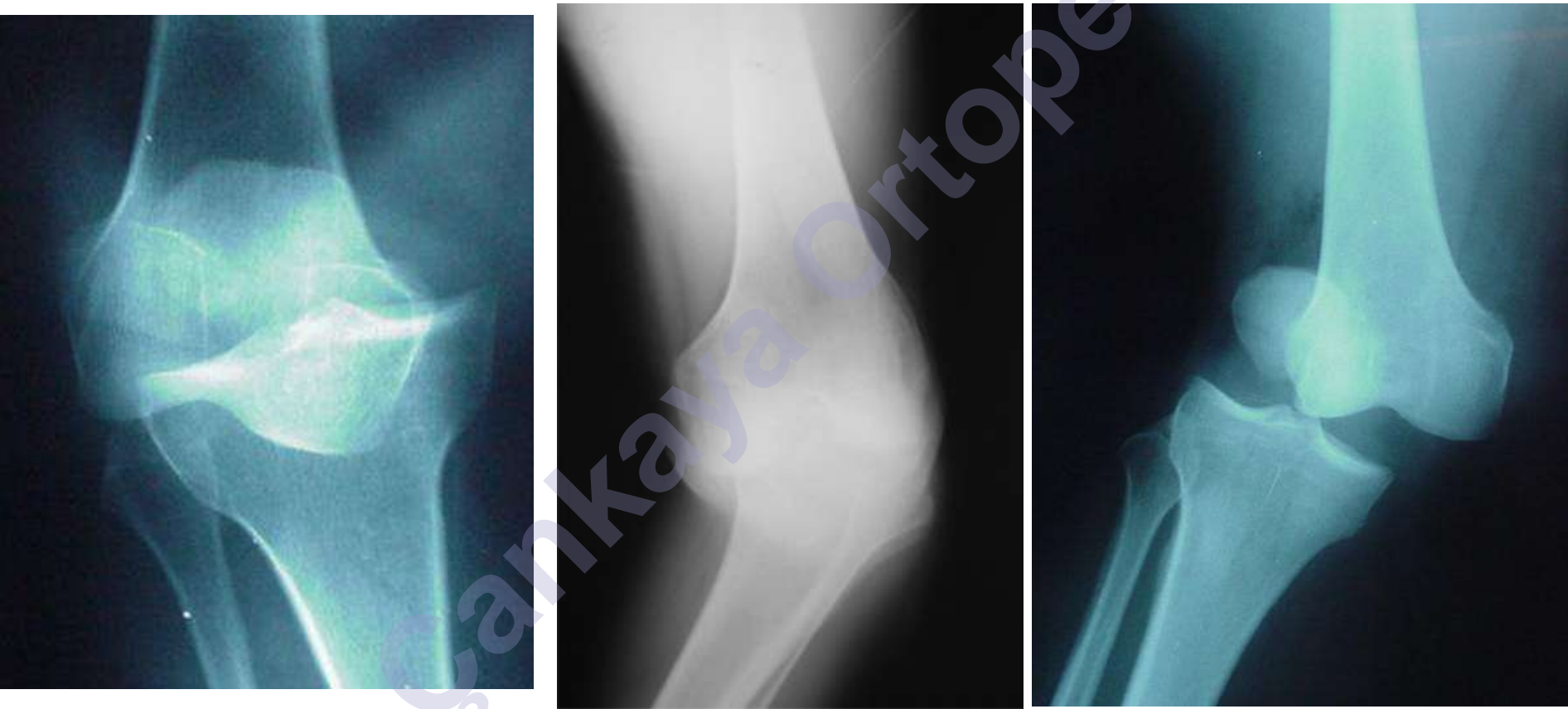
- KD I : (*One cruciate intact*)
- KD II: (*ACL + PCL , Collaterals intact*)
- KD III: (*ACL + PCL + One collateral injured*)
  - KD III M: *Medial*
  - KDIII L : *Lateral*
- KD IV: (*ACL + PCL + LCL + MCL* )
- KD V: (*Fracture dislocation*)
- Subgroup: **C:Vascular injury / N: Neurological injury**

# Emergency management

- Monitor vascular integrity
- Maintain reduction
  - Anterior external fixation if unstable in an immobilizer
- Manage open wounds
- Observe for compartment syndrome



