# L’insuccesso nella chirurgia legamentosa di ginocchio

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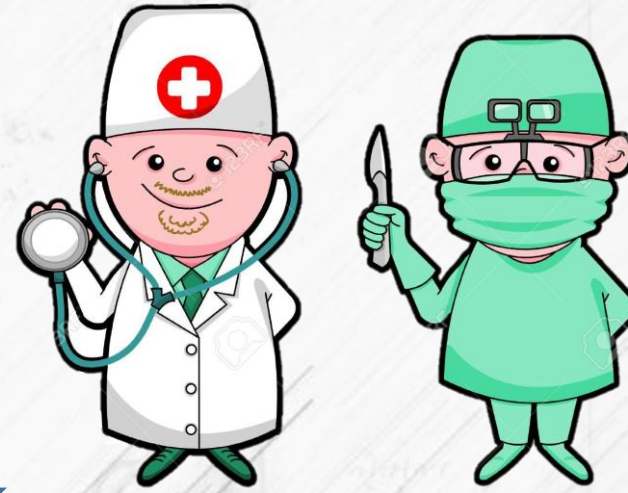
# Complications in knee arthroscopy

**Overall complications rate: 4.7%**

- **Mostly in PCL reconstruction: 20.1 %**
- **In ACL reconstruction: 9 %**
- **Few in meniscal surgery (2.8% meniscectomy – 7.6% meniscal repair)**



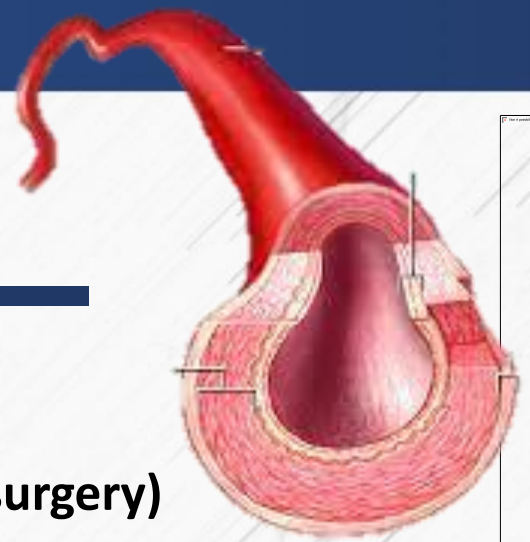
- ***Surgical complications (3.68%) were more common*** than medical (0.77%) or anesthetic complications (0.22%), and infection was the most common complication overall (0.84%)


Salzler M, AJSM 2014

- **Pulmonary embolism: 0.11%**

Courtesy by P. Ferrua

# Neuro- Vascular lesions (0.6%)



**Structures at risk:**

- **Popliteal artery (PCL-posterior compartments surgery)**
- **Geniculate arteries (> superolateral)**
- **Great Saphenous Vein (PM portal)**

- **Most common nerve injury: Inferior branches of saphenous nerve (neuroma) in medial meniscus suture**

- **Common peroneal nerve (in lateral meniscectomy and repair)**

often related to technical errors, underuse of posterolateral incision with deflecting device, and unrecognized anatomic variations

Courtesy by P. Ferrua

# Hyatrogenic damage to articular structures

- Medial Collateral Ligament → Excessive Valgus stress
- Patellar tendon → wrong portals

## Articular cartilage

**Most frequent and potentially catastrophic:**

- Wrong Portals
- Instruments insertions
- Movement during surgery
- Poor quality images

