

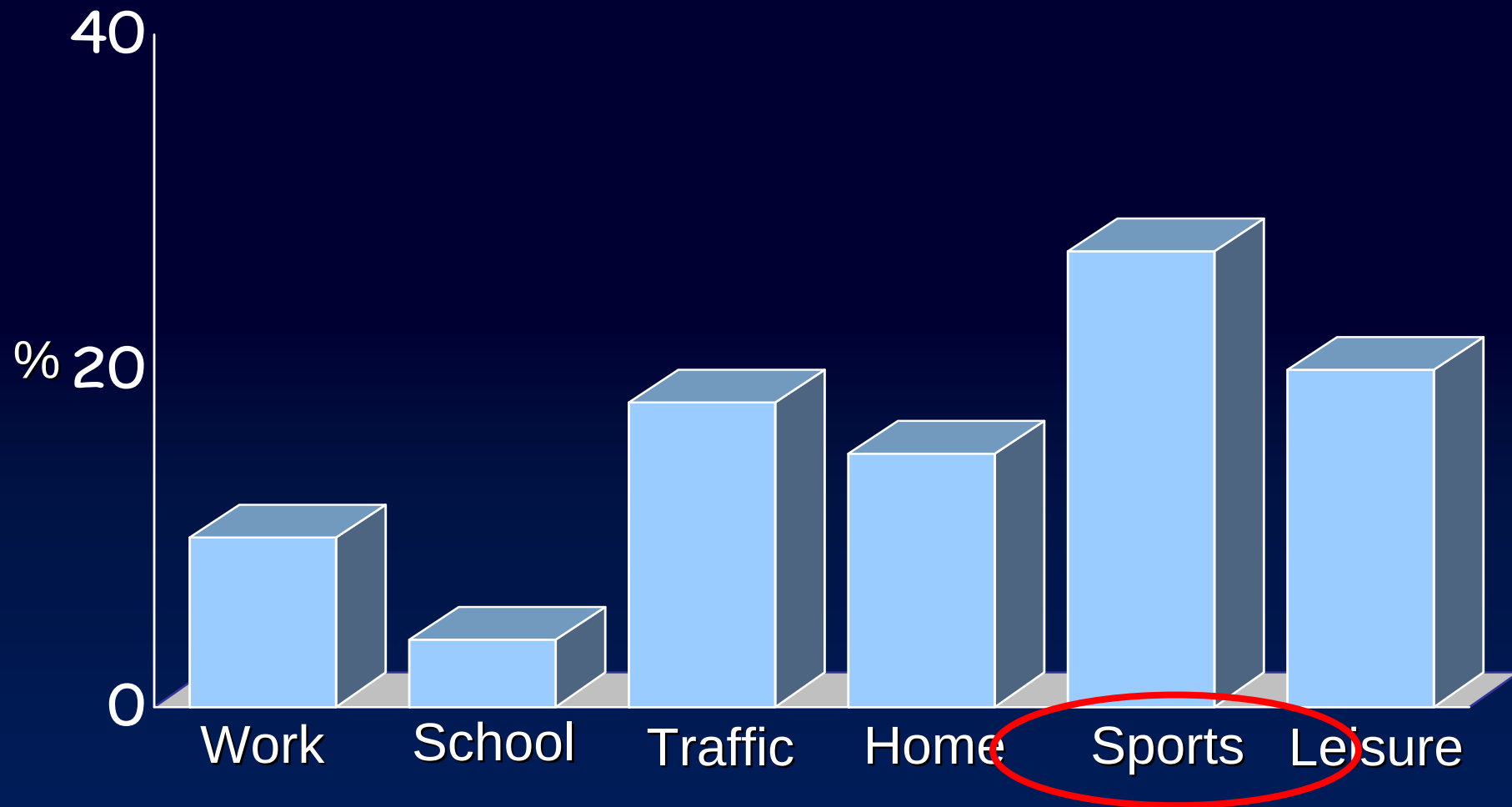
# INSTABILITA' DI GINOCCHIO

FRANCESCO GIRON

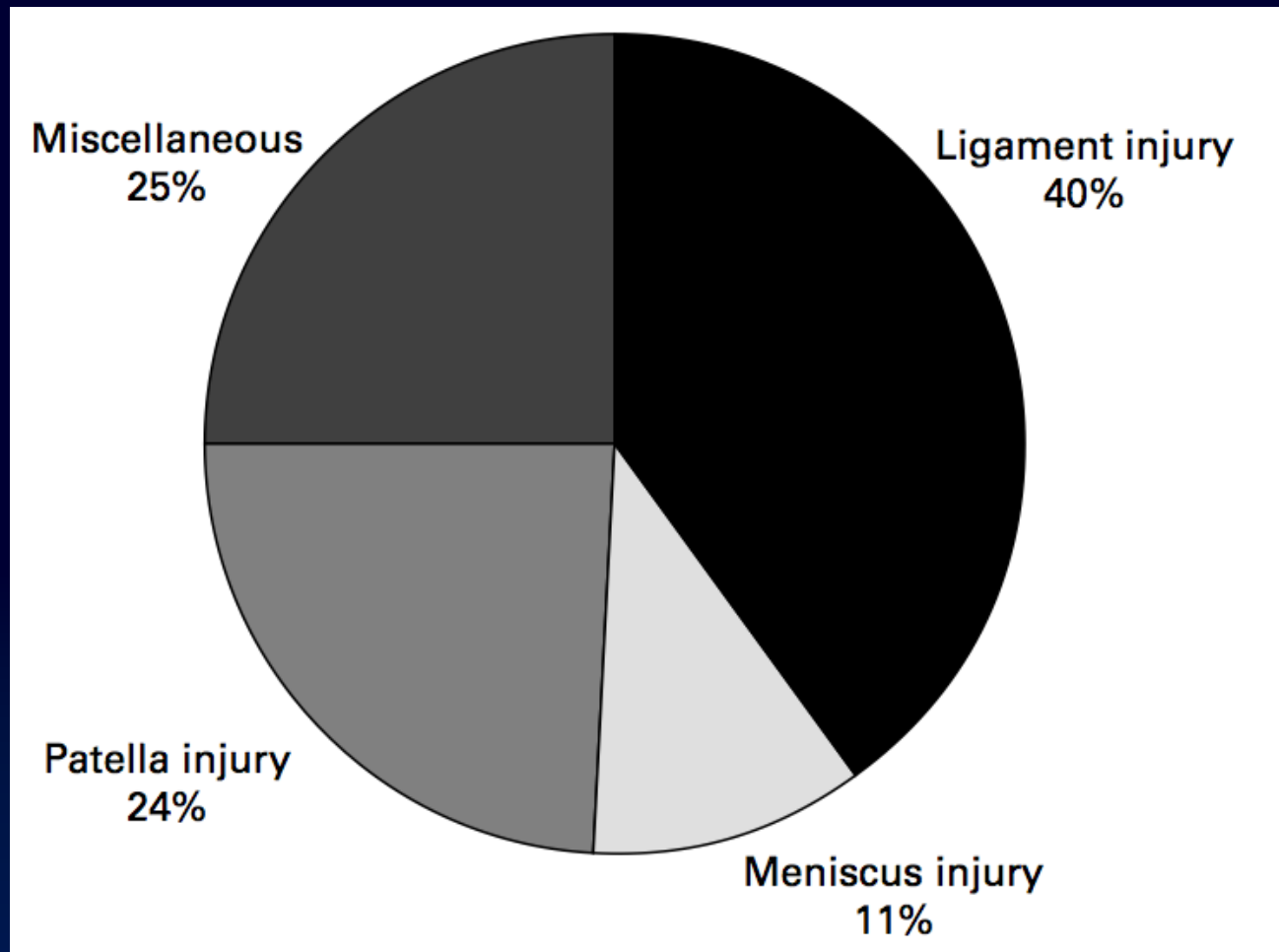
PIERLUIGI CUOMO

Azienda Ospedaliero Universitaria Careggi - Firenze

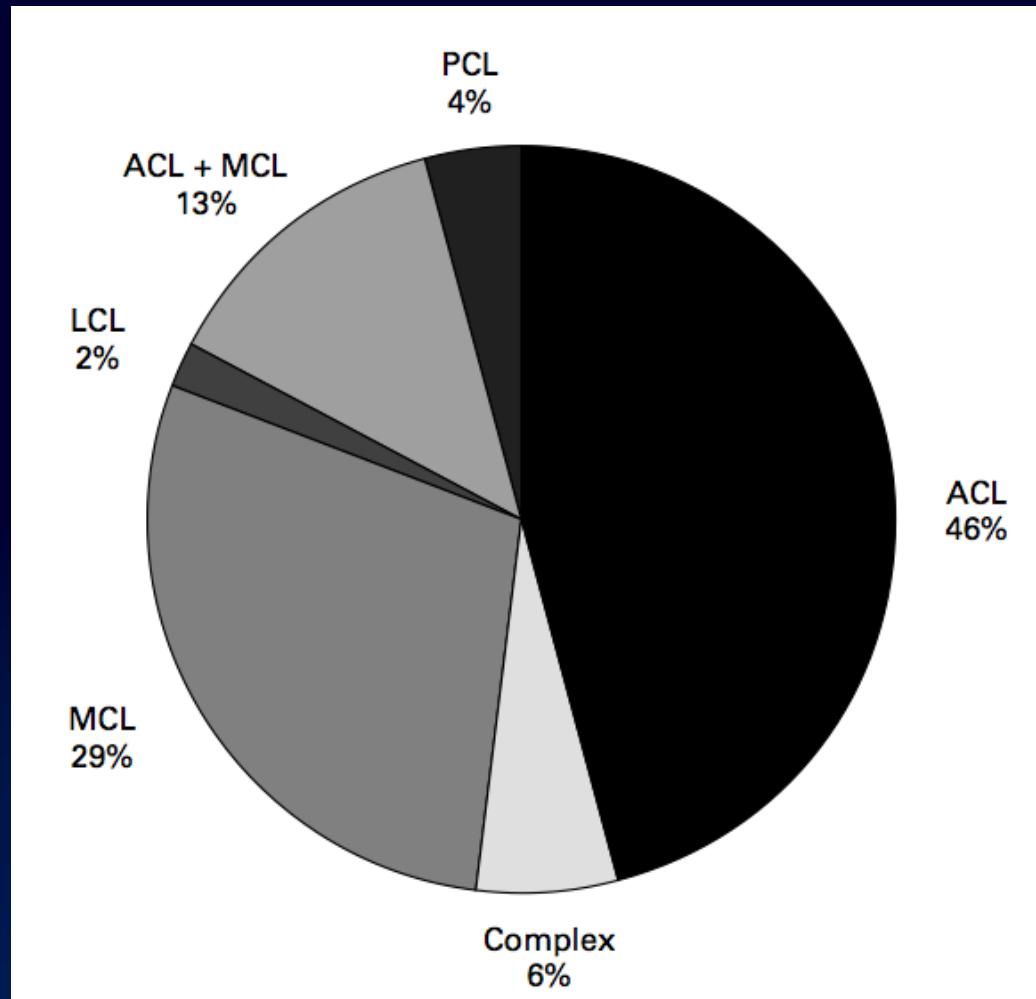
Knee injuries incidence: 0.3/1000 inhab./year



Nielsen, *J Trauma* 1991



Bollen, *Br J Sp Med* 2000



Bollen, *Br J Sp Med* 2000

## Outline of presentation:

1. ACL

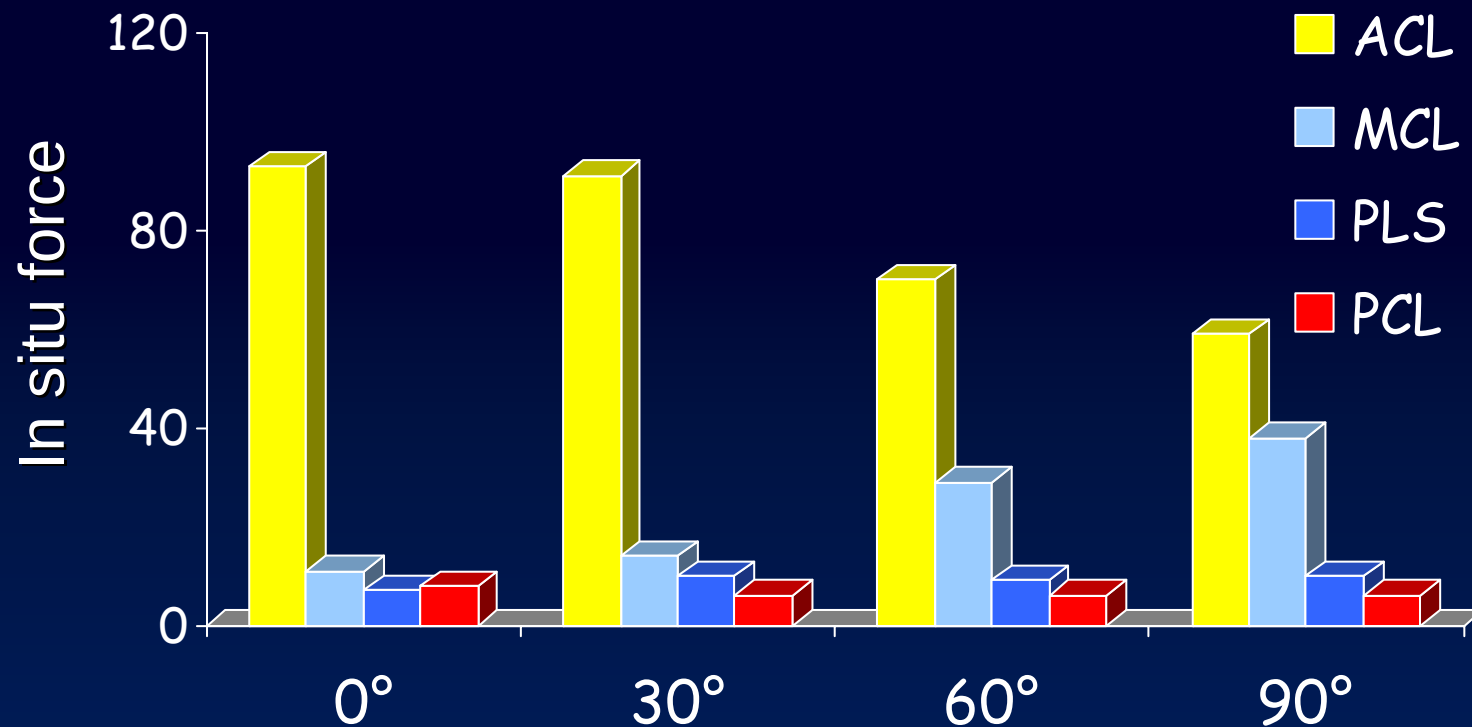
2. MCL

3. PCL

4. LCL

# ANTERIOR CRUCIATE LIGAMENT

In situ forces after a 110 N anterior load



Sakane, Woo, *KSSTA* 1999

## Mechanism of injury



Contact: 44%

Non contact: 56%

Piasecki, *Am J Sp Med* 2003

# Meccanismo di lesione “non-contact”



**Cambi di direzione rapidi**

*Olsen, Am J Sports Med 2004*



Atterraggio da un salto



Valgo e rotazione esterna



Phantom foot: sci in extra e tibia in intrarotazione

Natri, *Sports Med* 1990

# Rischio lesione LCA

femmine / maschi

---

|            |           |
|------------|-----------|
| Calcio     | 2.1 – 9.4 |
| Ginnastica | 8.6       |
| Basket     | 1.6 – 5.3 |
| Pallavolo  | 2.7       |
| Atletica   | 2.2       |
| Judo       | 1.8       |
| Pallamano  | 1.4       |
| Softball   | 1.1       |
| Sci        | 1.0 - 1.4 |