# Plain X-rays



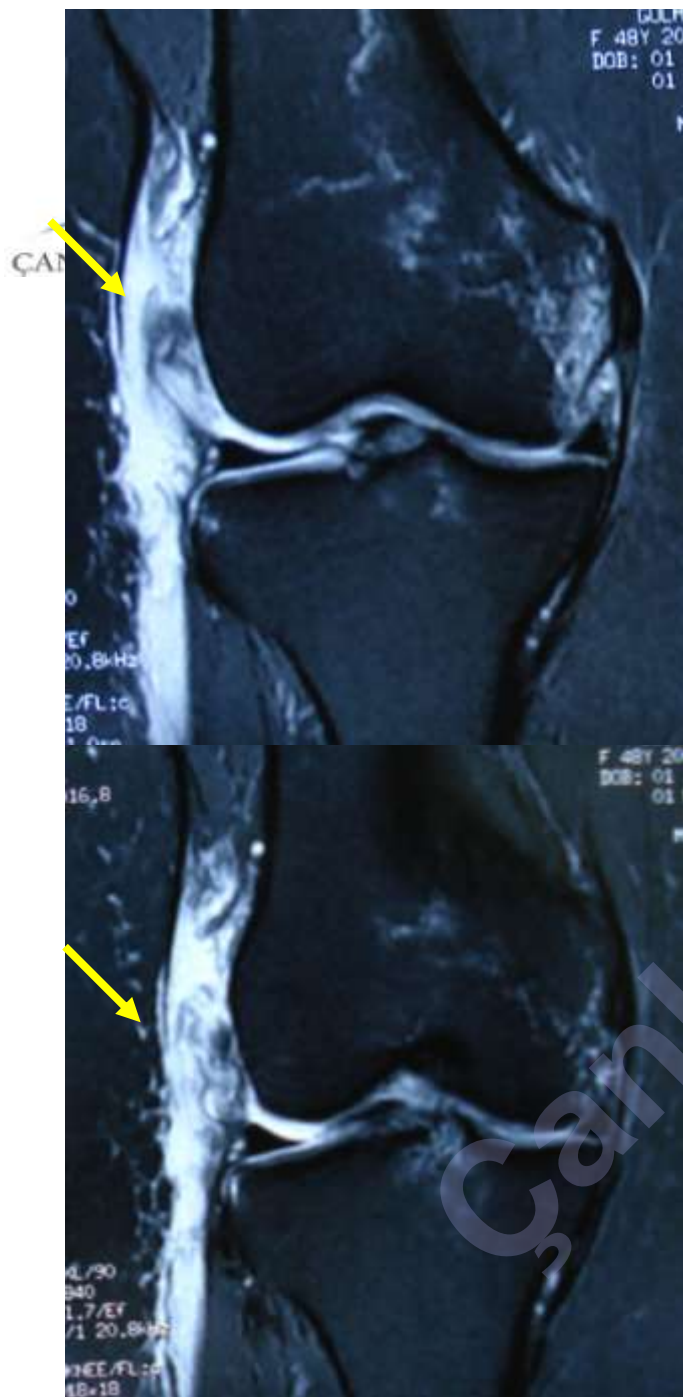


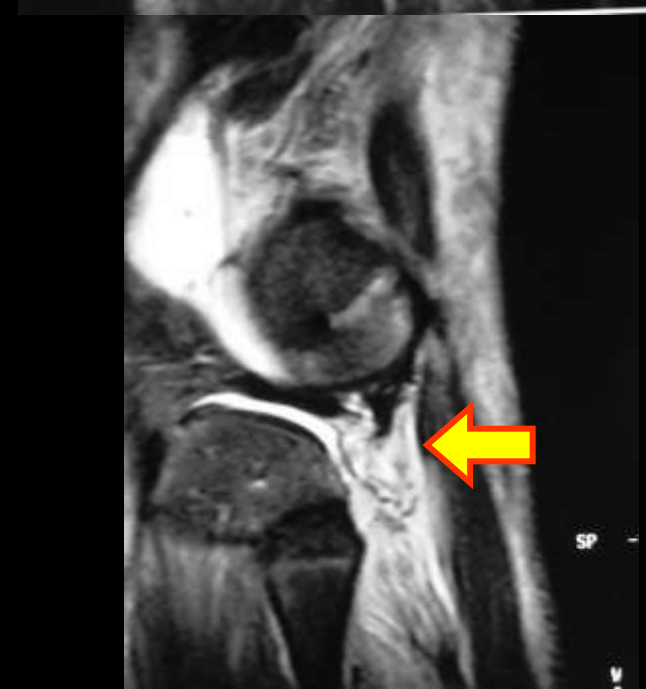
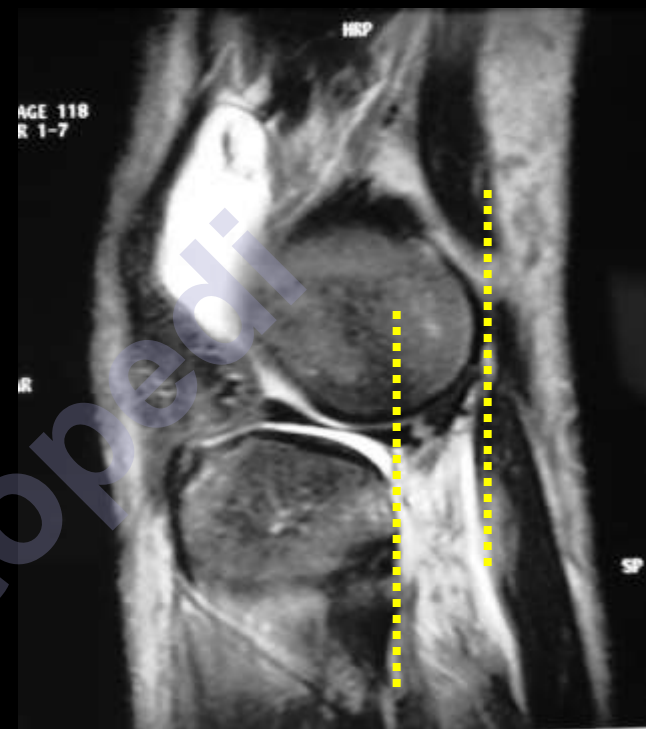