**<u>How to prevent:</u>**

**Spinal needle guided portals**

**Pie crusting**

Before and after PIE CRUSTING


Han X, *<u>BMC Musculoskeletal Disorders</u> 2020*

Courtesy by P. Ferrua

# Ligament reconstruction surgery: ACL

**Overall success rate: 69 to 95%**

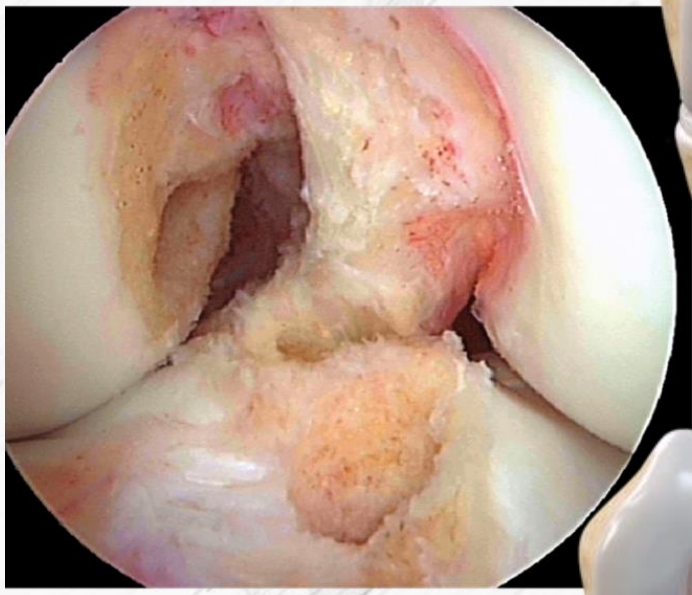
**Most of failures are related to:**

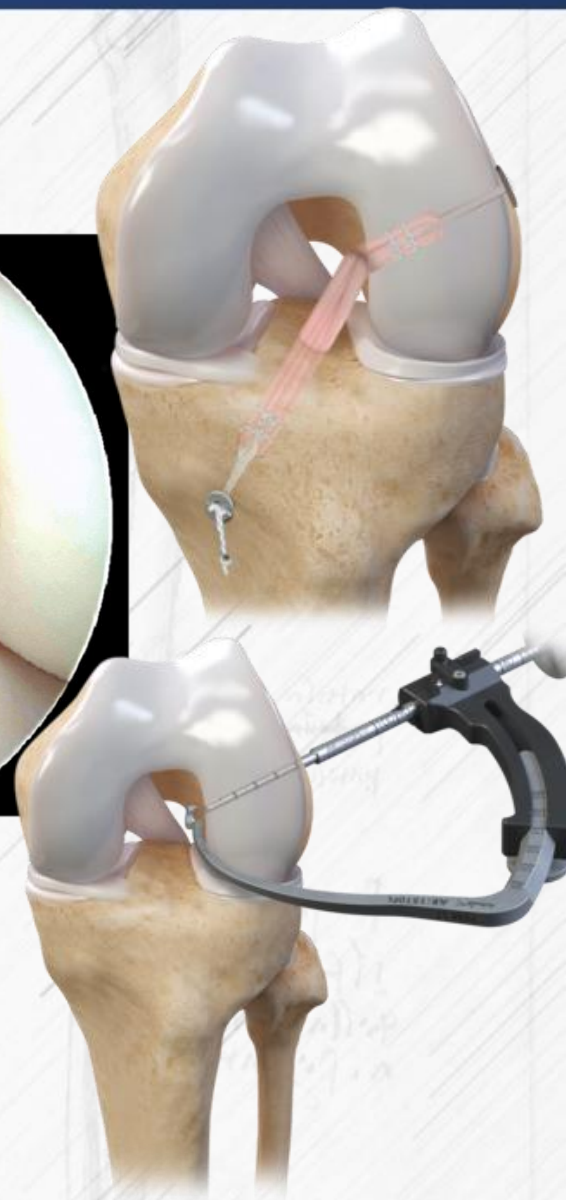
- **New Trauma**
- **Biologic failure**
- **Hardware related issues**
- **Improper surgical technique**
- **Wrong rehabilitation**

**<u>Complications:</u>**

**Intraoperative**

**Postoperative**



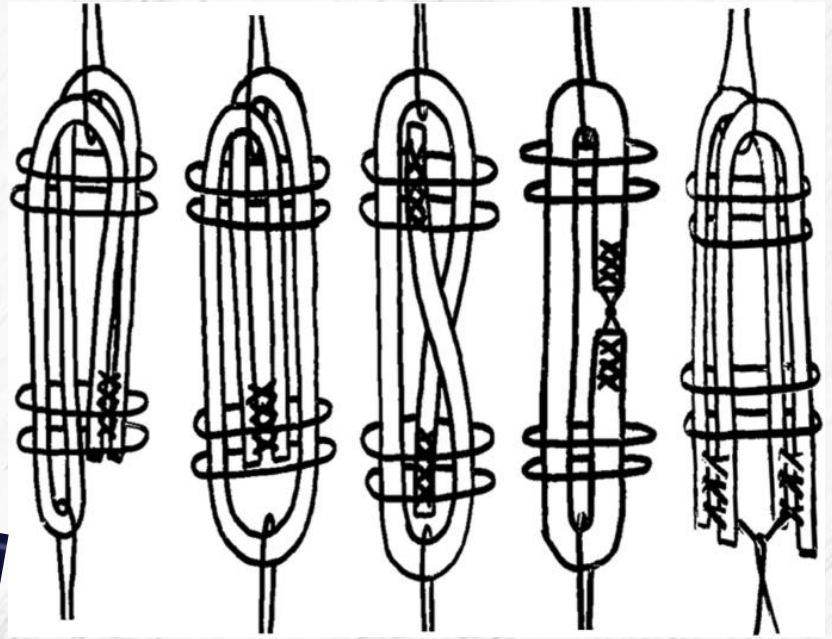


Courtesy by P. Ferrua

# ACL Intraoperative complications

## 1. Graft too short/too thin (< 7-8mm final construct)

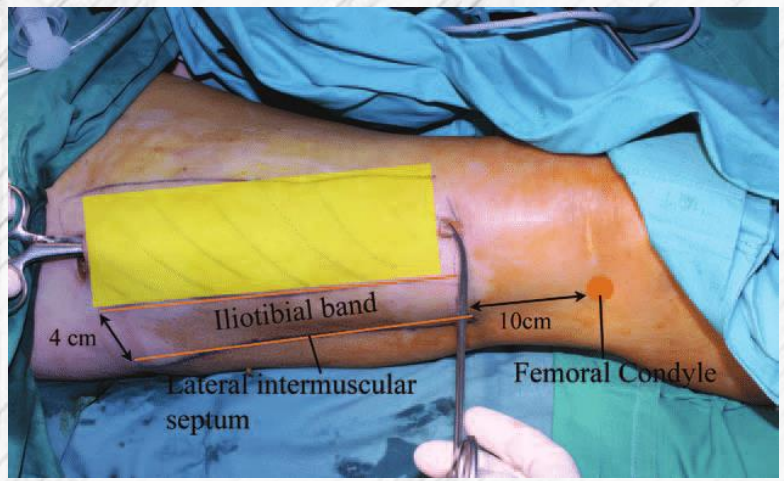
Triplicate/Quadruplicate the tendon
Change graft
Allograft augmentation
Autologous fascia lata



## 2. Graft on the floor


Barbier 2015

Sterile retrieving (within 15 s)
Removing all sutures
Bath in saline solution for 3 min
Cleansing in Chlorexidine 2% for 5 min
Cleaning the graft in antibiotic solution for 5 min
Washing with saline for 3 min
Additional intra and post operative antibiotics




Courtesy by P. Ferrua

# ACL Intraoperative complications

## 3. Insufficient fixation

**Always have a reserve plan for fixation:**

- **Extended Button**
- **Screws**
- **Staples**


## 4. Wrong graft placement

- **Impingement**
- **Restricted ROM**

***Notchplasty*** **if minor error,** ***reboot of procedure***
**if major mistake in graft placement**


Courtesy by P. Ferrua

# ACL post-op complications

## INFECTION

**Incidence 0.5 - 1.8%**

- **Arthroscopic lavage (10-15 liters) +/- hardware removal-graft removal + colture**
- **No eventual revision surgery before 6 months**

## ARTHROFIBROSIS

**Loss of ROM is commonly related to:**

- **Poor surgical *technique* (tunnel placement)**
- **Poor surgical *timing***
- **Bad *rehabilitation***