# Fattori di rischio

Anatomici

Ormonali

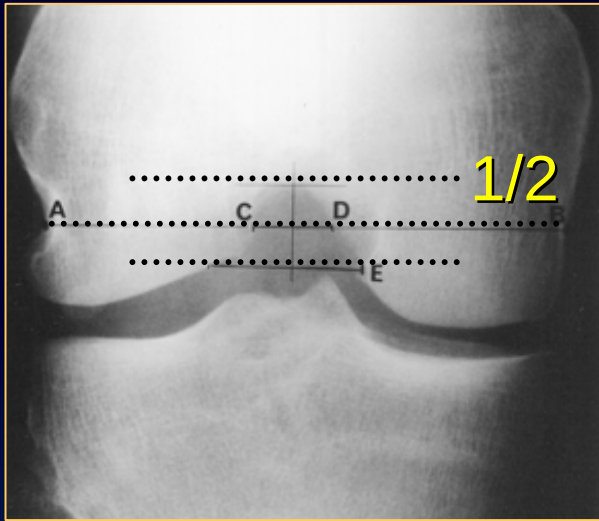
Neuromuscolari

# Valgismo arto inferiore

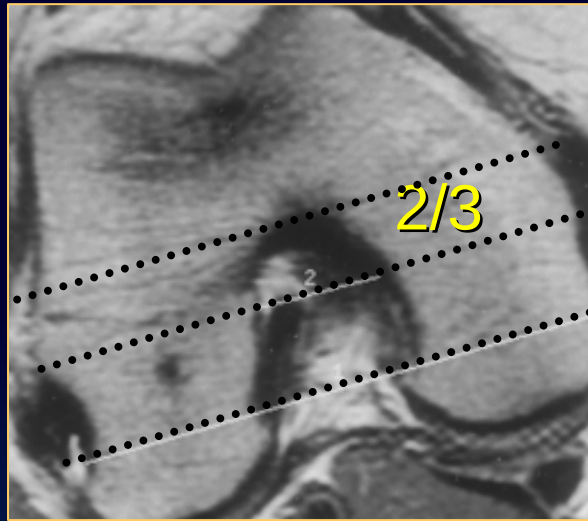


Fattore teorico

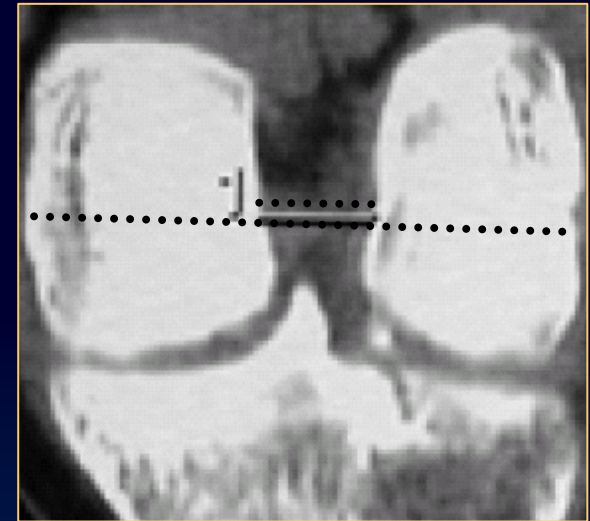
# Gola intercondilica



Shelbourne  
*Am J Sp Med* 1998



Anderson  
*Am J Sp Med* 2001



Kirkley  
*ACL Study Group* 2002

# Dimensioni LCA



Più piccolo nelle donne

Anderson, *Am J Sp Med* 2001

# Lassità articolare



Maggiore nelle donne

Rozzi, *Am J Sp Med* 1999

# Rigidità rotatoria



Minor rigidità (stiffness) nella rotazione interna

Wojtys, JBJS-A 2003

# Influenze ormonali

## Fase ovulatoria

*Liu*  
*Am J Sp Med 1997*

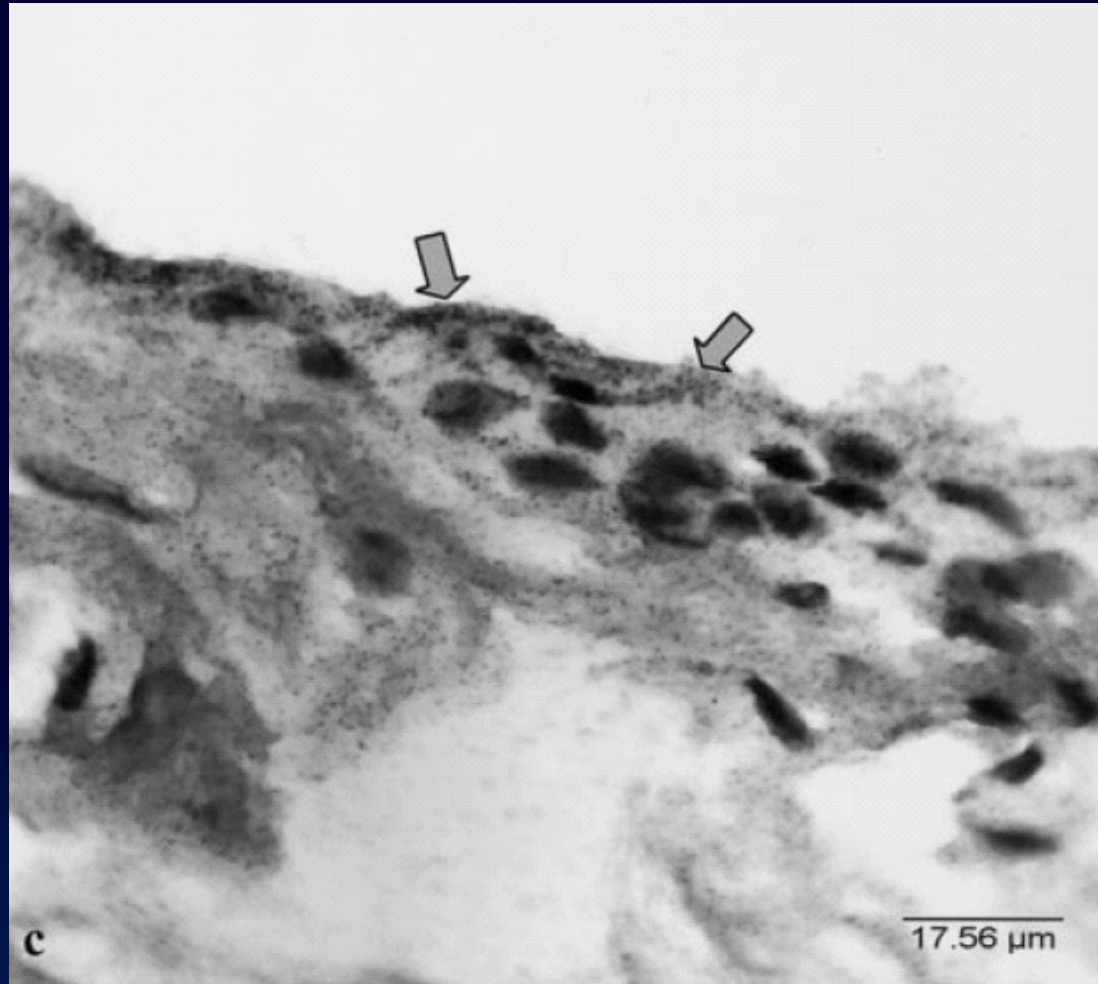
*Wojtys*  
*Am J Sp Med 2002*

## Fase mestruale

*Myklebust*  
*Sc J Med Sci Sp 1998*

*Slauterbeck*  
*J Athlet Training 2002*

*Arendt*  
*J Gend Specif Med. 2002*



Recettori ormonali (relaxina) presenti  
solo nel LCA delle donne

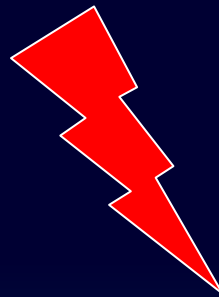
*Dragoo, Am J Sp Med 2003*



Stessa traslazione anteriore  
e incidenza di lesioni in tutto il ciclo

Beynnon, *ACL Study Group* 2004  
Belanger, *Am J Sp Med* 2004

# Influenze ormonali



Performance  
neuromuscolare

# Cambi di direzione



Più esteso, extraruotato e valgo dei maschi

Malinzak-Garrett, *Clin Biomech* 2001  
Mc Lean, *Med Sci Sports Exec* 2004

# Atterraggio



A ginocchio più esteso e in valgo

Fagenbaum, *Am J Sp Med* 2003

Hewett, *JBJS-A* 2004

Salci, *Clin Biomech* 2004

Mc Lean, *Med Sci Sports Exec* 2004



Maggiori forze di taglio nello stop-jump

Chappell-Garrett, *Am J Sp Med* 2003

Ginocchio valgo, esteso ed “extraruotato”

Tronco indietro e flesso

Forza quadricipite



Posizione di non ritorno

## Diagnosi Lesione LCA

Lachman & Anterior drawer tests

Tibia displaced anteriorly

IKDC Grades:    1+   3-5 mm  
                         2+   6-10 mm  
                         3+   > 10 mm

Compare with contralateral

Evaluate translation and end-point

## Lachman test



Anterior drawer test at 30° knee flexion

Torg, *Am J Sp Med* 1976

## Anterior drawer test



80° -90° knee flexion

## Dynamic tests



Valgus & IR stress with flexion

Anterolateral tibial sublux. in extension

Reduction around 30° of flexion

Grade 1+: glide

2+: clunk

3+: gross or subluxation

MacIntosh, *JBJS-B* 1972 Hughston, *JBJS-A* 1976

Slocum, *CORR* 1976 Noyes, *Orthop Trans* 1978

Losee, *Orthop Clin North Am* 1985

## Moment of examination

|                      | Weeks from injury |     |
|----------------------|-------------------|-----|
|                      | <2                | >2  |
| Lachman test         | 78%               | 85% |
| Anterior drawer test | 22%               | 54% |

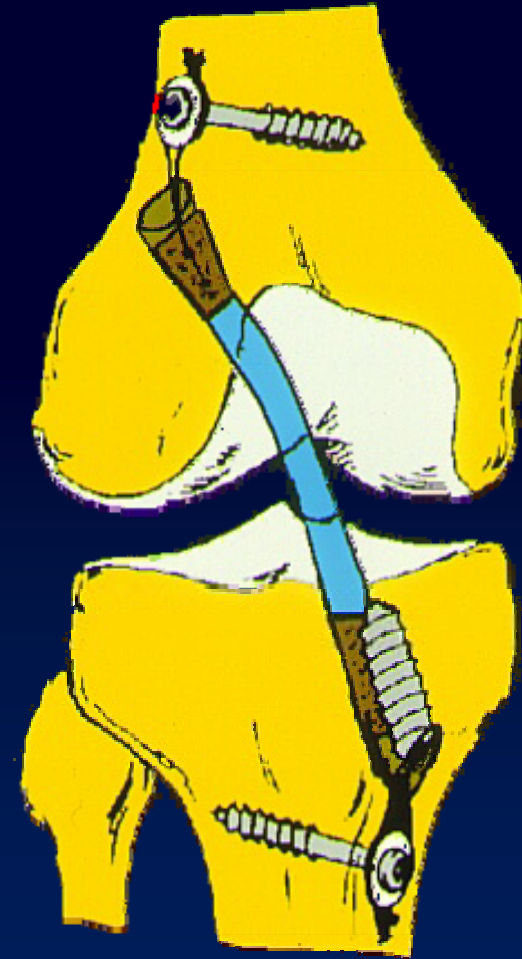
# Arthrometer



KT-1000

# Ricostruzione LCA

Trapianto intra-articolare  
Tunnel femorale e tibiale



# Trapianto ideale

Dovrebbe :

Ricreare l'anatomia e la biomeccanica native

Garantire rapida osteointegrazione e valida tenuta iniziale

Avere bassa morbidità nel sito donatore

Avere limitato rischio di infezione

Essere di diametro e lunghezza adeguate alla tecnica e fissazione scelta

Essere cost/effective

# Opzioni trapianto

| Autologo         | Omologo                                                         | Sintetico             |
|------------------|-----------------------------------------------------------------|-----------------------|
| TR<br>ST+G<br>TQ | TR<br>ST+G<br>TQ<br>T. Achille<br>Tibiale ant.<br>Tibiale post. | Dacron<br>LAD<br>LARS |

# Tendine Rotuleo (TR)

“Gold standard”

1/3 centrale + brattee ossee

Trapianto pro LCA più studiato



# Vantaggi

Facilmente individuabile (sotto l'incisione)