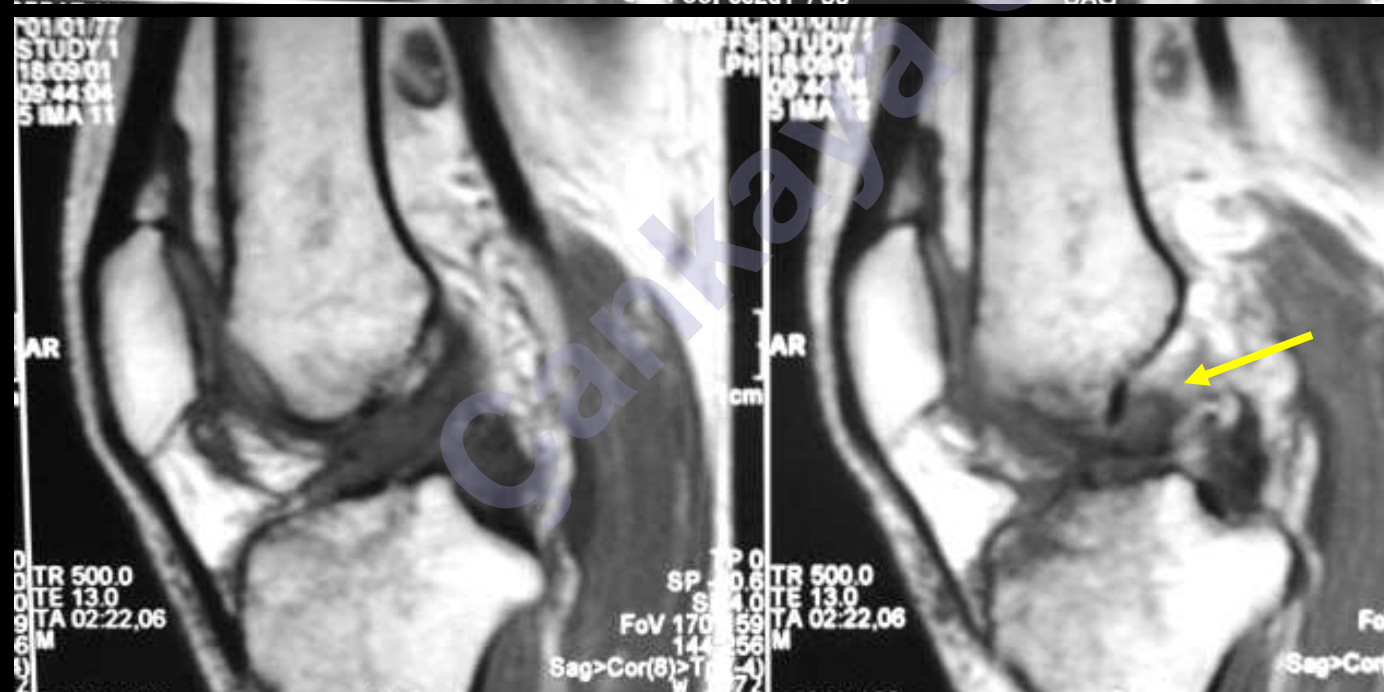
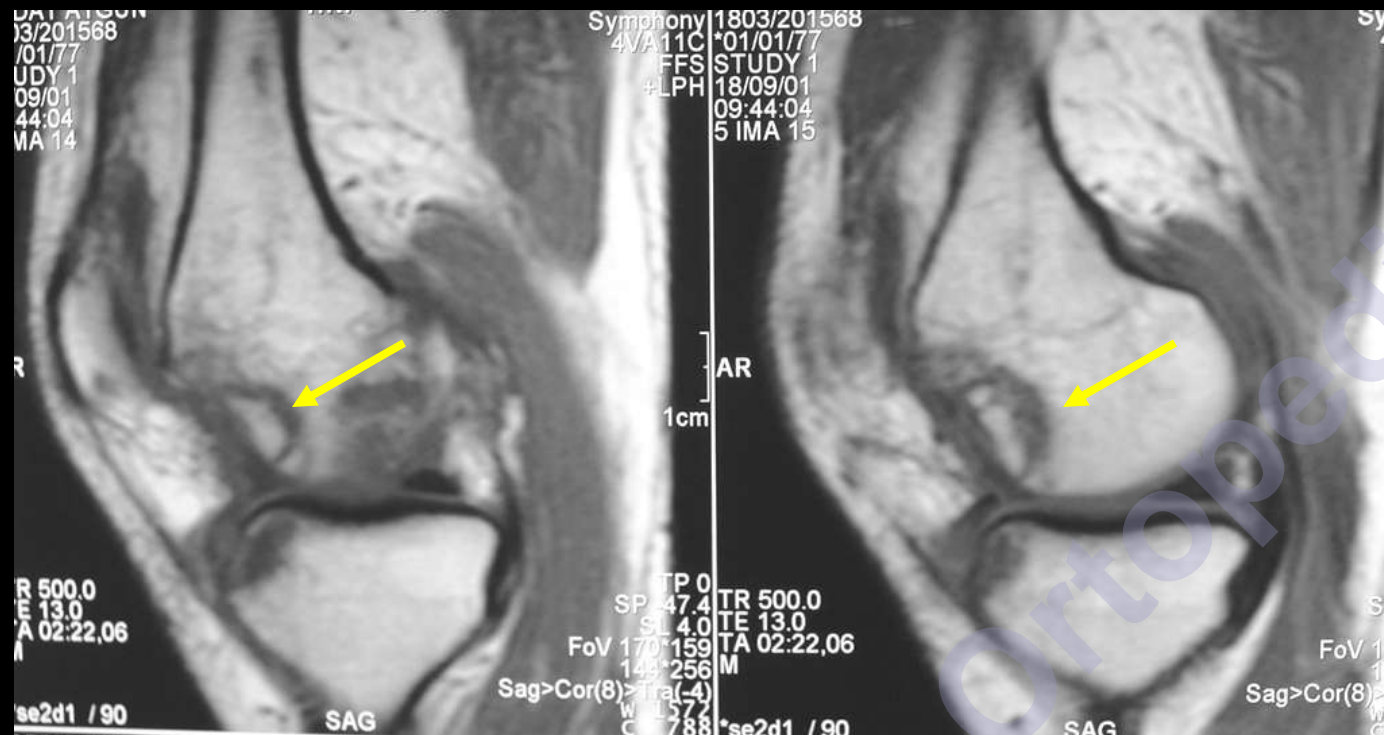
# Tibio-fibular separation