**SURGERY within 2°-3° month**

Courtesy by P. Ferrua

# ACL post-op complications: Cyclops Syndrome

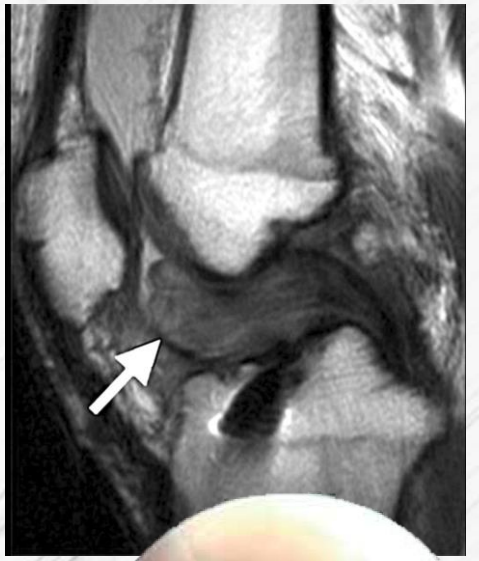
***Incidence 2.2% - 21% of all ACL***

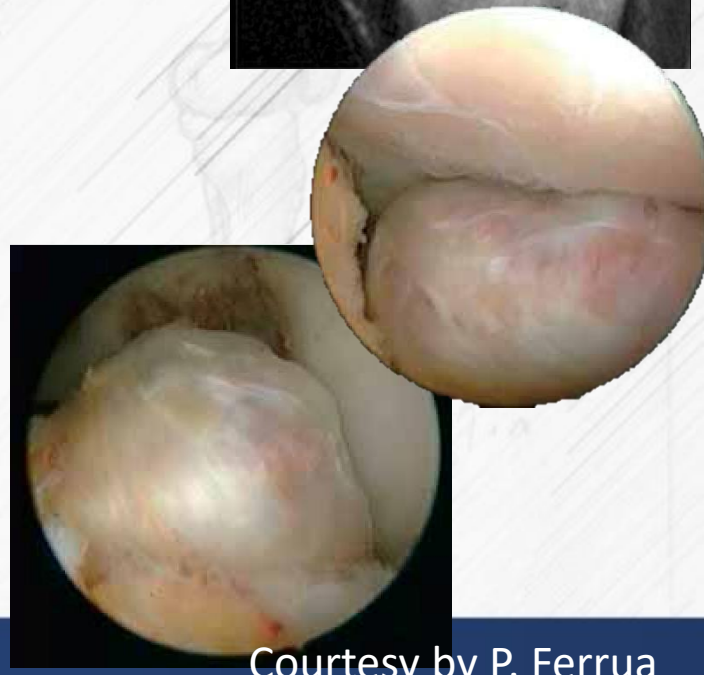
**Fibrovascular nodular lesion → LOSS OF EXTENSION**
**Pathophysiology unknown: intrarticular debris + conflict with the notch**

**Usual onset after 3-4 months**

**Differentiate with pseudocyclops syndrome (AM bundle remnant) → *always evaluate intra-op impingment and in case remove it***

**surgery for symptomatic patients with good results**





Courtesy by P. Ferrua

# ACL revision

**5-10 %** of all ACL reconstructions

**Causes of failure:**

1. Technical error
   - Pathoanatomy (primary or post-traumatic)
   - Lack of associated lesions treatment
2. Purely traumatic (32%)
3. Biologic failure (7%)

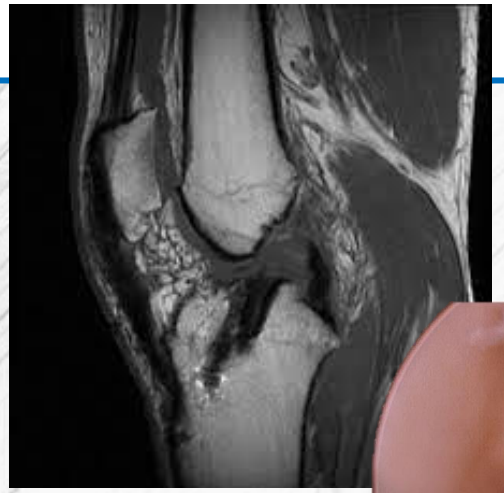
***ACL failure: Instability vs loss of ROM vs persistent pain***

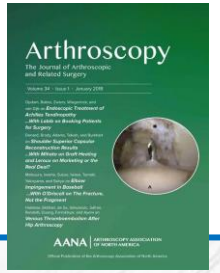
**ERRORI DI TECNICA**
- Posizionamento dei tunnel
- Tensionamento/fissazione graft
- Mancato riconoscimento lesioni meniscali, cartilaginee o legamentose associate

| POSIZIONE TUNNEL | CAUSA FALLIMENTO |
|---|---|
| **FEMORE** | |
| Anteriore | impingement in estensione |
| Posteriore | eccessiva tensione in estensione |
| Verticale | persistenza instabilità rotatoria |
| **TIBIA** | |
| Anteriore | eccessiva tensione in flessione e limitazione estensione (*roof impingement*) |
| Postereriore | eccessiva tensione in estensione e conflitto con LCP |