Proprietà biomeccaniche superiori LCA

Facilità di fissazione

Osteointegrazione

# Osteointegrazione

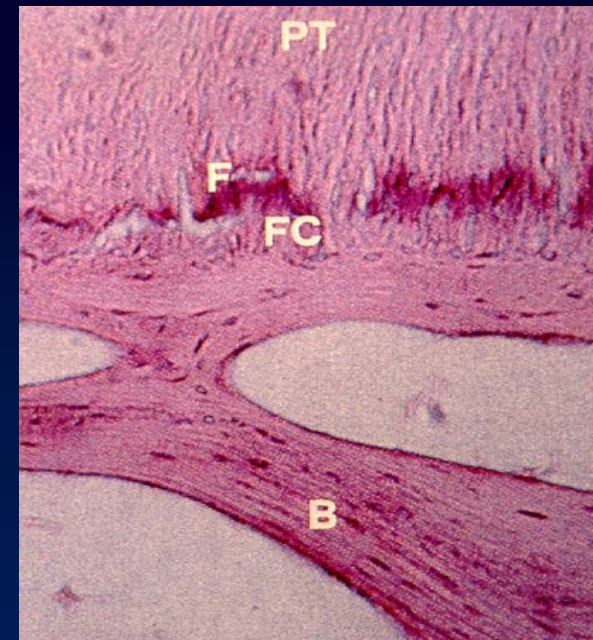
Più rapida (6 settimane)

*Schiavone Panni, KSSTA '93*  
*Tomita, Arthroscopy '01*

Entesi condrale

*Schiavone Panni, KSSTA '93*  
*Petersen, ESSKA '98*

Zona di transizione simile a LCA



Guarigione diretta  
(Zona di transizione)

# Svantaggi

Incisione più lunga

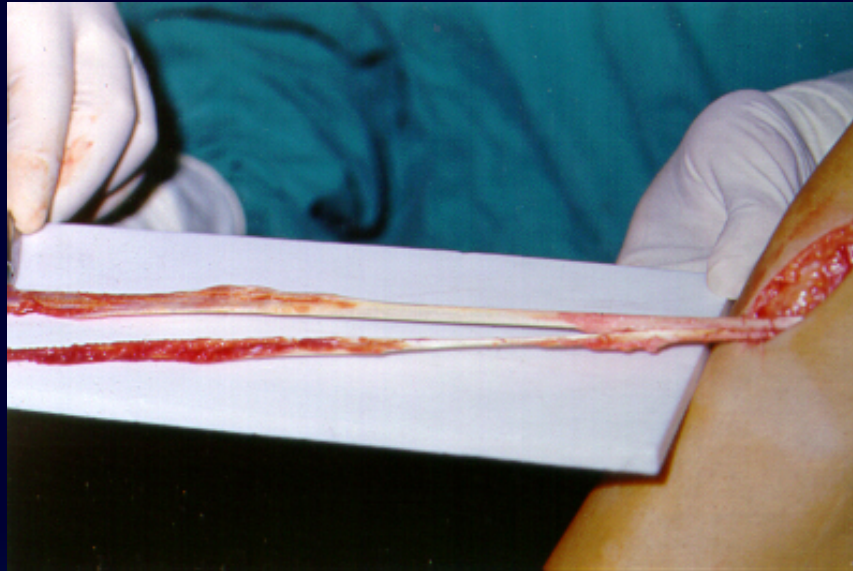
Rischio frattura o lesione tendinea

Recupero forza ed estensione

Morbidity in sede di prelievo (dolore anteriore)



# Semitendinoso e gracile (STG)



Proprietà biomeccaniche inferiori

Maggiori difficoltà di prelievo

Fissazione – anello debole

# Semitendinoso e gracile raddoppiati (D-STG)

“New gold standard”

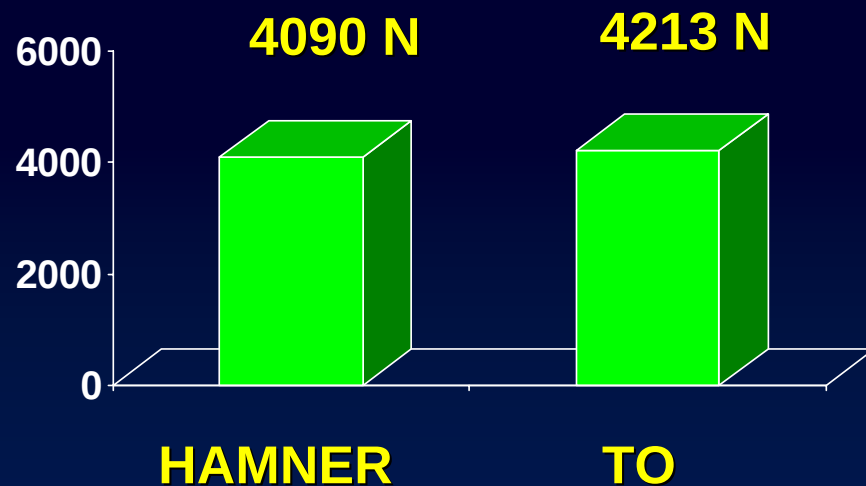
Nuovi studi biomeccanici

Nuovi e più efficaci mezzi di fissazione

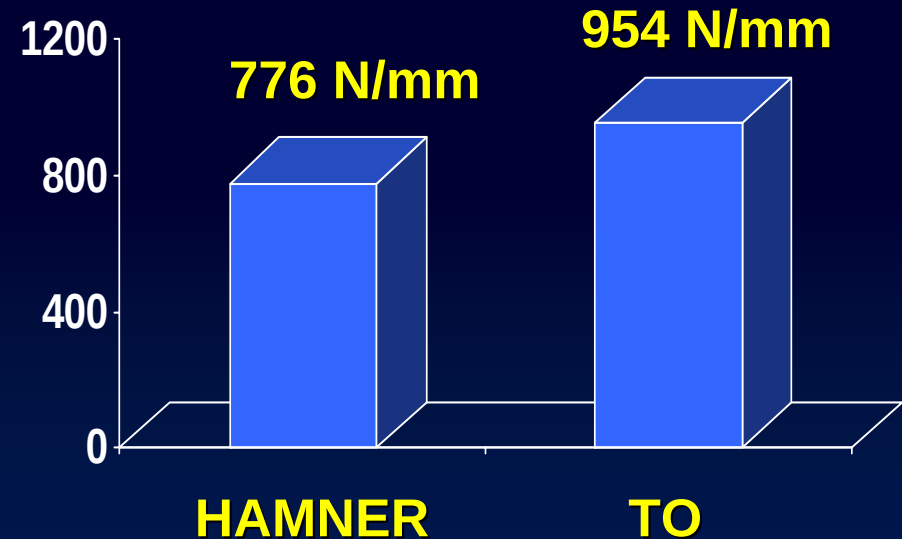


# Proprietà biomeccaniche\*

## Carico al fallimento



## Rigidità



\*Tensione uguale

Hamner, *J Bone Joint Surg Am*, 1999  
To, *Am J Sports Med*, 1999

# Recupero forza muscolare

Non influenzata dal prelievo dei flessori (Cybex)



Aune, *AJSM* '01

Shaieb, *AJSM* '02

Ejered, *AJSM* '03

Feller, *AJSM* '03

Jansson, *AJSM* '03

Gobbi, *Arthroscopy*, '03

Aglietti, *JBJS-A* '04

# Svantaggi

Osteointegrazione

Assenza zona di transizione

Lassità residua

Tunnel widening

Deficit di forza IR

# Deficit recupero forza IR

Consenso non unanime

Non deficit a lungo termine

Riabilitazione non mirata



Torry, *AJSM* '04

Viola, *AJSM* '00

Segawa, *Arthroscopy* '02

# Controversia TR - DSTG



Oltre 2000 pubblicazioni su Medline

# RCT

Eriksson, *JBJS-B* '01

Aune, *AJSM* '01

Shaieb, *AJSM* '02

Ejerhed, *AJSM* '03

Feller, *AJSM* '03

Jansson, *AJSM* '03

Gobbi, *Arthroscopy* ' 3

Aglietti, *JBJS-A* '04

Laxdal, *Arthroscopy* '05

# Non differenze

Risultati soggettivi

Flessione ginocchio

Ritorno allo sport

# Differenze significative

- TR:
- + fastidio all'inginocchiamento (6/7)
  - + deficit di estensione (4/9)
  - + dolore anteriore (3/9)
- DSTG:
- + tunnel widening (3/3)
  - forza dei flessori (3/7)
  - + lassità AP (2/9)

# Allograft

Stessi tendini (TR, ST, G, TQ) più:

Tendine d'Achille



Tibiale ant./post.



# Vantaggi

Ampia selezione

No morbità sede prelievo

Minore tempo di sala

Riabilitazione più facile (?)



# Svantaggi

Proprietà meccaniche inferiori

*Scheffler, Arthroscopy '08*

Osteointegrazione più lenta

*Jackson, AJSM '93*

Rischio trasmissione infezione

*Buck, CORR '89*

Costo

# Programma norvegese (5 settimane)

3 tipi di esercizi specifici



A terra



Materassino



Tavoletta



Cambi di direzione



Pliometria



Coordinazione e propiocezione



Anche a occhi chiusi !



In coppia

## Esercizi di base

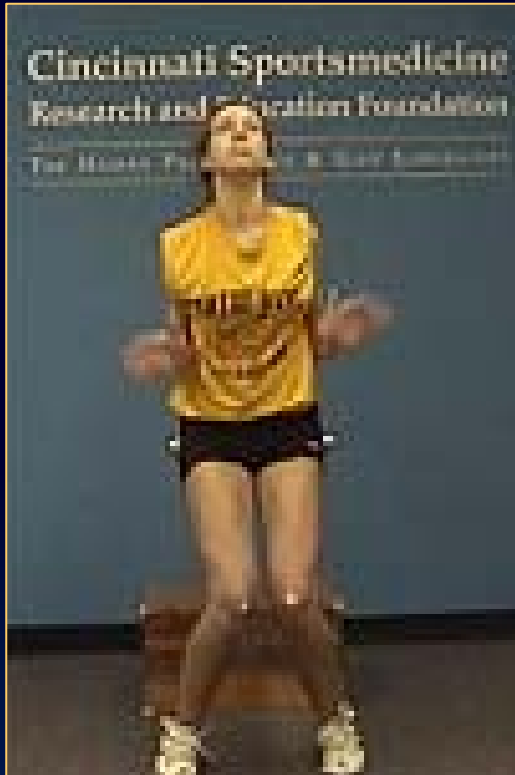


## Ruolo protetivo degli hamstring

*Cerulli, ACL Study Group 2004*

*Myer, Scand J Sp Med 2004*

# Risultati



Prima



Dopo

*Paterno, J Orthop Sports Phys Ther 2004*



50% di lesioni LCA in meno

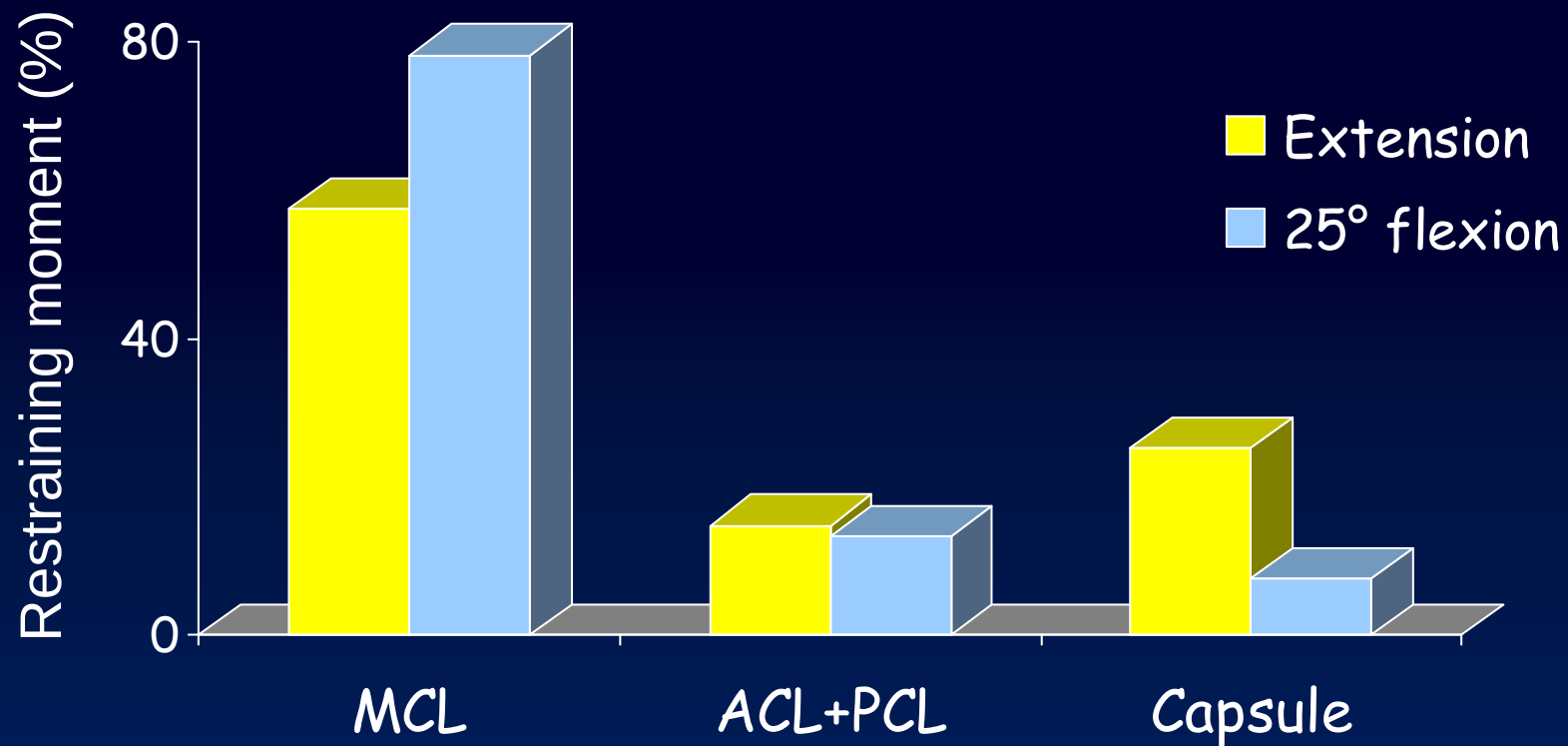
Rischio come maschi che non hanno seguito programma