# Femoral peel-off







**Occult  
fractures  
of the  
contra-  
lateral  
compart-  
ment**

# Conservative treatment

- Associated injuries preventing surgery
  - Open wounds
  - Compartment syndrome
- Elderly patients with severe comorbidities
- Residual laxity or stiffness due to prolonged immobilization common
- All comparative studies show inferior results compared to surgery
  - *Richter M: Am J Sports Med 2002, 30:718-727*
  - *Dedmond BT. Am J Knee Surg. 2001 Winter;14(1):33-8*

# Pre-op plan

- Incisions
- Graft selection
  - Allograft
  - Contra-lateral knee
- Implants
- Timing : 2-3 weeks to allow for a synovial seal and soft tissue healing



# Surgical strategy

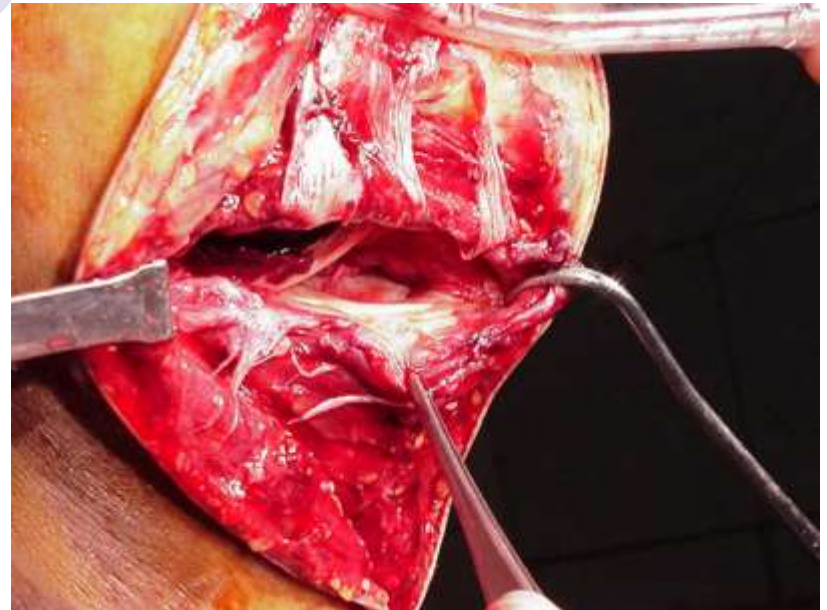
- Repair all injured structures in the same setting
  - Higher risk of arthrofibrosis
- Reconstruct PCL and repair PL and PM side in the first surgery
- Reconstruct ACL at 6 weeks before WB
  - *Stannard JP. J Knee Surg. 2012; 25(4):287-94.*
  - *Stannard JP: Am J Sports Med. 2005; 33(6):881-8.*
- All reconstructions must be complete before full weight-bearing

# Exam under anesthesia

- Pain, effusion and muscle spasm preclude a complete ligament exam in the awake patient
- EUA useful in final decision making



# Valgus stress test



# Postero-lateral drawer test



# External rotation recurvatum test

Postero-lateral  
subluxation of the tibia  
results in  
hyperextension and  
varus



# Dial test

- ER more than 15 degrees compared to the healthy knee is positive
- 30 degrees PLC
- 90 degrees PLC + PCL



# Surgical principles

- Address PCL / ACL
  - Internal fixation for bone avulsions
  - Allograft reconstruction for mid-substance injuries
- Primary repair of capsule and menisci
- Collaterals & popliteus
  - Internal fixation for bone avulsions
  - Primary repair: good tissue quality
  - Primary reconstruction : questionable tissue quality