**MANCATA INTEGRAZIONE GRAFT**
- Vascolarizzazione
- Reazioni immunologiche

**NUOVI TRAUMI**
- Ri-rottura traumatica
- Riabilitazione aggressiva






Fox JA et al. Arthroscopy 2004

Courtesy by P. Ferrua

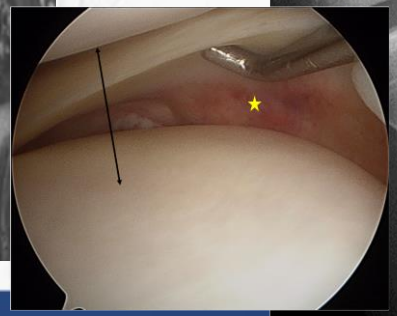
# Technical errors

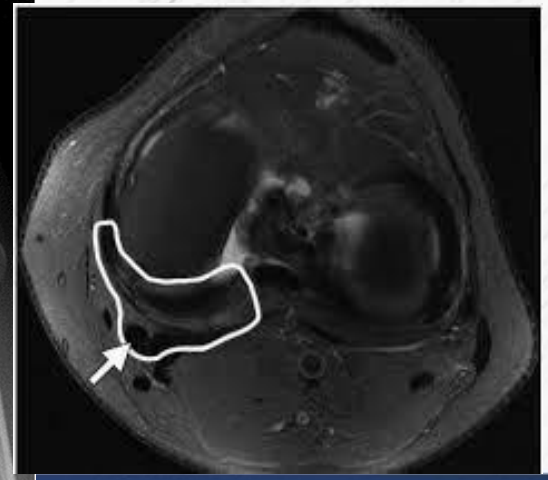
*Lack of associated lesions treatment*

**Peripheral instability:**

- **PL and PM**
- **ALL**







Courtesy by P. Ferrua

# Technical errors

**Wrong tunnels**
**Wrong screws position**



Courtesy by P. Ferrua

# Technical errors

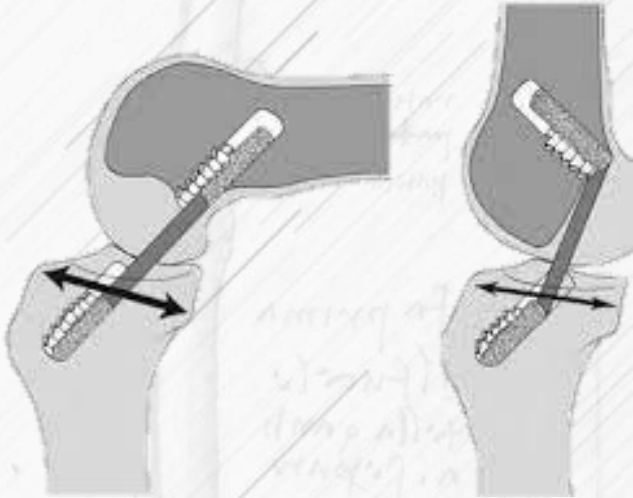
## Hardware failure: buttons

- Non correctly  flipped button:  in /out of tunne
- Bungee e Windshield wiper effect
- Ballonisation

## Hardware failure: cross pins

- Fractures
- Migrations
- Lack of coaxiality

b.



Courtesy by P. Ferrua

# ACL-r failure

## Hardware failure: screws

- **Blow out**
- **Migrations**
- **Intrarticular debris (resorbable)**



Courtesy by P. Ferrua

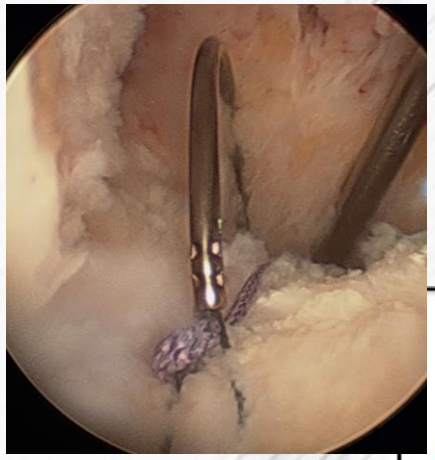
# Ligament reconstruction surgery: PCL

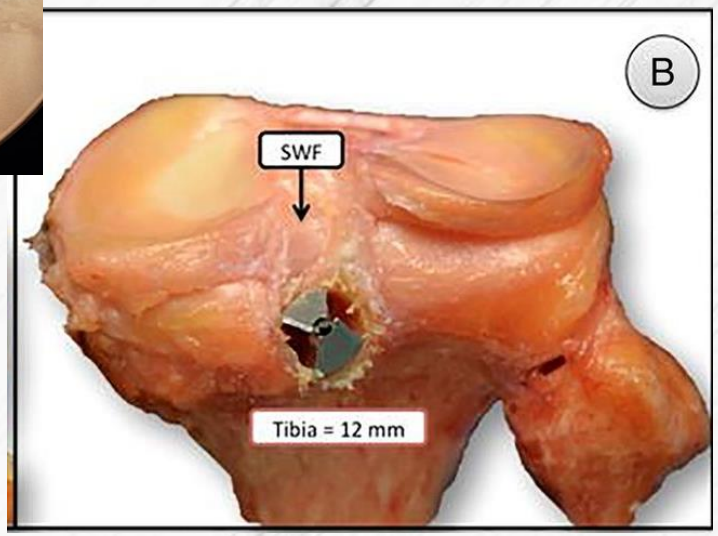
**25%** of PCL reconstruction shows a Grade II posterior laxity at final follow up

Incidence of OA is 60% at 10 years FU

Incidence of intra- and post operative complications is higher than ACL

Neurovascular lesions are rare but very severe






Courtesy by P. Ferrua

# Ligament reconstruction surgery:PCL

## Limit your failure: technical tips

C arm for tibial tunnel vs Trans-septal (70° arthroscope)

Killer turn

Long tibial screw

Courtesy by P. Ferrua

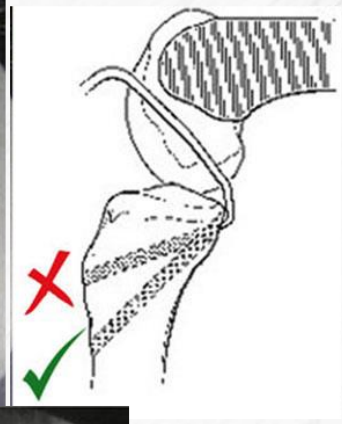
# Ligament reconstruction surgery: PCL

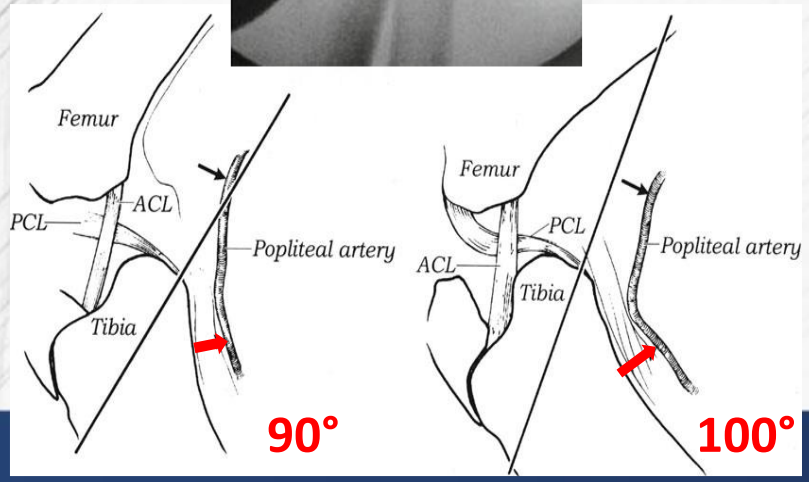
Fluoroscopy paramount (even expert surgeons)