Myklebust – Engebretsen, *Clin J Sports Med* 2003  
Noyes, *8th Congress Orthop, Rehab, Biomech, Assisi* 2004

# MEDIAL COMPARTMENT



## Restraints to valgus



Grood-Noyes, *JBJS-A* 1981

## Valgus stress test at 30° flexion



Positive in isolated MCL lesions

## Valgus stress test in extension



Positive in combined lesions (MCL + ACL/PCL)

Grade I



Sprain

Tenderness

No instability

Grade II



Partial lesion

Mild instability

Grade III



Complete lesion

Gross instability

## ACL & MCL lesion



Most frequent ligamentous injury: 12%  
Positive varus stress test & Lachman test

*Miyasaka, AJKS 1991*

# Trattamento

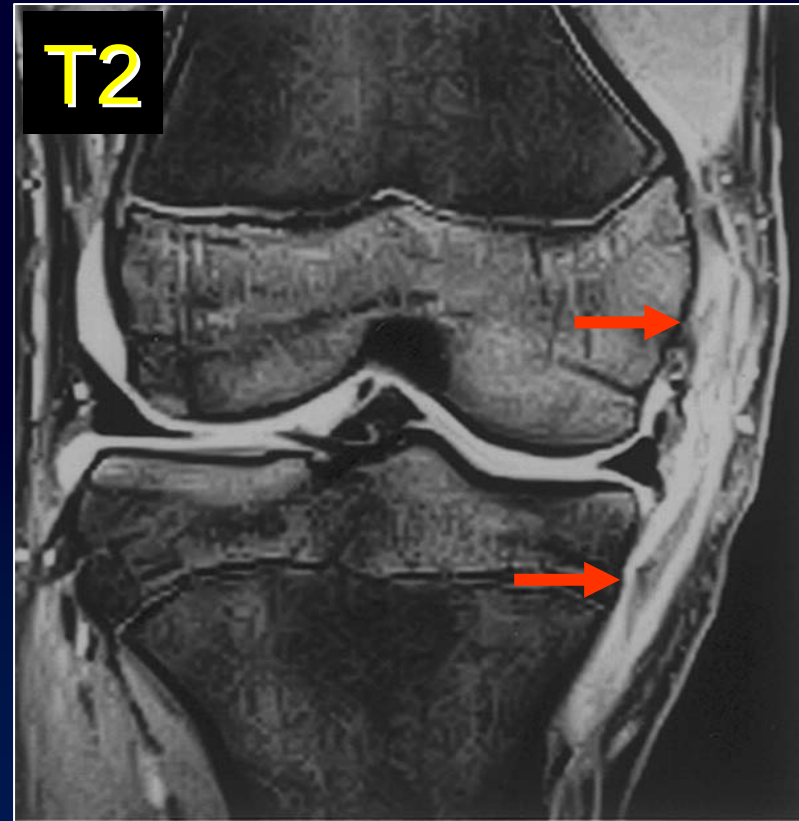
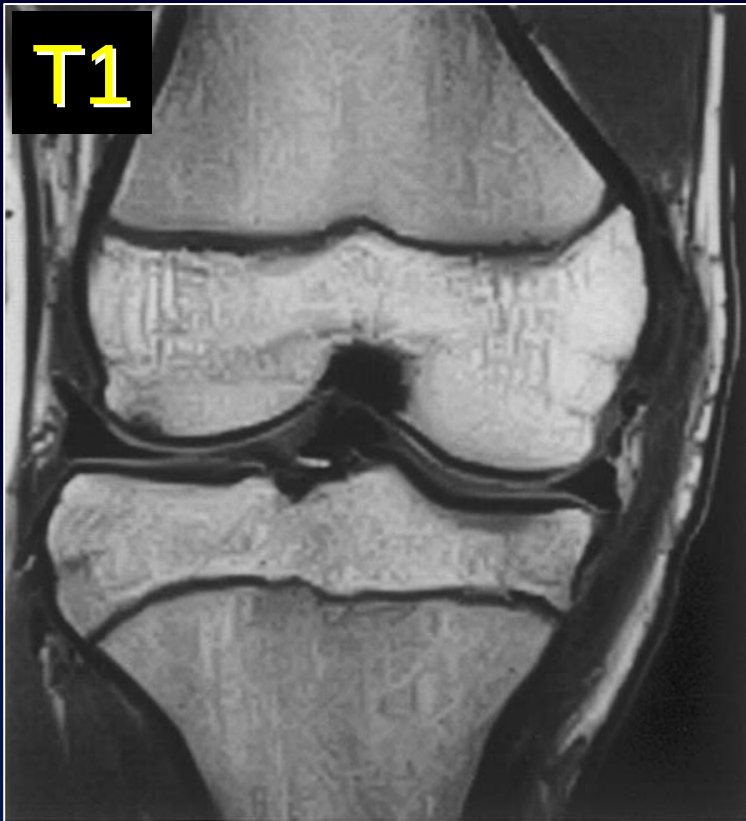
- 1. Ricostruzione del LCA
- 2. Conservativo per LCM
- Stessi risultati – meno artrofibrosi

# Quando?

Se operati in fase acuta vi è pericolo di  
artrofibrosi

Conviene di solito attendere il recupero del  
movimento

# LCM Ribaltato



- Sopra la zampa d'oca non tende a guarire conservativamente

*Nakamura, AJSM, 2003*

# Distacco lato tibiale



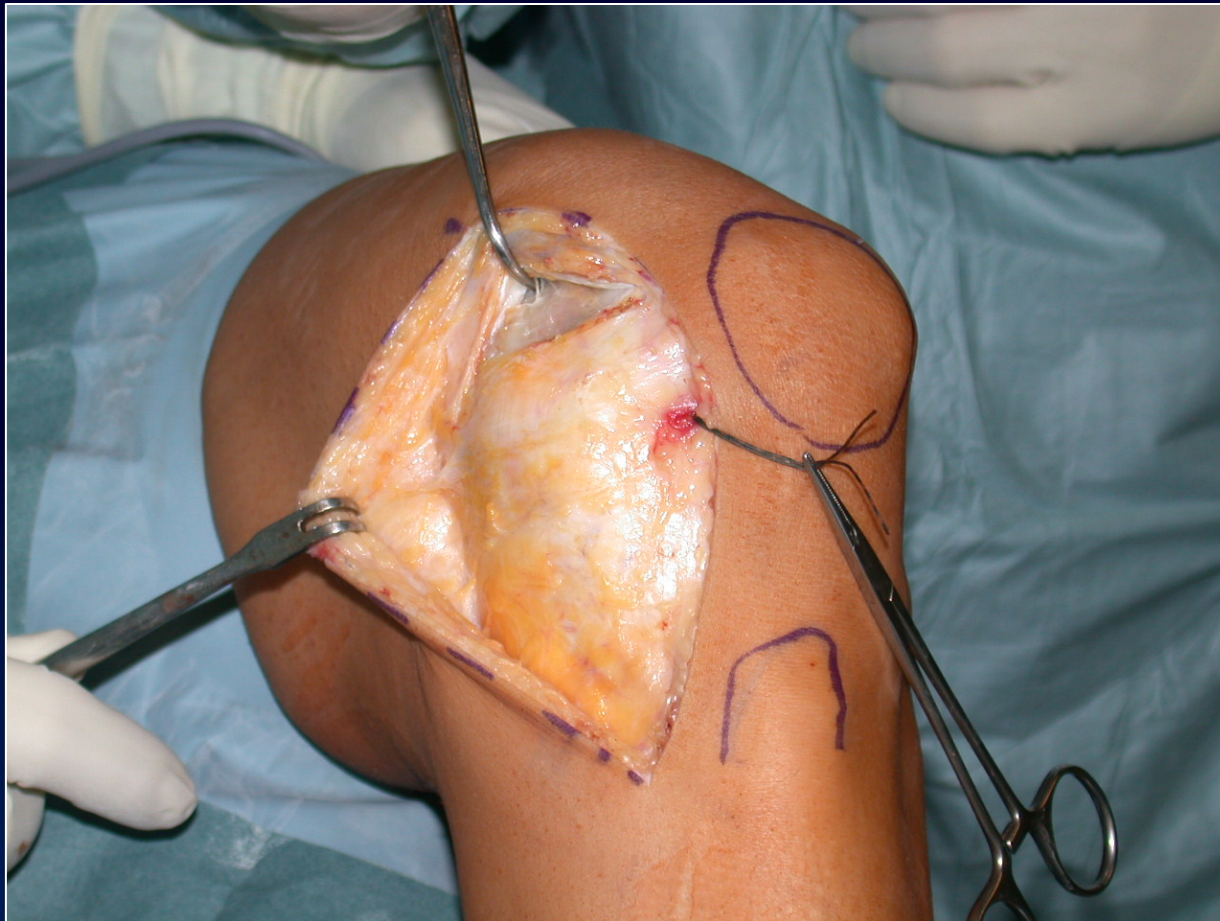
- Rifissazione con cambra

# Lesione Cronica LCA e LCM

| • Lassità mediale | Ricostruire |
|-------------------|-------------|
| • < 5 mm          | solo LCA    |
| • > 5 mm          | LCA + LCM   |

Valutazione clinica !

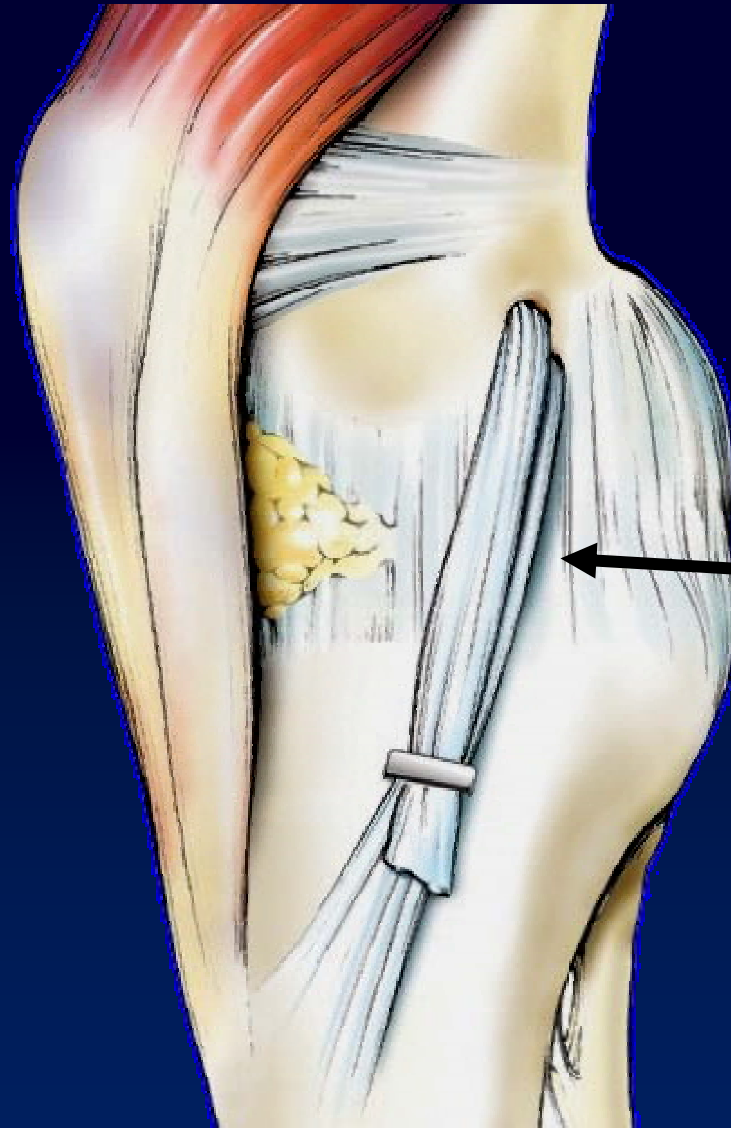
# Tecnica Chirurgica



Incisione

# Ricostruzione LCM

Bosworth modificato



ST Autologo

# Ricostruzione LCM

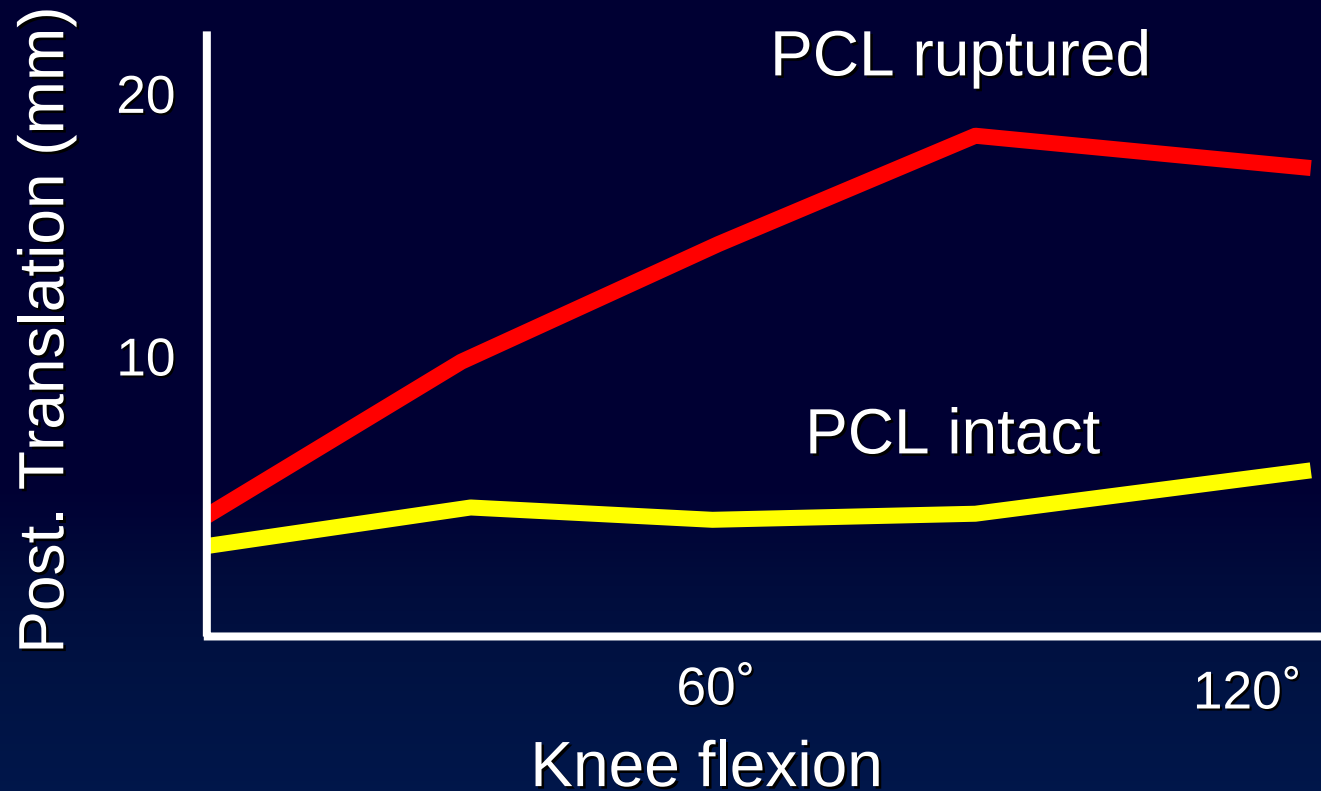
Tendine d'Achille omologo



1 2 3

Fissazione tibiale

# POSTERIOR CRUCIATE LIGAMENT



Primary restraint to posterior translation

Gollehon, *JBJS-A* 1987

Grood, *JBJS-A* 1988

Amis, *JBJS-B* 1998

## Posterior sag sign



Gravity test

## Posterior drawer test



Posterior tibial force

## Step off



|       |      |                                         |
|-------|------|-----------------------------------------|
| Grade | 0:   | normal                                  |
|       | I:   | tibia just anterior to femoral condyles |
|       | II:  | tibia flush with femoral condyles       |
|       | III: | tibia posterior to femoral condyles     |