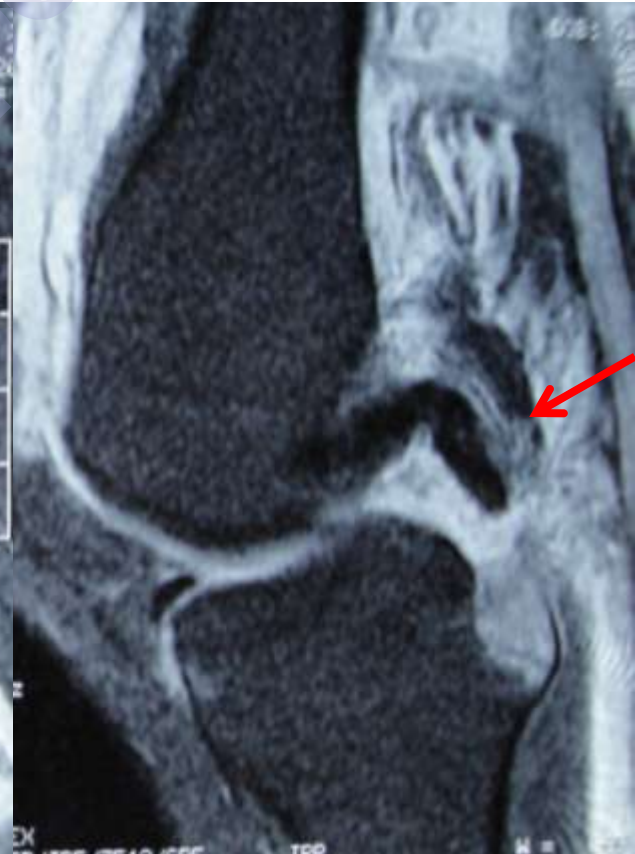
## ■ Repairable avulsions

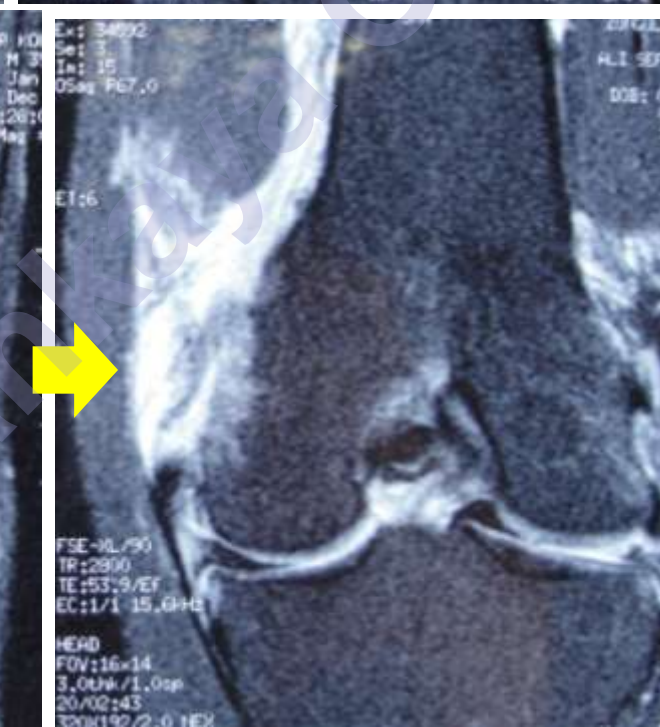
- ACL : % 19
- PCL : % 51
- MCL : % 64
- **LCL : % 84**