Last part of tunnel by hand or with retro-drill

Tibial tunnel 55-60° to avoid difficulties in graft introducing and risk for neuro-vascular structures

PCL footprint-popliteal artery averages 7.2 mm



# Ligament reconstruction surgery: PCL

## Limit your failure: rehab protocol

**M4 brace**

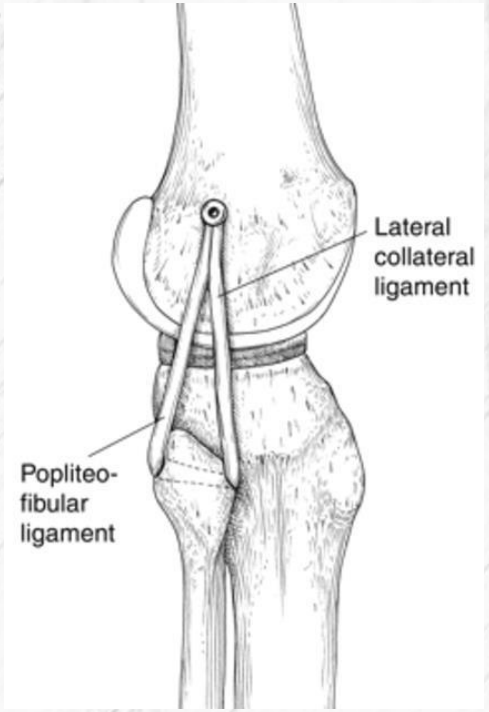
**ROM recovery in prone decubitus with posterior drawer manual reduction + ER**