# Trattamento conservativo



# Ricostruzione LCP



# Incisione a “J”

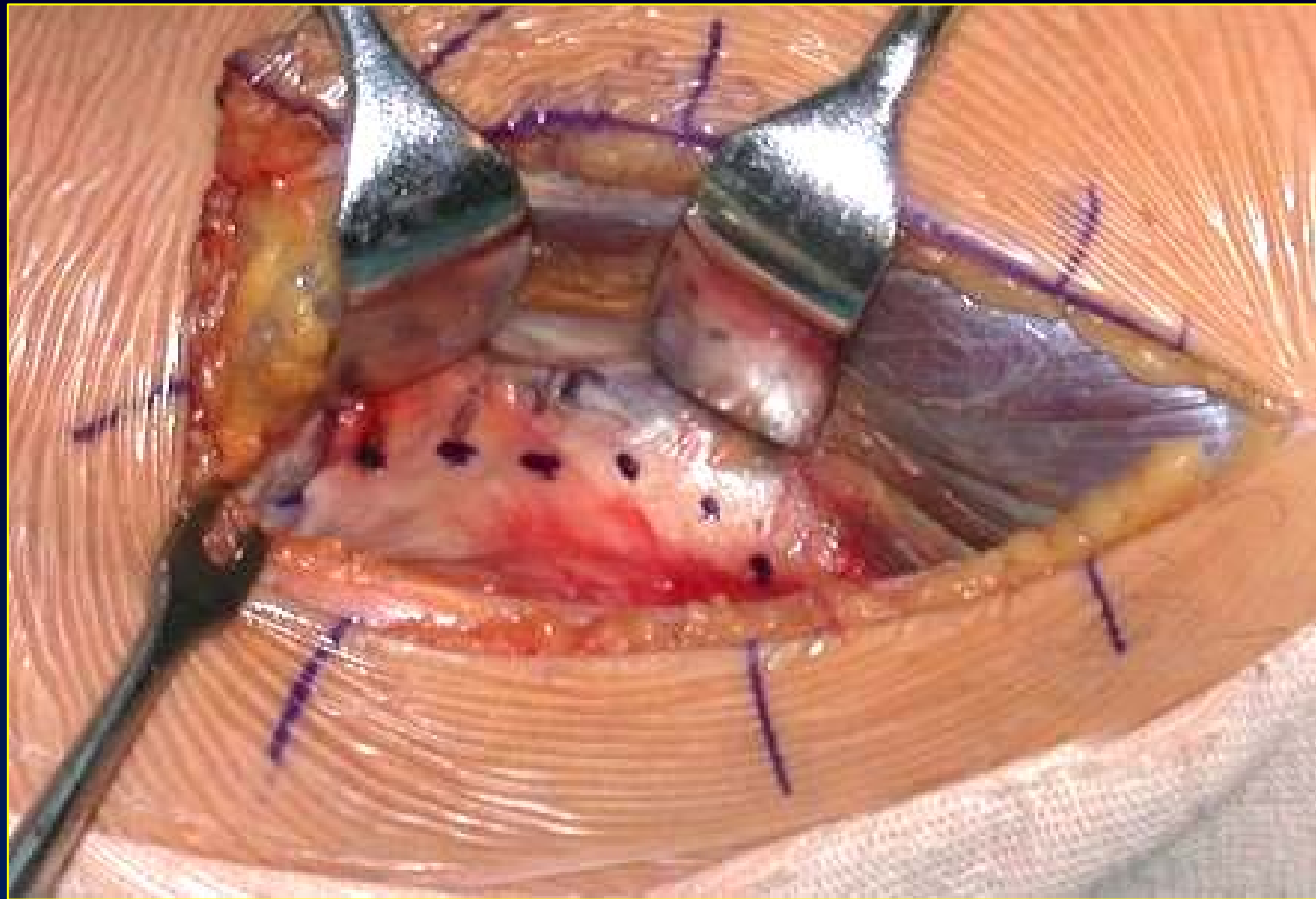
T



Burks and Schaffer, *Clin Orthop*, 1990

# Incisione capsulare longitudinale mediana

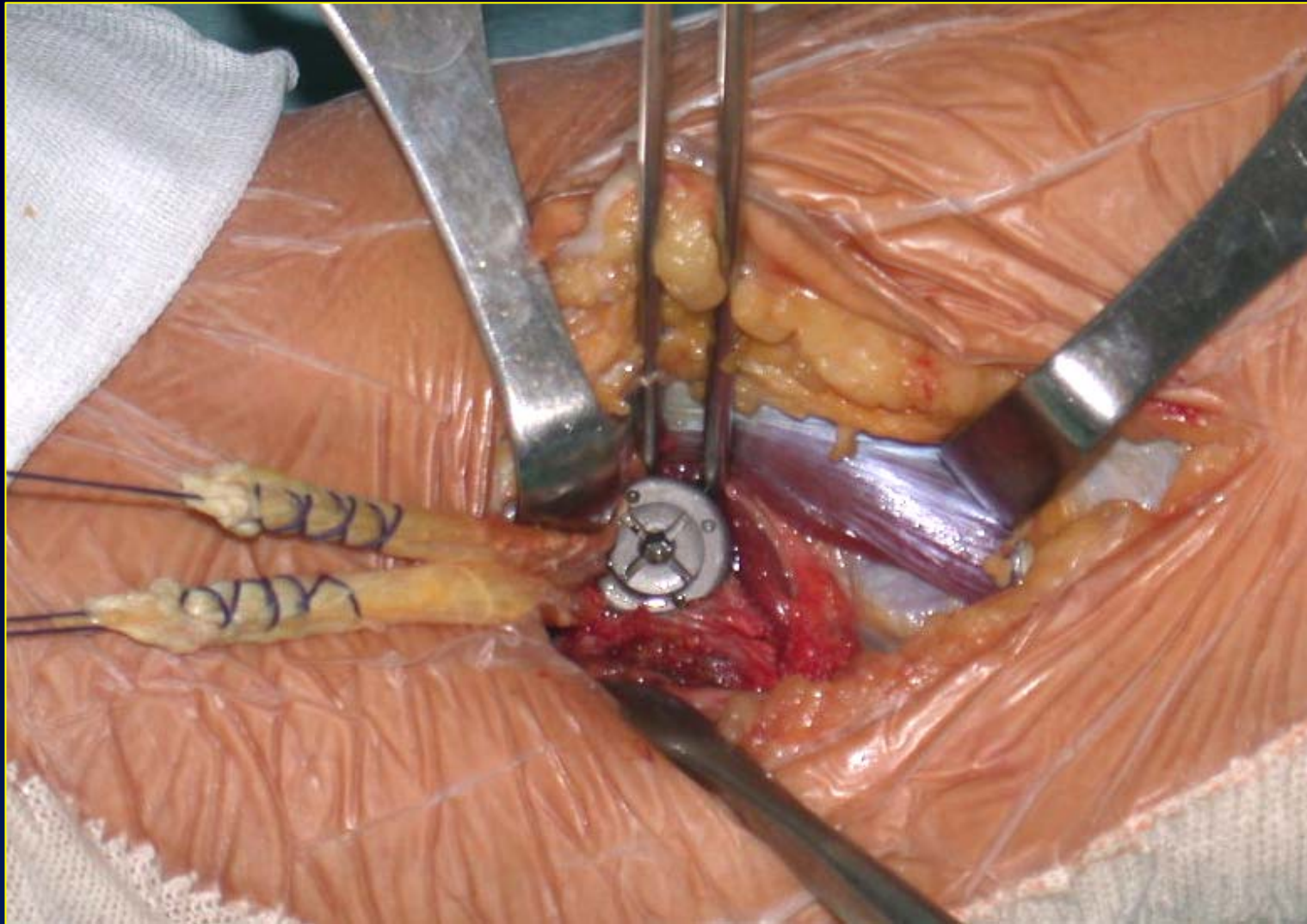
T



# Tendine d'Achille o tibiale anteriore (allograft)



## Bicortical screw and washer



No angolazione

No abrasione

Minore deformazione  
plastica

Carico al fallimento elevato

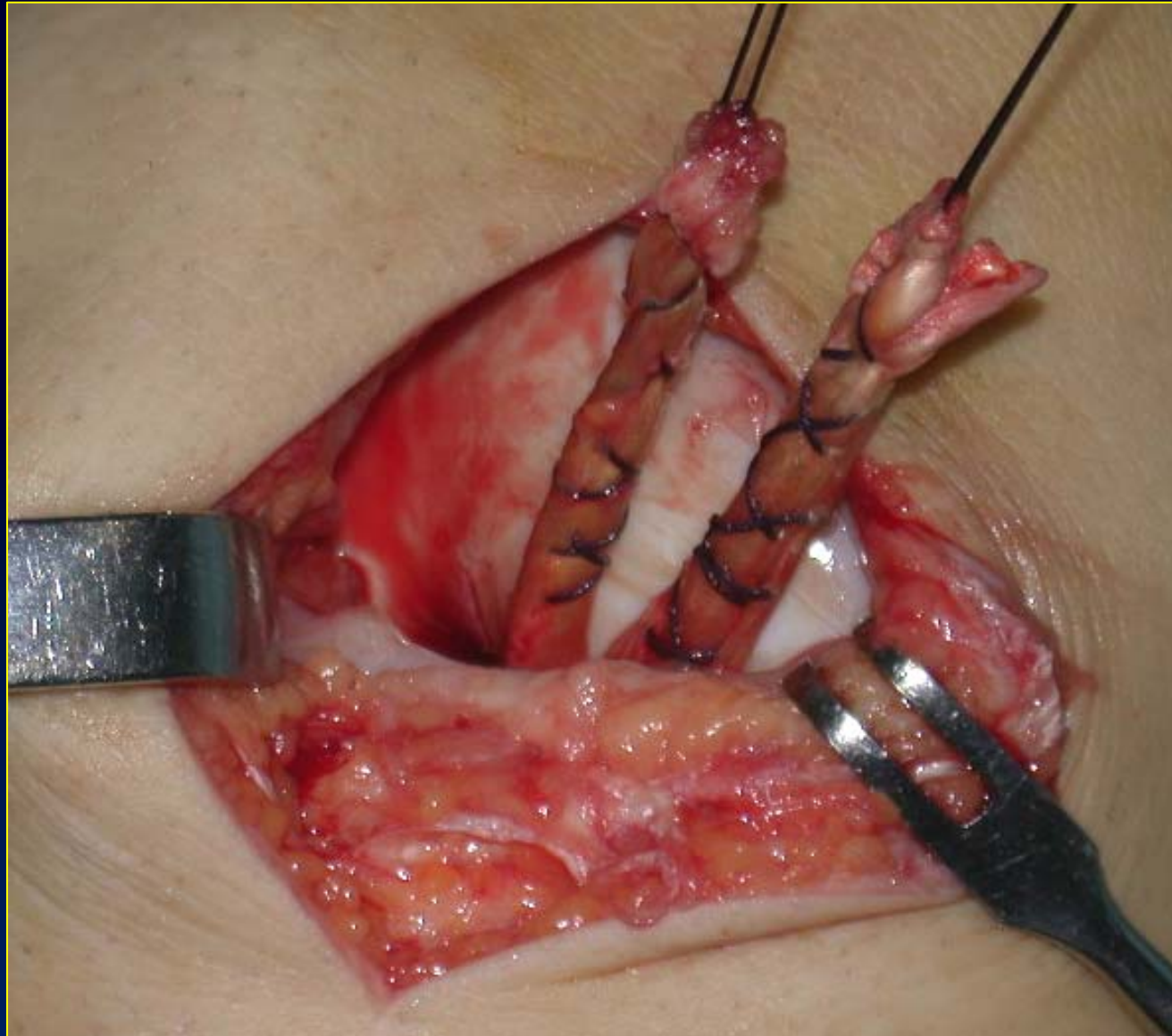


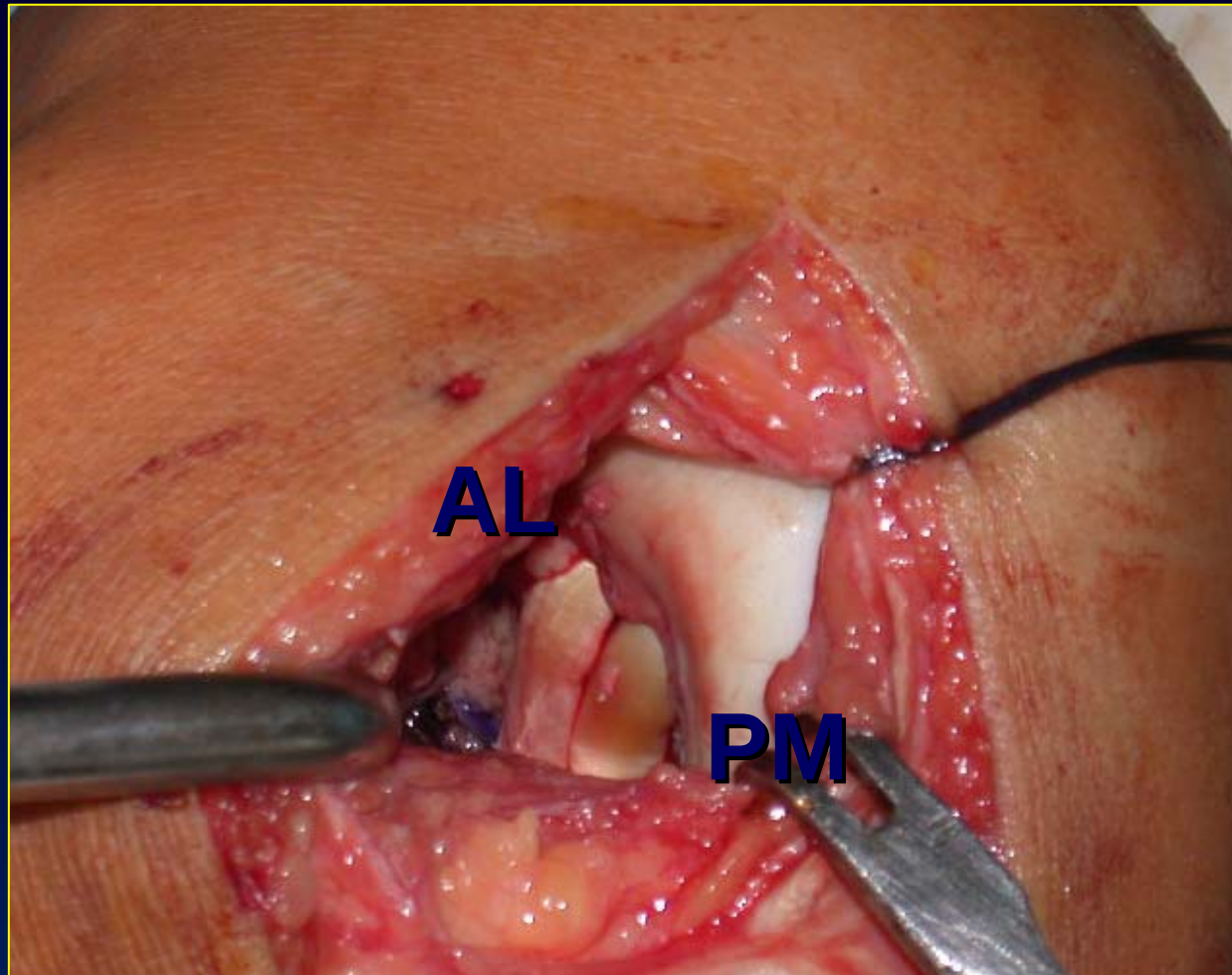
Bergfeld, *Am J Sports Med*, 2001  
McAllister, *Am J Sports Med*, 2002  
Markolf, *J Bone Joint Surg Am*, 2002  
Yasuda, *Am J Sports Med* 2003

## Secondo tempo – paziente supino



# Accesso Subvastus

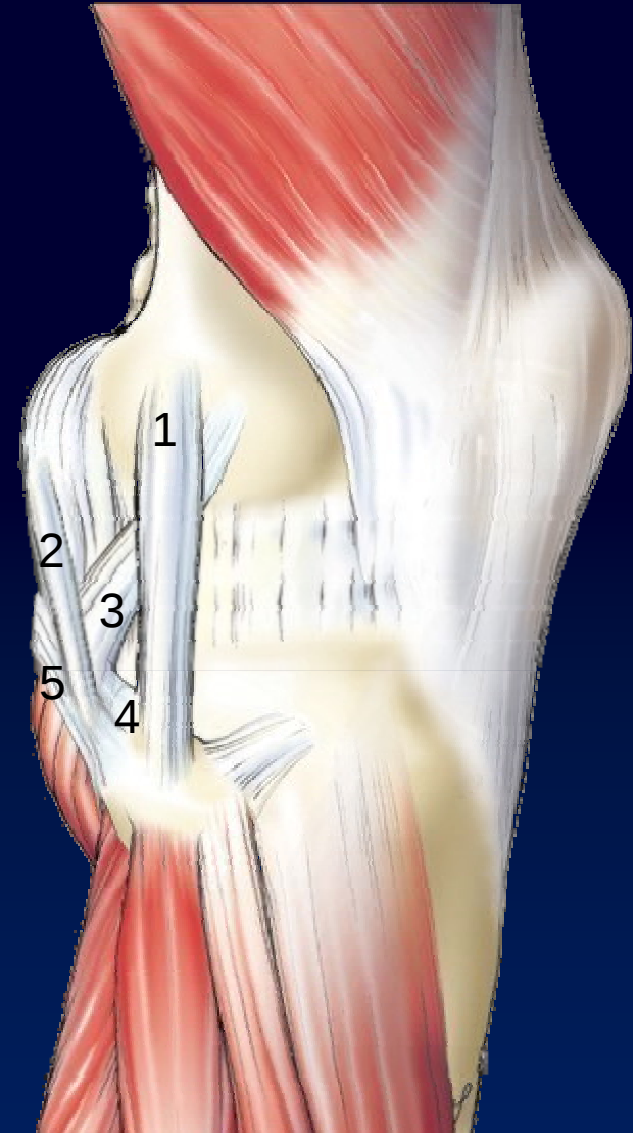




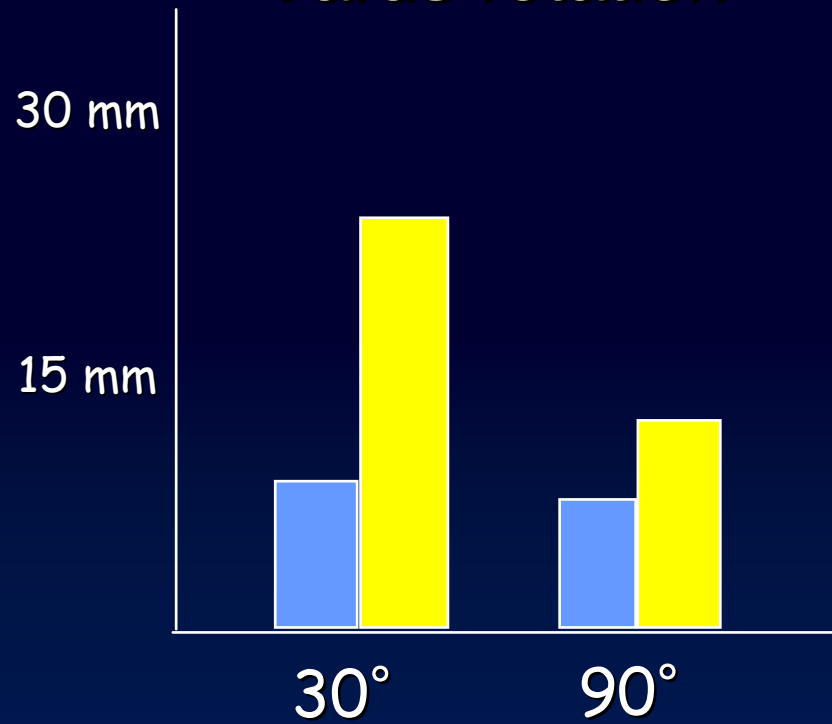
# LATERAL COMPARTMENT

Posterolateral structures:

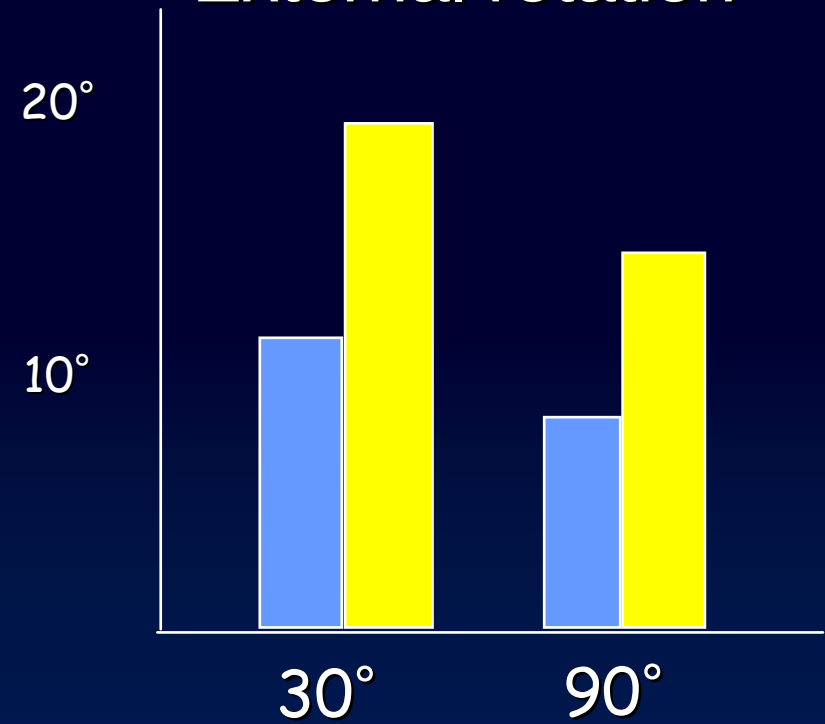
1. LCL
2. Fabellofibular lig.
3. Popliteus tendon
4. Popliteo-fibular lig.
5. Arcuate lig.



## Varus rotation



## External rotation



■ PLS intact  
■ PLS cut

## Varus stress test

|           |         |
|-----------|---------|
| Grade I   | < 5 mm  |
| Grade II  | 6-10 mm |
| Grade III | > 10 mm |