- *Twaddle BC: J Orthop Trauma. 2003 17:198-202.*

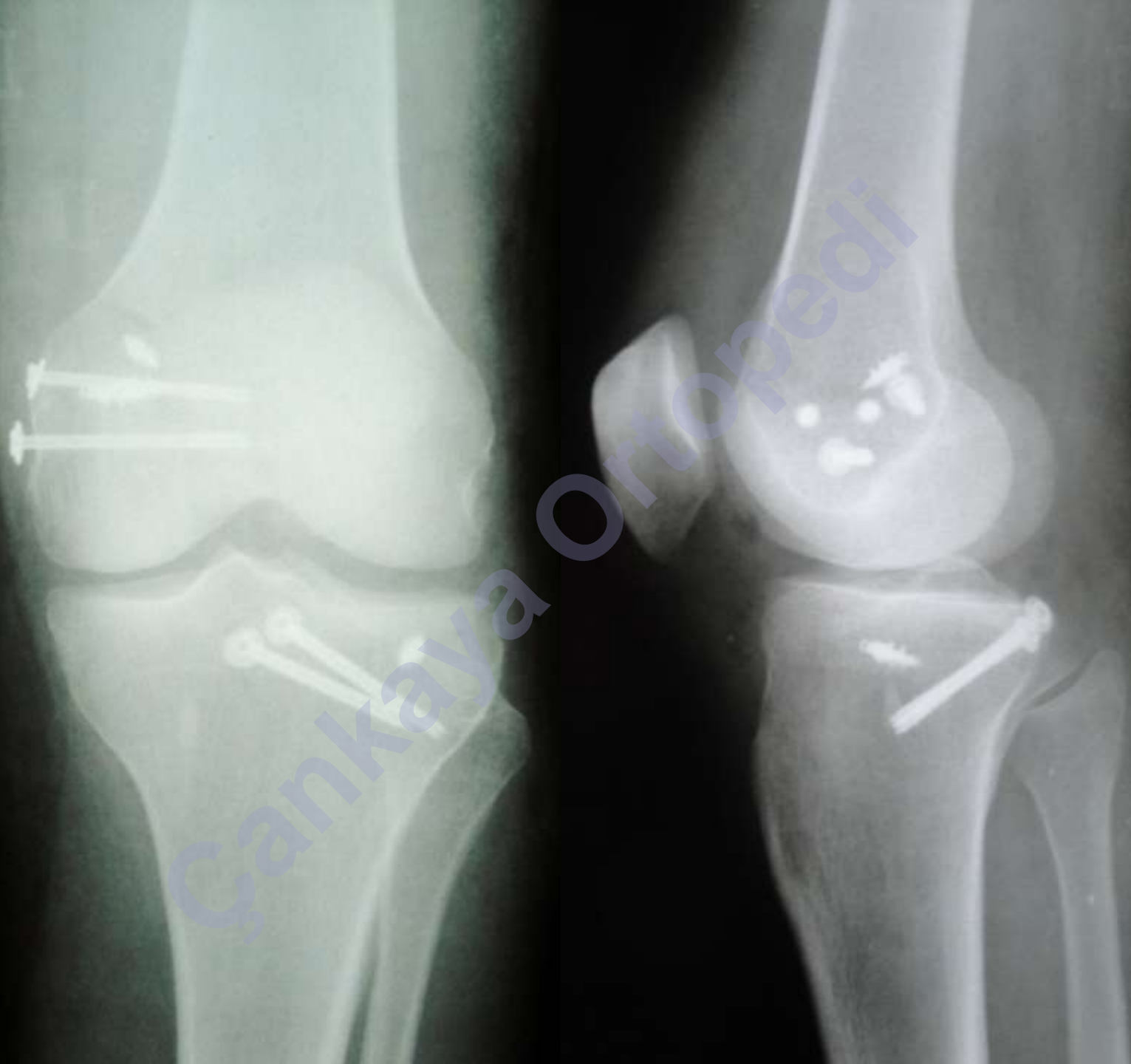


# PCL tibial avulsion





**MCL  
femoral  
avulsion**





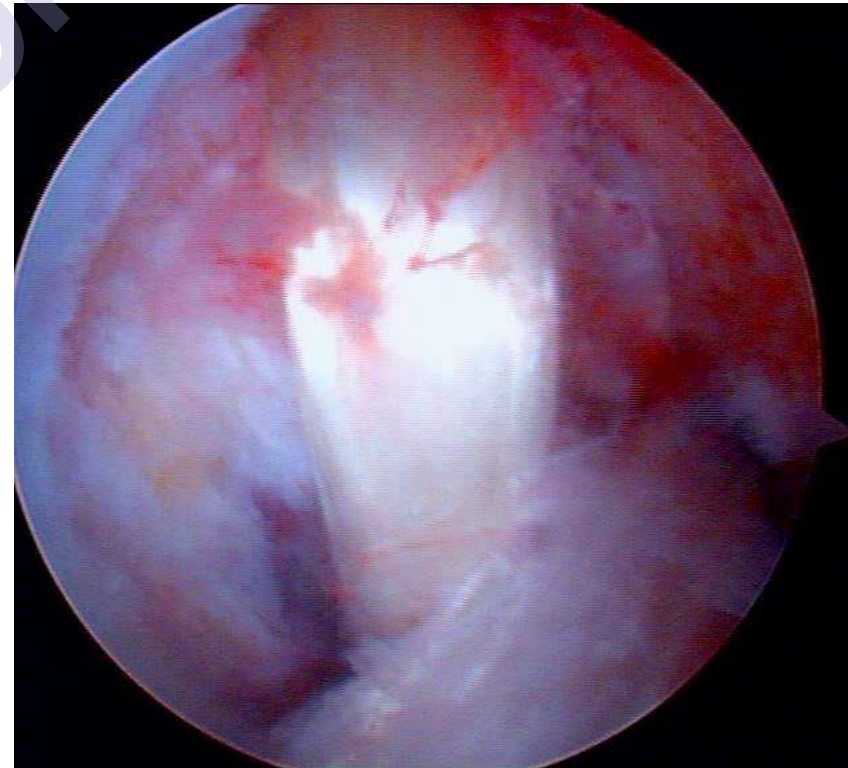
# Arthroscopy

- Injury pattern of the cruciates
- Opening of the involved compartment
- Peripheral tears of the meniscus
- Fractures and chondral injuries in the contralateral compartment



# Reconstruct cruciates

- Allografts to minimize morbidity
- Single bundle, trans-tibial PCL
- Anatomical, single bundle AM portal ACL



## Lateral side

- Peroneal nerve
- ITB
- LCL
- Popliteus
- Menisci & Coronary ligaments
- Posterolateral capsule
- Lateral gastroc
- Biceps insertion



# Peripheral repair

- Suture anchors
- Avoid large screw-washer combinations
- Non- absorbable no:2 sutures
- Anatomical repair of capsule, menisci, collateral ligaments and popliteus