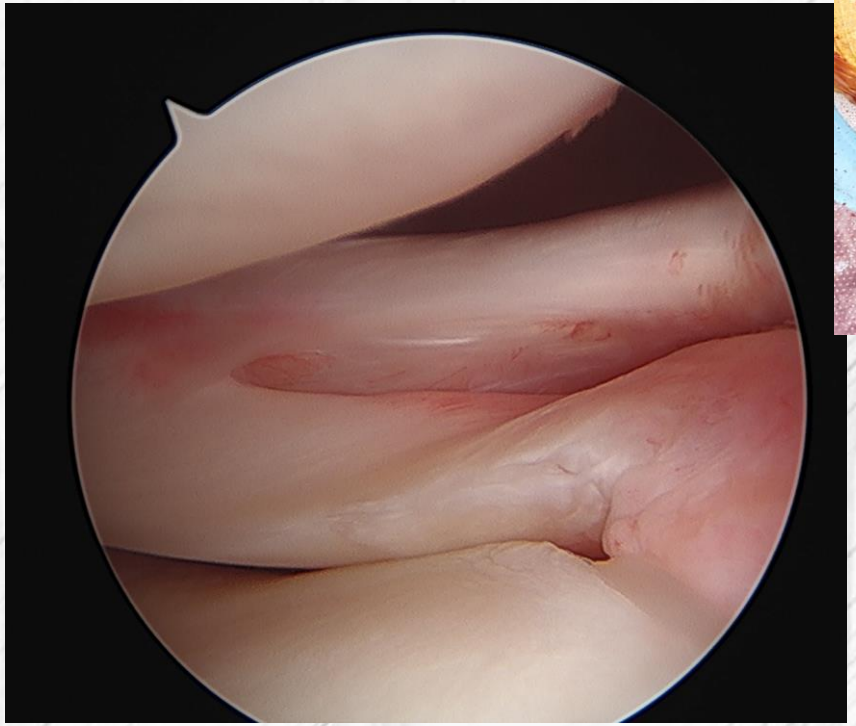
Courtesy by P. Ferrua

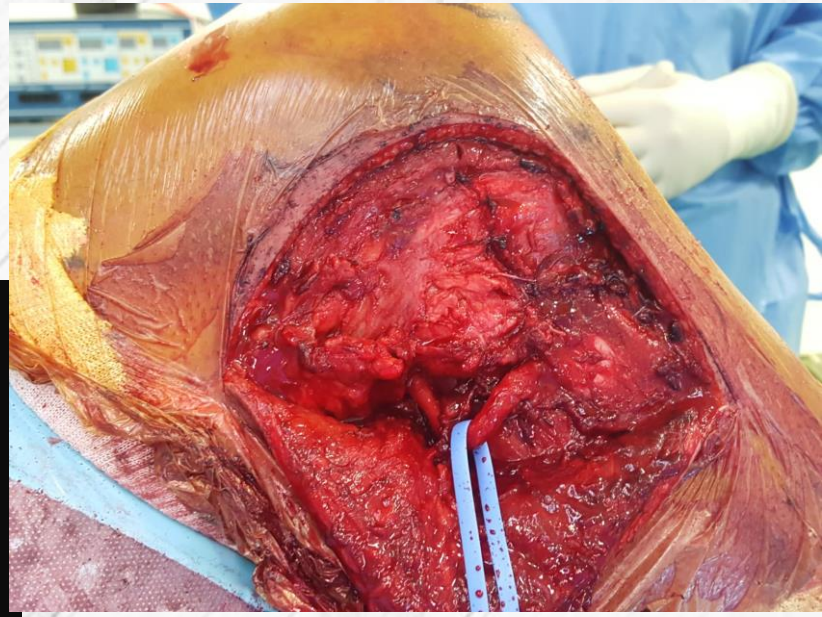
# Ligament reconstruction surgery: PCL

## Limit your failure

**Treat all the associated lesions (PM /PL,  menisci)**





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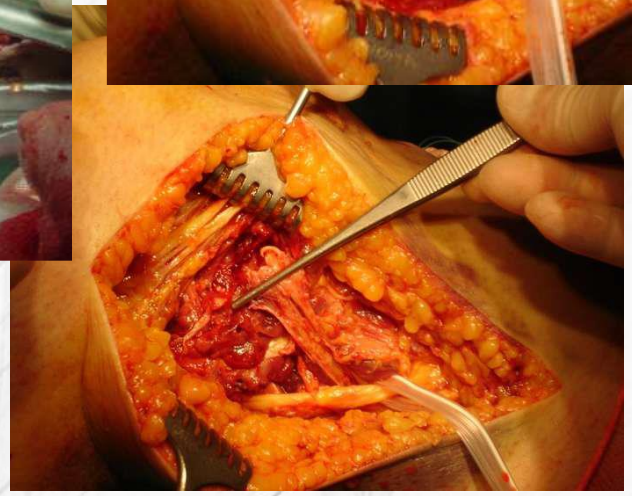
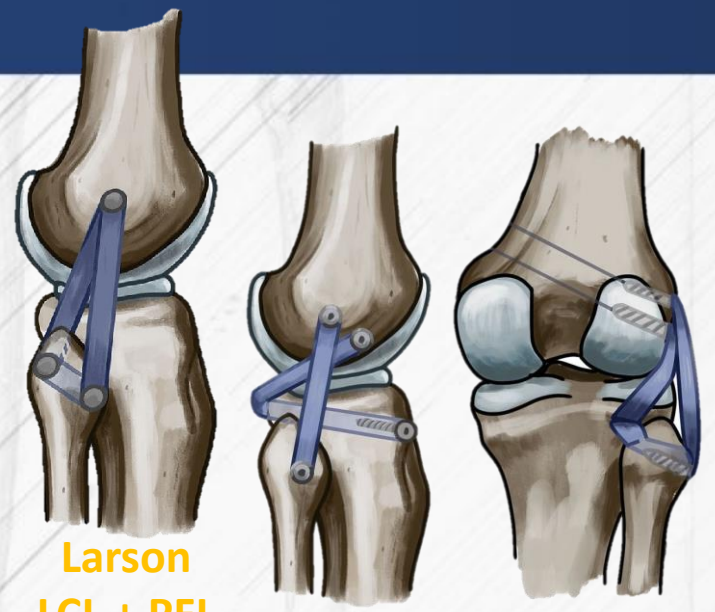
# Peripheral instability

**Repair** (acute) vs **reconstruction** (chronic)

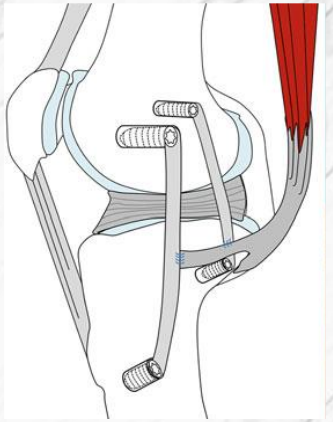


**Acute repair**: within 2 to 3 weeks, adequate tissue

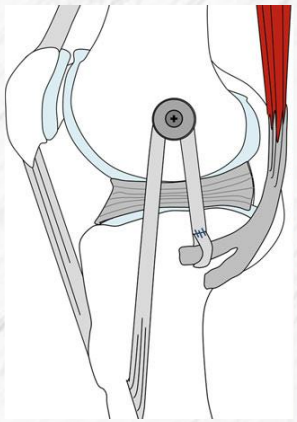


Larson
LCL + PFL

Laprade
LCL + PFL + PLT



Coobs
sMCL + POL



Kim
sMCL + POL

# Peripheral instability


Geeslin AG
AJSM 2015


*Stannard JP. J Knee Surg. 2012*

**POSTERO-LATERAL**
***Failure incidence*:**
**37% for repair**
**9% for primary reconstruction**

**POSTERO-MEDIAL**
***Failure incidence*:**
**20% for repair**
**4% for primary reconstruction**

***Failure mechanism*: new trauma (varus/valgus force, hyperextension, direct trauma), residual laxity**

**Overall complications after PLC injuries: 8%**
- ***Arthrofibrosis*** **(18%)**
- **heterotopic ossification (4%)**
- **hematoma (4%)**
- **Fistula (2%) or iatrogenic peroneal nerve injury (2%)**

**Complications after PMC injuries:**
- ***Arthrofibrosis (20% vs 17%)***
- **deep implant removal**
- **pain**
- **wound infection**
- **joint stiffness**

# Peripheral instability

***Results after ACL reconstruction:***

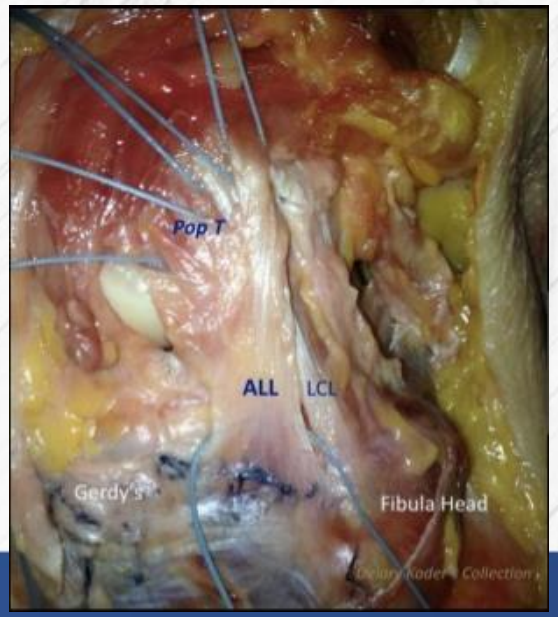
1. **Pivot Shift glide: 25% with HT and 16% with BPTB**

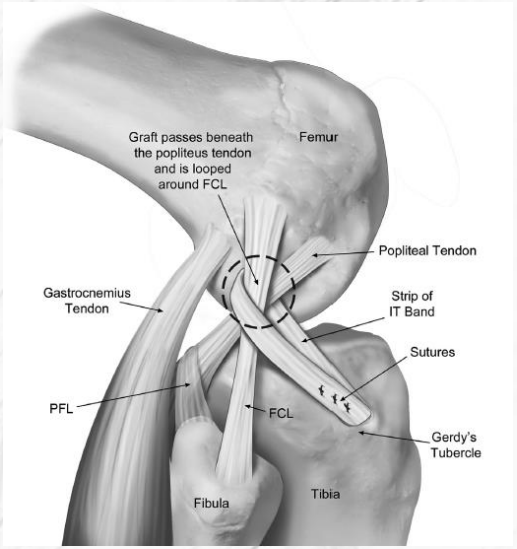
**10.7% ALL injury in conjuction with ACL**