LCL primary restraint  
Isolated LCL lesions produce small laxities

*Gollehon, JBJS-A, 1987  
Grood, JBJS-A, 1988*

## External rotation test



Increased external rotation at  $30^{\circ}$  , not at  $90^{\circ}$   
in case of isolated PLS lesions

Figure 4 position



Tenderness palpating the LCL  
LCL weakness may be appreciated

## Combined PCL/PLS lesion

Posterior drawer > 10 mm

ER @ 90° /30° > 10°

Varus stress > 5mm

Reverse pivot shift ++



## External rotation test at 90 degrees

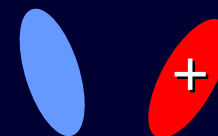
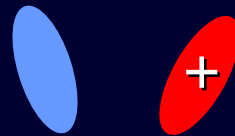


## External rotation test

PLS

PLS+PCL

30° knee flexion



90° knee flexion



## Reverse pivot shift



Tibial posterior sublux. in flexion – reduction in ext.  
May be present in 35% of normal knees

Jakob, AOS 1981  
Cooper, JBJS-A 1991

## Combined ACL/PLS lesions



10-15% of ACL insufficiencies

Hyperextension, increased external & varus rotation

LaPrade, *SMAR*, 1997

Noyes, *JBJS-A*, 2001

## Combined ACL, PCL & PLS

Dislocation (self-reduced 50%)

### Acute phase:

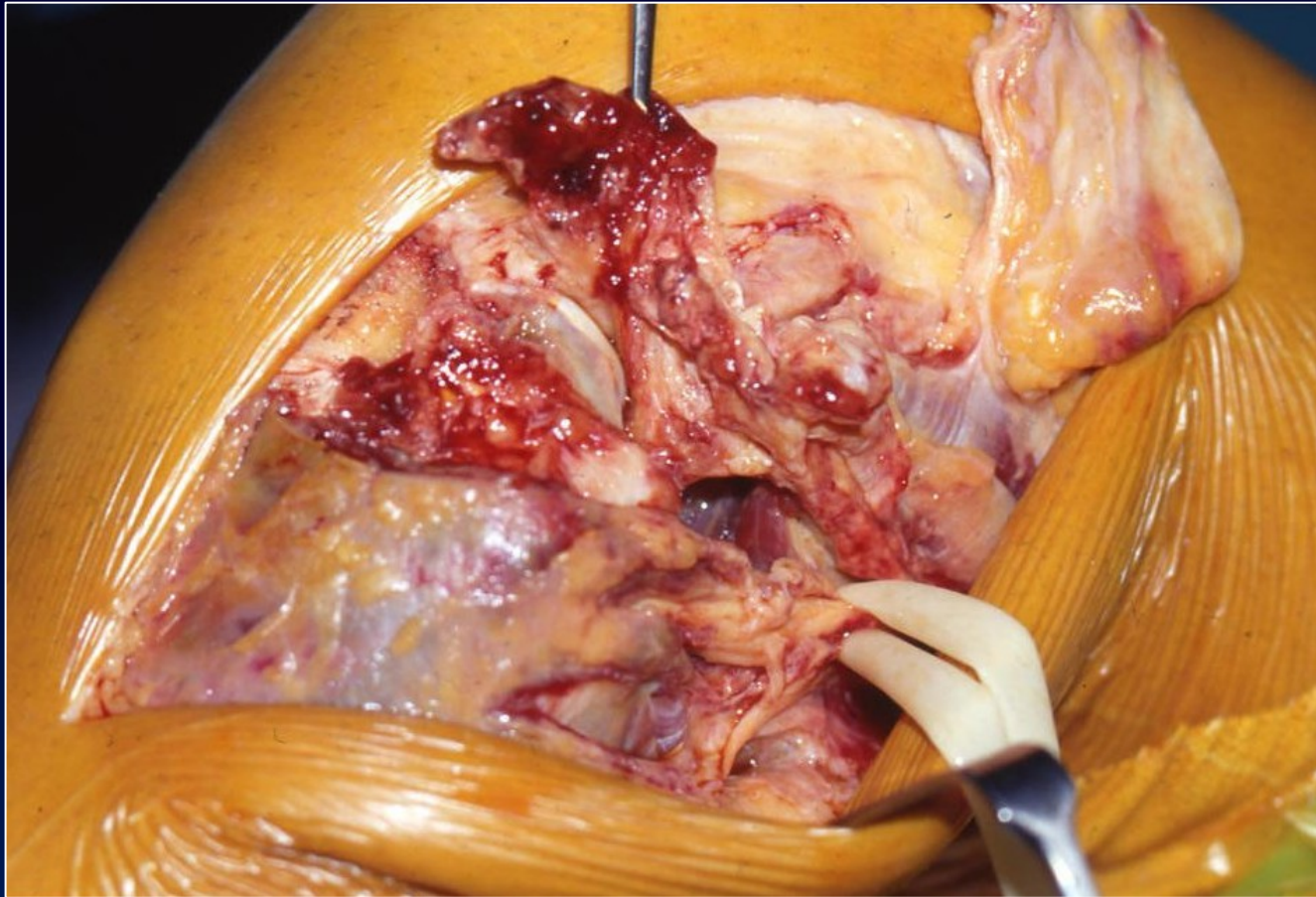
- look at N.V. function
- reduce if still dislocated
- repaire vessels & collaterals