# LCL + popliteus femoral insertion repair

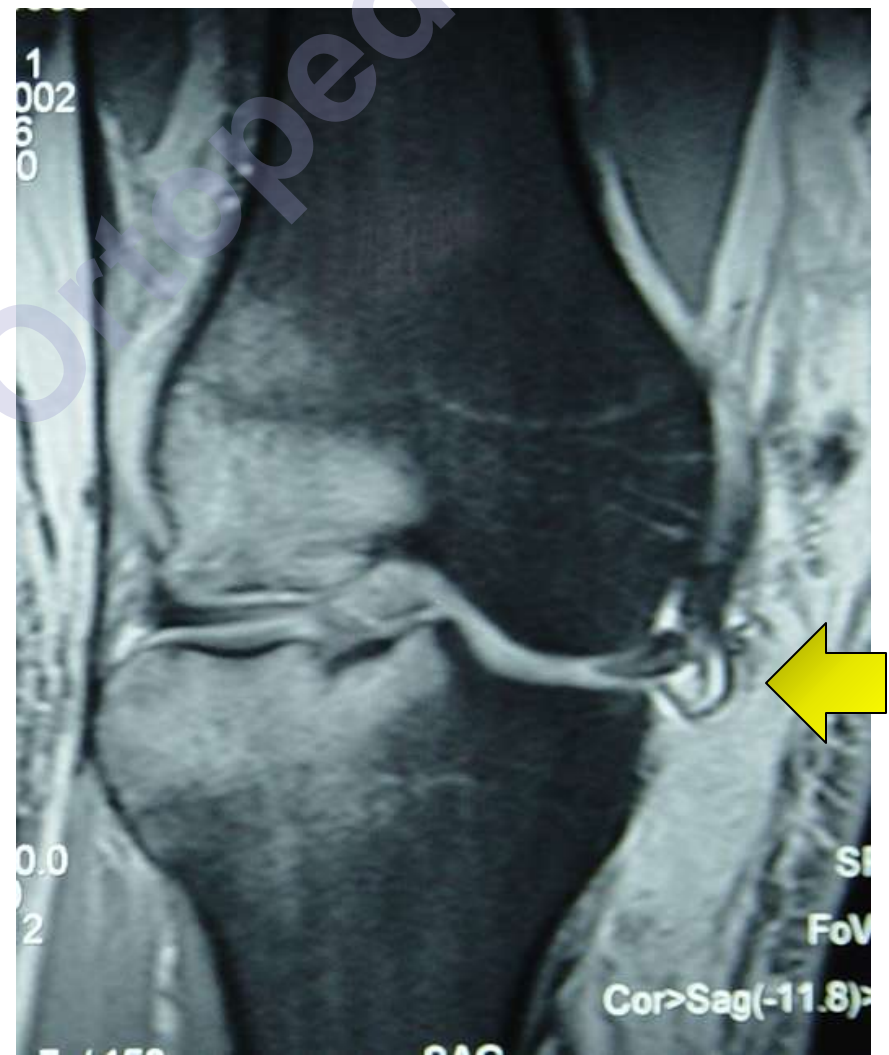
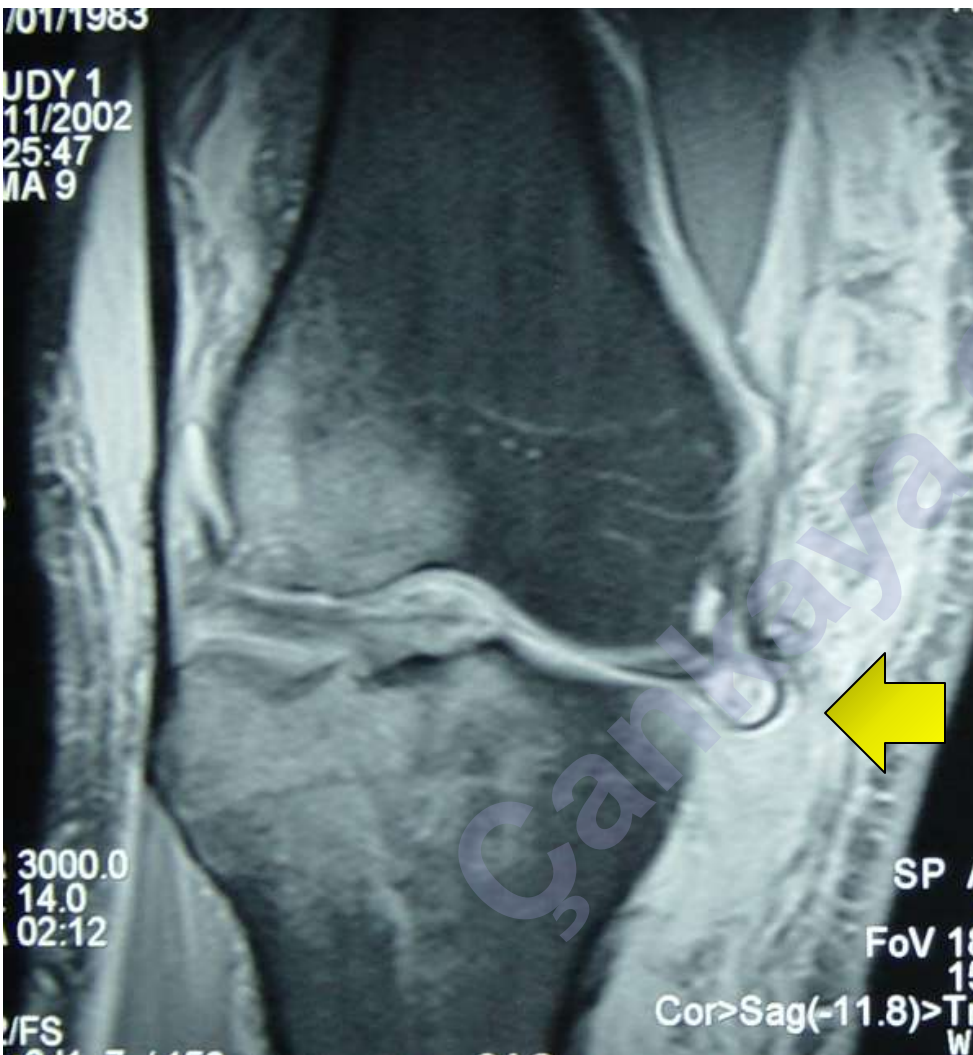