Yunes – Arthroscopy 2001

2. **Pivot Shift clunk at 2 years of F-U: 4% BPTB and 18% HT**

Mohtadi – Clin J Sport Med 2015

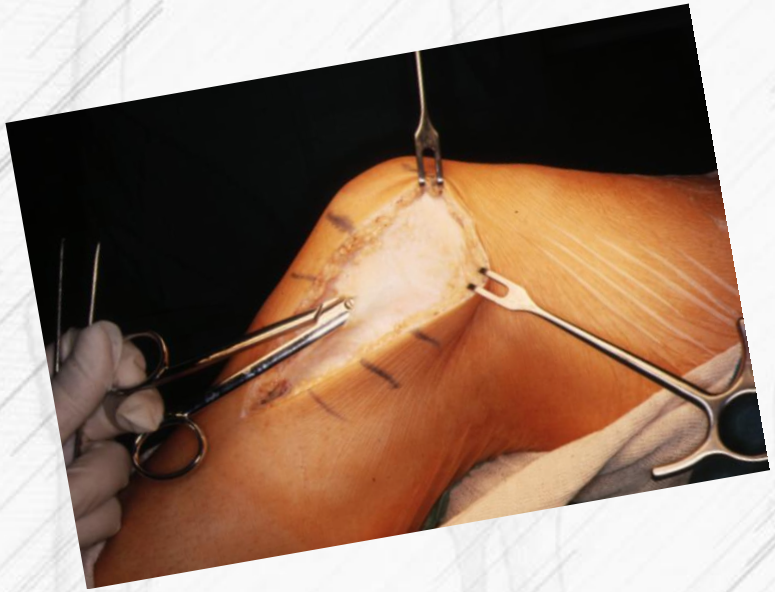


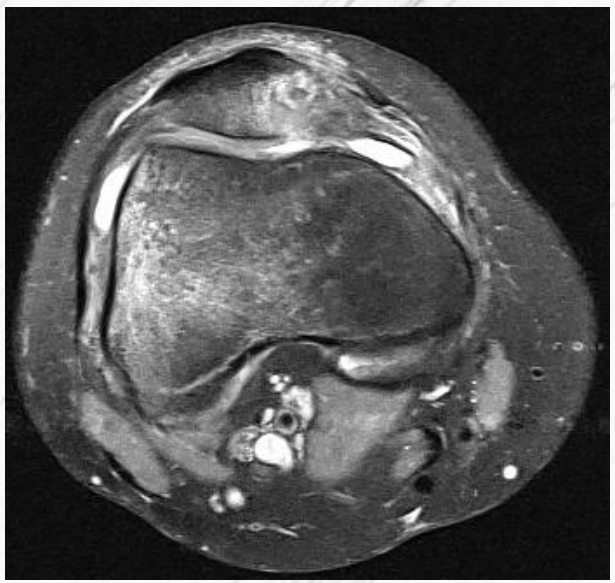




## Indications:

- **Pivot Shift gross (3+)**
- **Side to side difference at Telos > 9 mm**
- **revision surgery**
- **Pivoting sport (soccer, rugby)**

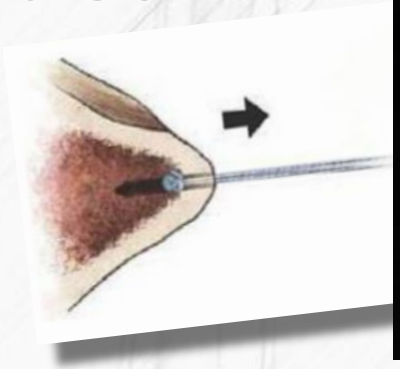
# Patellofemoral instability

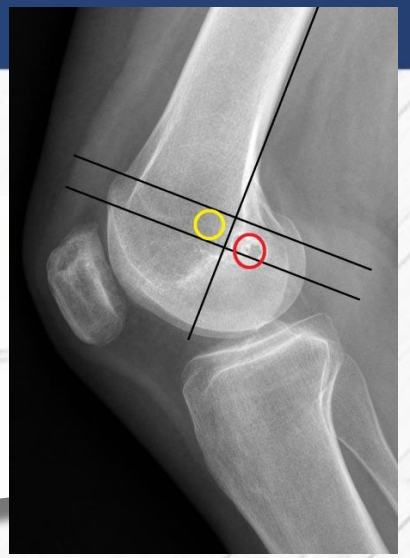




# Failure: technical issues

## MPFL

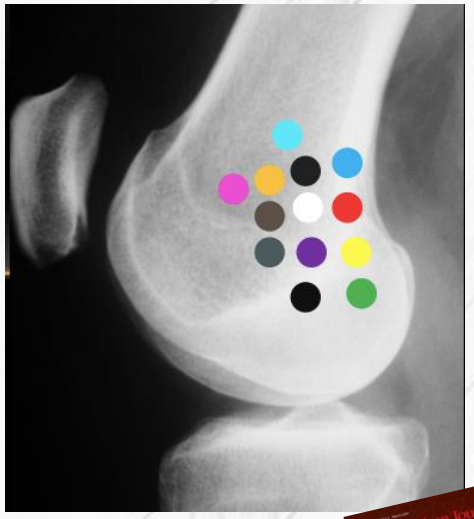


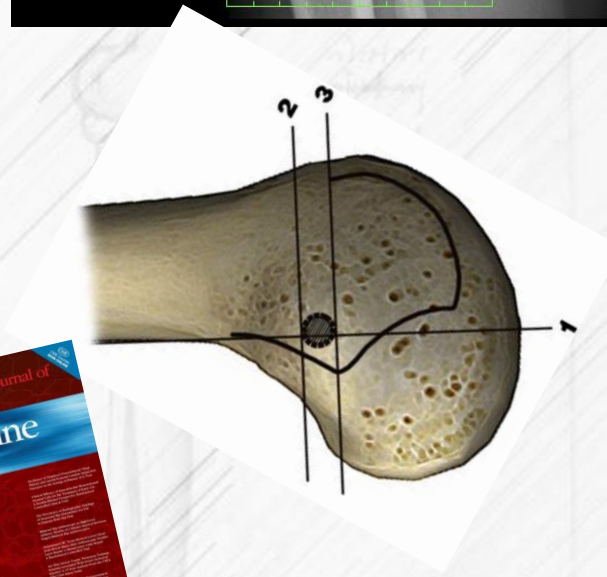



- Misplacement of femoral tunnel (fluoroscopy mandatory)