### Subacute phase:

- reconstruct both cruciates

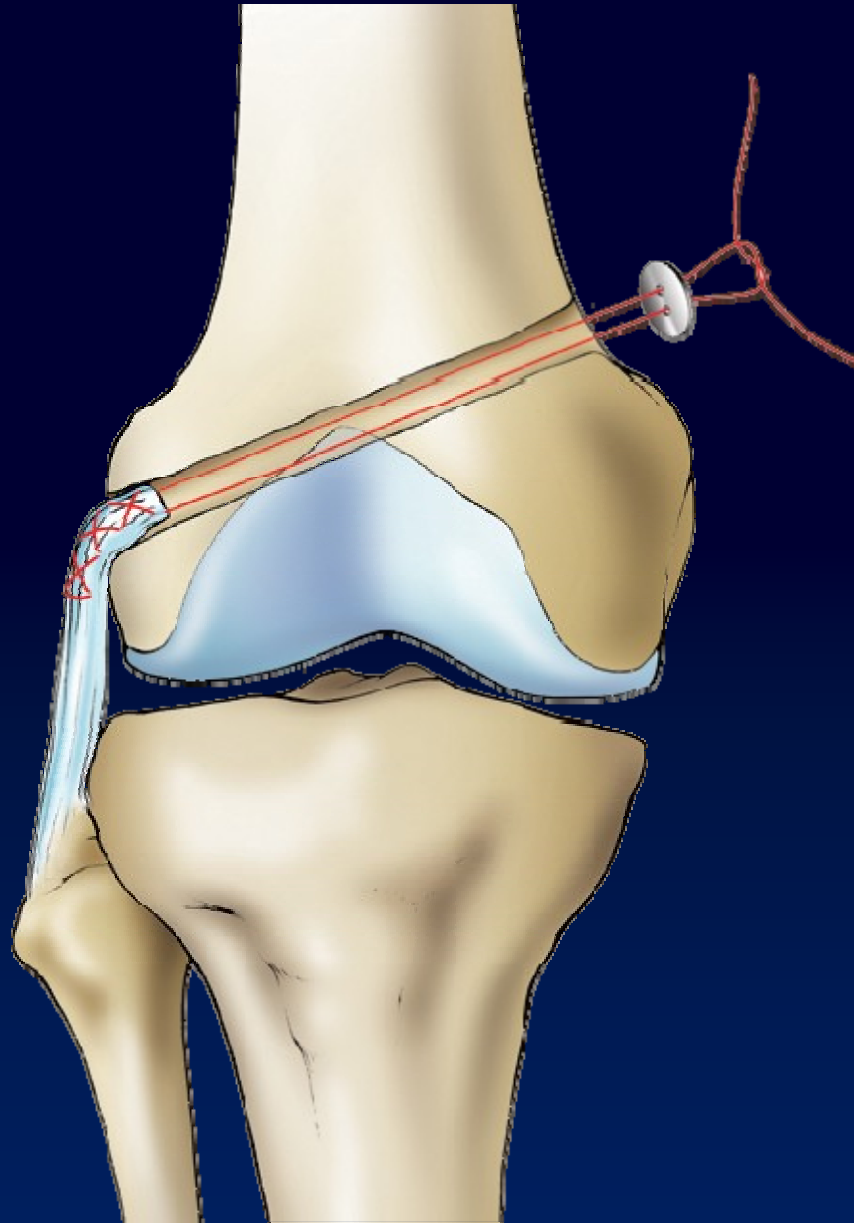


# Tecniche laterali in fase acuta

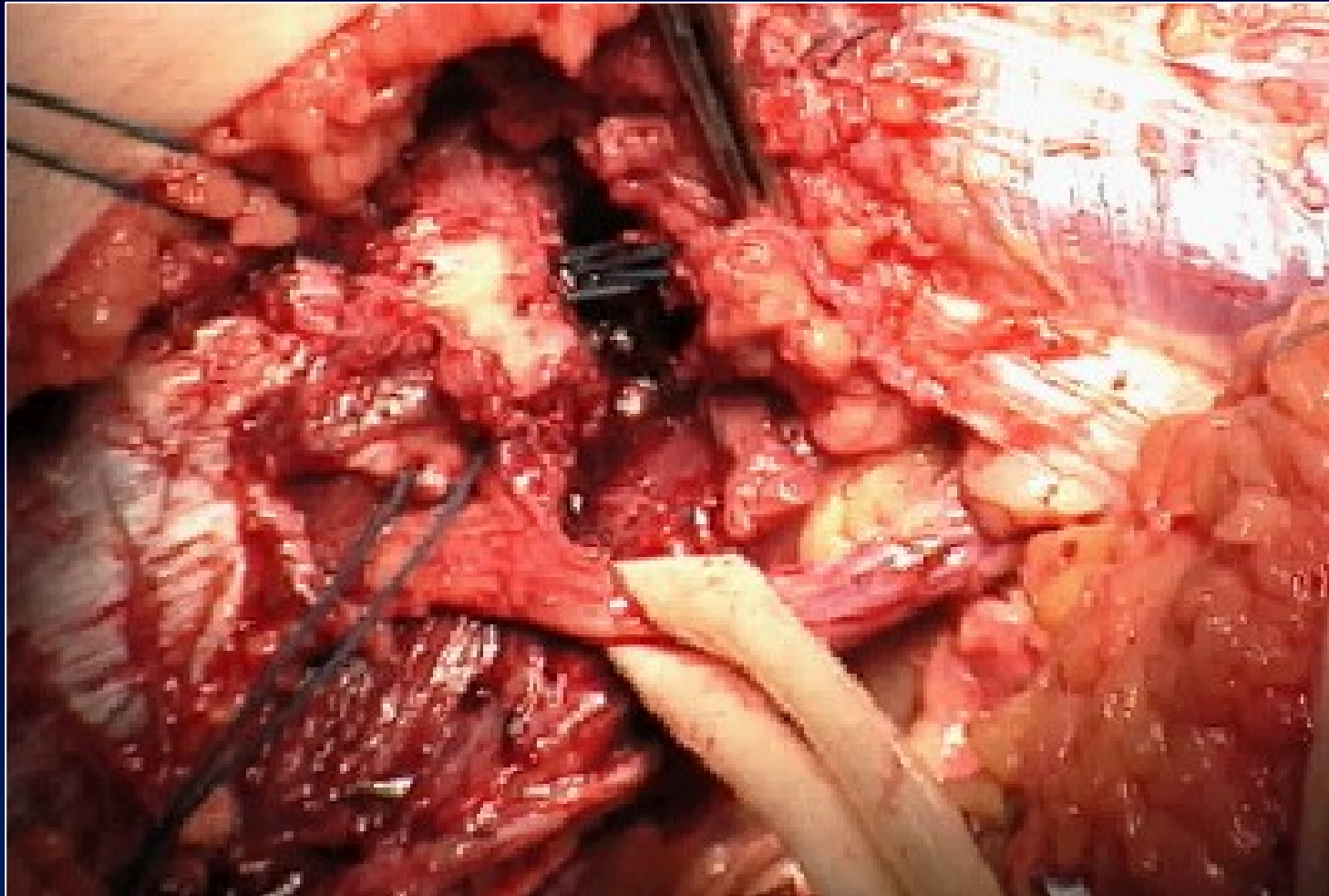


- Riparare o rinforzare le principali strutture lesionate per evitare lassità cronica