**LCL + popliteus  
femoral insertion  
repair**



# Intra-articular entrapment of MCL



# Bi-cruciate injury + medial tibial side avulsion

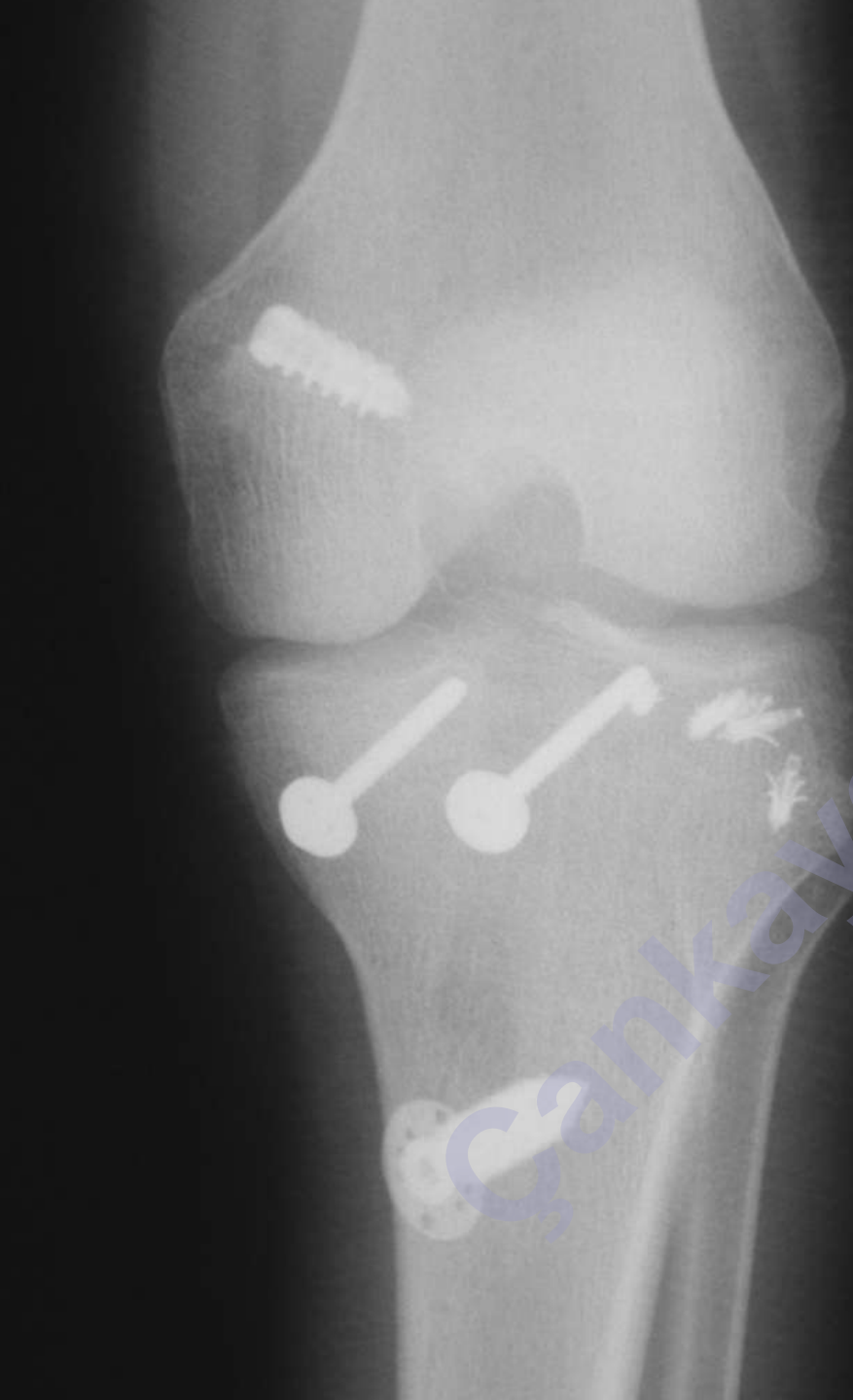






**Fix tibial rim fractures**





- **PRIMARY RECONSTRUCTION** if extensive damage to tissues present, precluding primary repair



## Reconstruction superior to primary repair in both lateral & medial injuries

- 64 knees postero-lateral injury
  - Primary repair : 37% failure
  - Primary reconstruction: 9% failure
    - Stannard JP. *Am J Sports Med.* 2005;33(6):881-8.
- 71 knees, postero-medial injury
  - Primary repair : 20% failure
  - Primary reconstruction: 4% failure
    - Stannard JP. *J Knee Surg.* 2012; 25(5):429-34.
- 28 knees, postero-lateral injury
  - Primary repair : 40% failure
  - Primary reconstruction: 6% failure
    - Levy BA. *Am J Sports Med.* 2010; 38(4):804-9.

**x3 to x6  
Failure**

# Rehabilitation

- Tailored to injury pattern and stability at the end of surgery
- 1-2 weeks immobilization for soft tissue healing
- Prone flexion started in 3 weeks
- Partial WB for 6 weeks
- Minimum 2 months brace
- High impact sports not before 8 months.

# What not to do in combined ligament injuries

- Partial repair/ reconstruction
  - Abnormal loads on the reconstructed ligaments lead to failure
- Conservative treatment followed by reconstruction
  - Impossible to identify and repair anatomical structures in chronic cases
  - Results of acute surgery better than late reconstruction

# Failure to correct all components of instability

1<sup>st</sup> surgery



2<sup>nd</sup> surgery



# Beware of fixed posterior dislocations



# After extensive release 2nd revision



# Results

- Difficult to standardize because of variety of injury patterns and reconstruction techniques
- Fixation of avulsions have better results than ligament repairs
- Acute surgery better than chronic reconstructions
- Primary repair works on the medial side
- Reconstruction more stable on the lateral side

# Factors associated with inferior outcome

- Conservative treatment
- Late surgery
- Severity of injury
- Involvement of the posterolateral corner compared to medial side
- Low velocity injuries in obese patients

- *Werner BC. Clin Orthop Relat Res. 2014 Feb 6.*

# Take home messages

- Correct all components of the instability in the same setting
  - Reconstruct cruciates
  - Repair collaterals
  - Preserve menisci
- Primary reconstruction of collaterals if tissues are of poor quality



# Thank you

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