- Patellar issues (less frequent)

- Excessive tension: MPFL reconstruction is <u>not</u> a proximal realignment





Most frequent pattern:

***Anterior and proximal tunnel: loss of flexion and anterior pain/cartilage degeneration***


Servien E. et al. Am J Sports Med. 2011

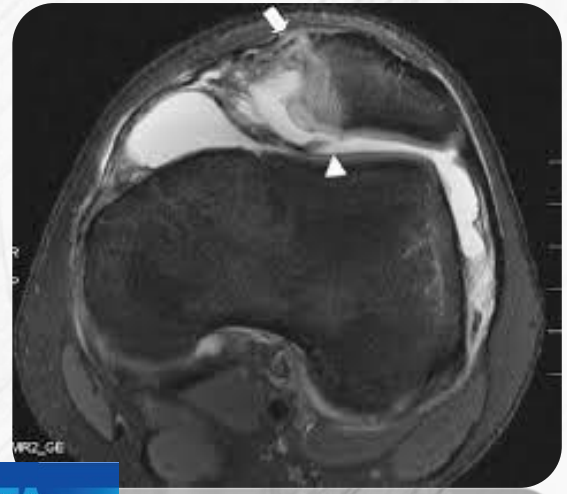
Courtesy by P. Ferrua

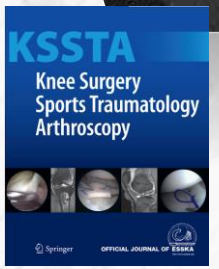
# Failure: technical issues

## MPFL

### Type of lesions
*(Sillanpaa 2014)*

- **P0 : pure ligament lesion**
- **P1: ligament lesion with a bone fragment**
- **P2 ligament lesion with an osteochondral fragment**






Sillanpaa 2014

**Type P2 MPFL lesions may require ACUTE surgical fixation**

### Arthroscopic MPFL Repair

- ***Yamamoto , 1986***
- ***Fukushima et al , 2004***
- ***Schottle , 2006***

**Sillanpaa Am J Sports Med 2008 76 patients (average age 20 years), 30 arthroscopic MPFL repair vs 46 conservative treatment: re-dislocation 19% (surgery) vs 23% (conservative)**

**Limited efficacy of arthroscopic MPFL acute repair if compared to conservative treatment**

# Failure: technical issues

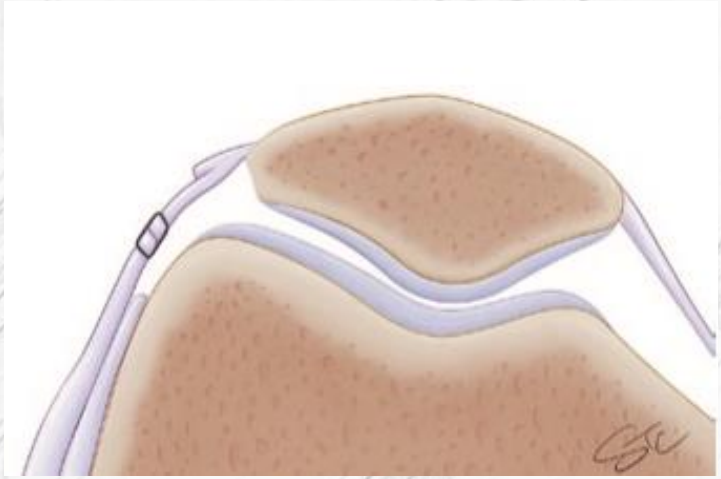
## Lateral release

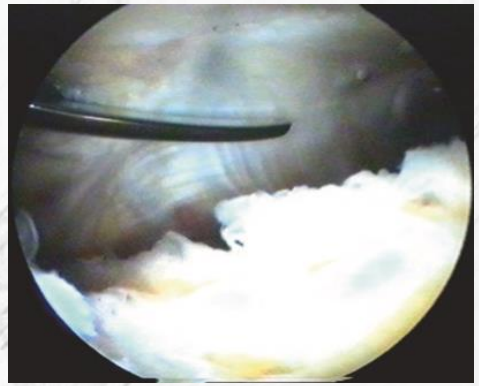
***Lateral release should never be extended too proximally (VL fibers)***

Most common complications:

- Residual pain
- Medial instability (always Hyatrogenic)
- Lateral instability

Prefer lateral lenghtening if indicated





*Caplan N et al. Why do patellofemoral stabilization procedures fail? Key to success. Sports Med Arthrosc Rev 2017*

Courtesy by P. Ferrua

# How do revision surgery performs?

- **Inferior to primary surgery**

Mean Kujala score 61.7 vs 80.3 primary
Significant difference in pain during activity

- **Rate of satisfaction relatively low**

**Better results for instability vs pain/stiffness**

*Kohn LM et al. Isolated and combined medial patellofemoral reconstruction in revision surgery for patellofemoral instability. a prospective study American Journal od Sports Medicine 2013*

*Chatterton A et al. Clinical outcomes after revision surgery for medial patellofemoral ligament reconstruction Knee Surgery Sports Traumatology Arthroscopy 2018*

*Zimmermann F et al. Revision surgery for failed medial patellofemoral ligament reconstruction results in better disease-specific outcome scores when performed for recurrent instability than for patellofemoral pain than for patellofemoral pain or limited range of motion Knee Surgery Sports Traumatology Arthroscopy September 2021*

Courtesy by P. Ferrua

# Take home messages

- Prevention of failure is the most effective approach
- Failure begins in the office (primary or revision surgery)
- Patient’s selection and right indication are paramount for success
- Adapt primary surgery to achieve results being as less invasive as possible



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