# Reinserzione sul Femore

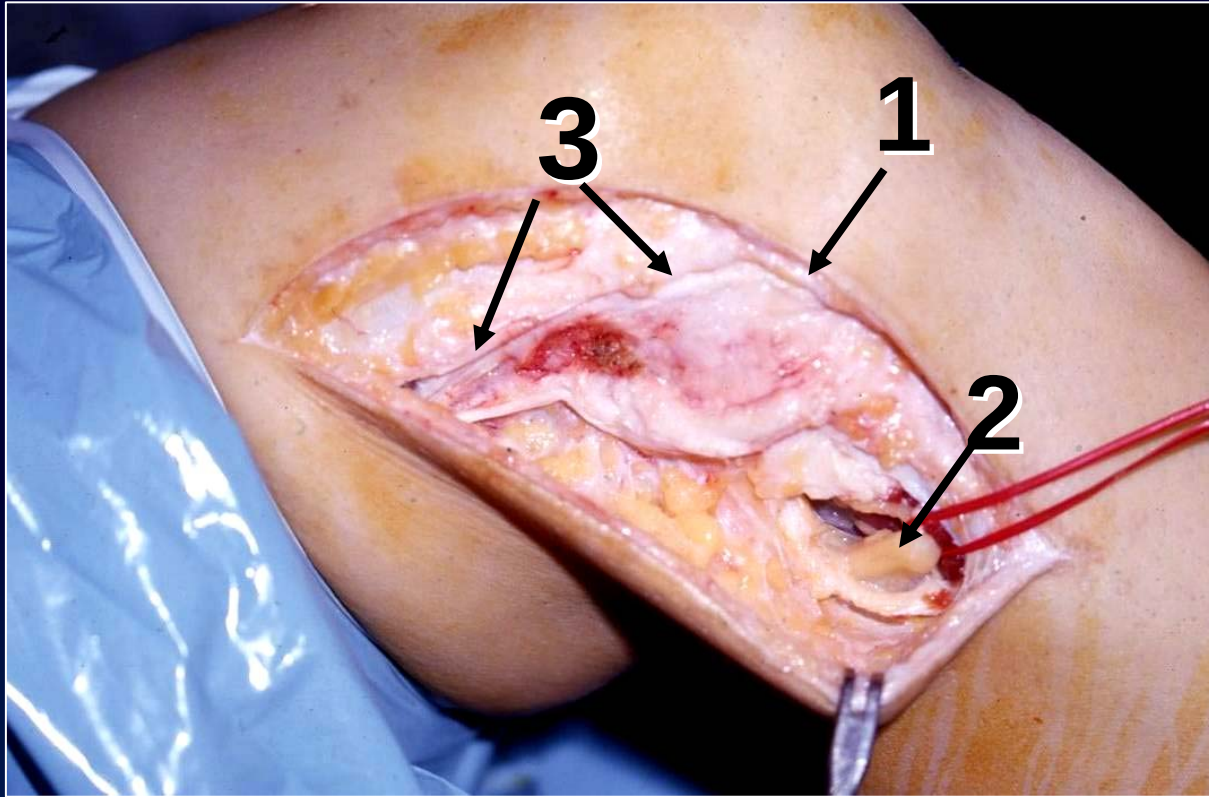


# Reinserzione su Testa Perone



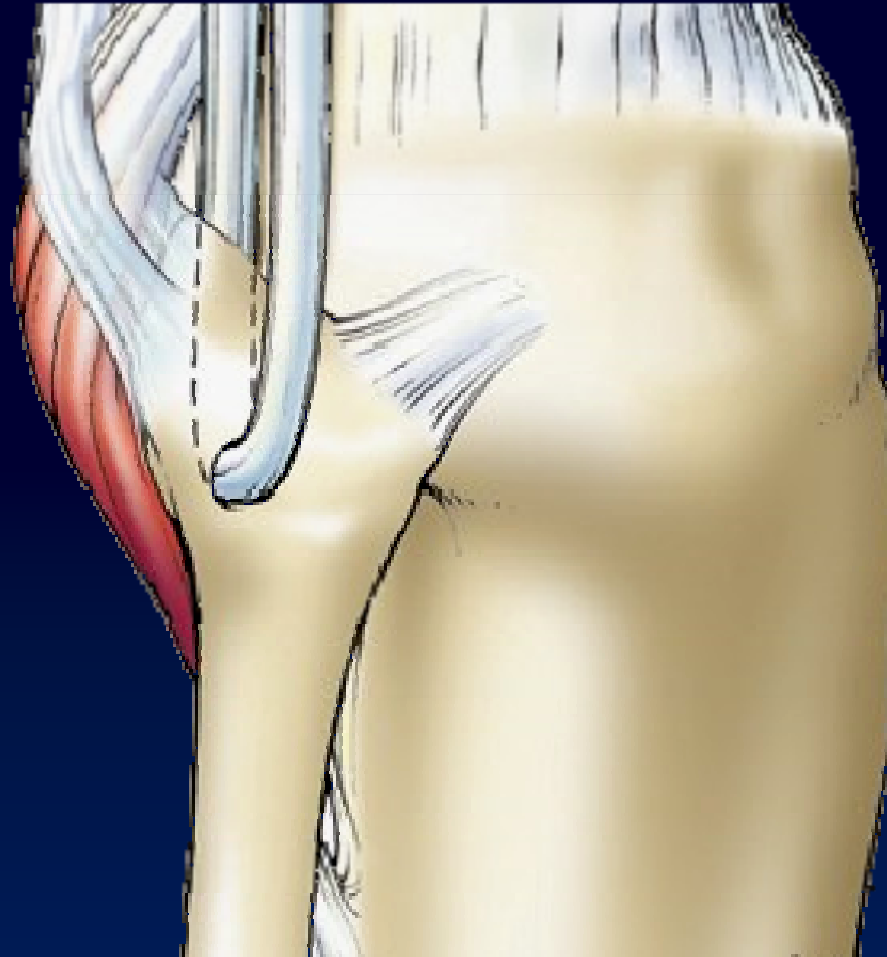
Punti transossei o ancore

# Tecniche Laterali in Fase Cronica



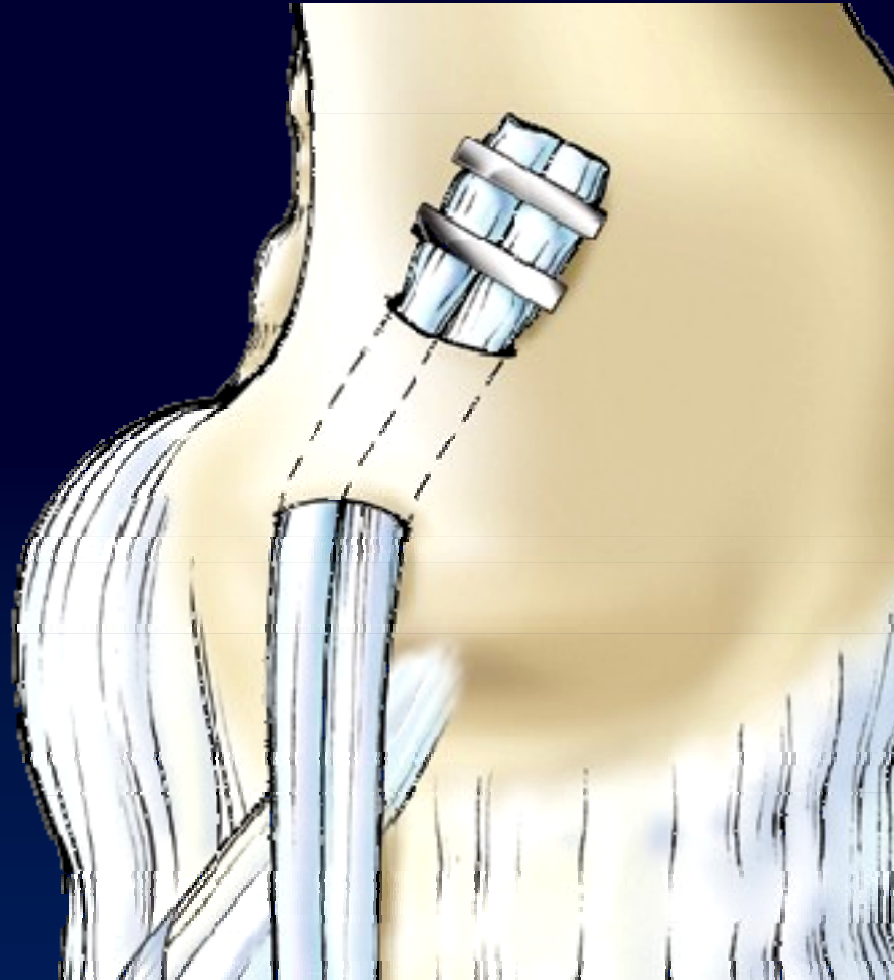
- 1. Incisione laterale cutanea arcuata
- 2. Isolamento dello SPE (neurolisi)
- 3. Incisione fascia lata
- 4. Tecnica anatomica e trapianti liberi

# Ricostruzione LCL con ST Autologo



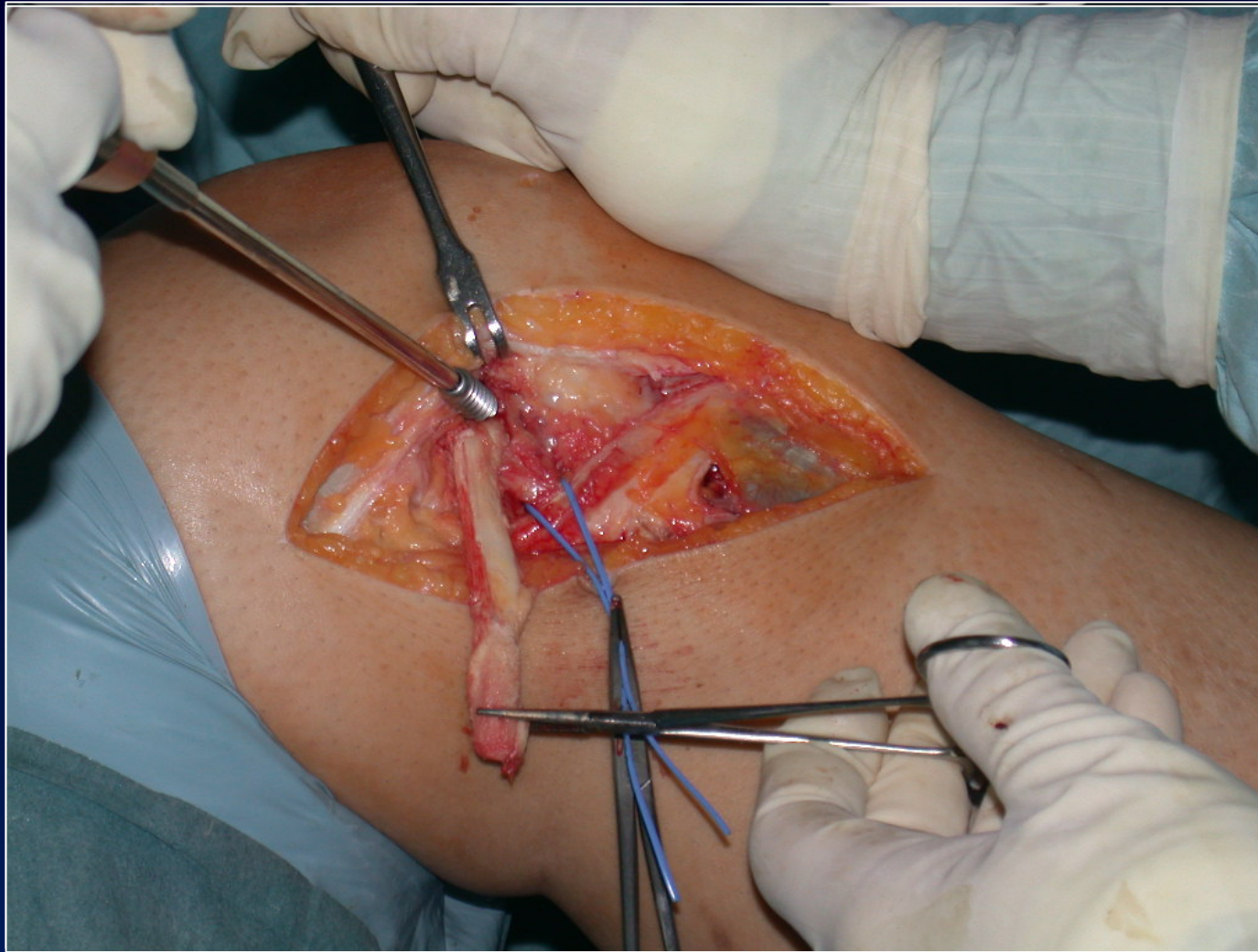
Tunnel Peroneale

# Ricostruzione LCL con ST Autologo



Tunnel Femorale

# Ricostruzione LCL con TR Omologo

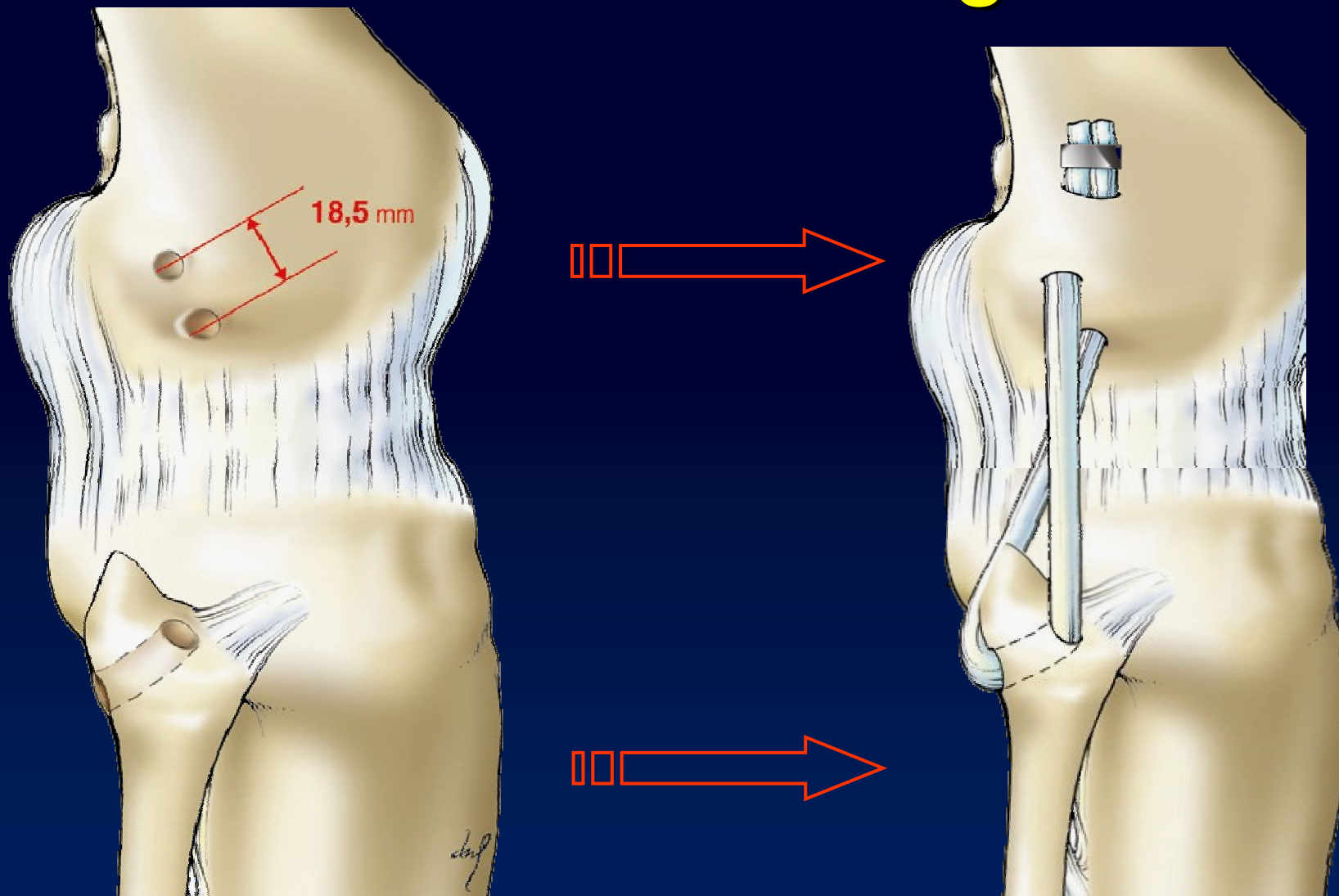


Fissazione femorale

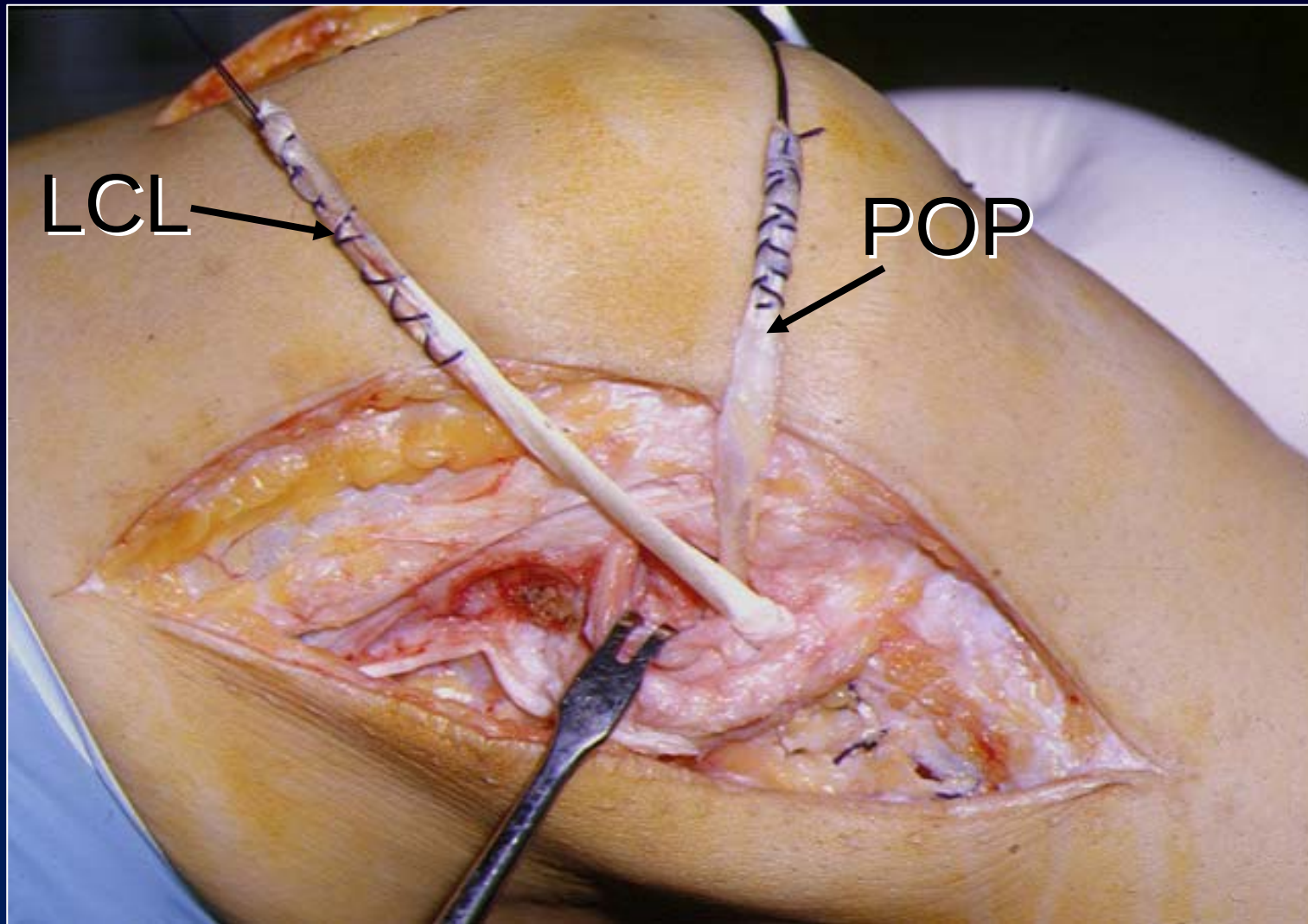
1 2 3

*Tibone AMIS*

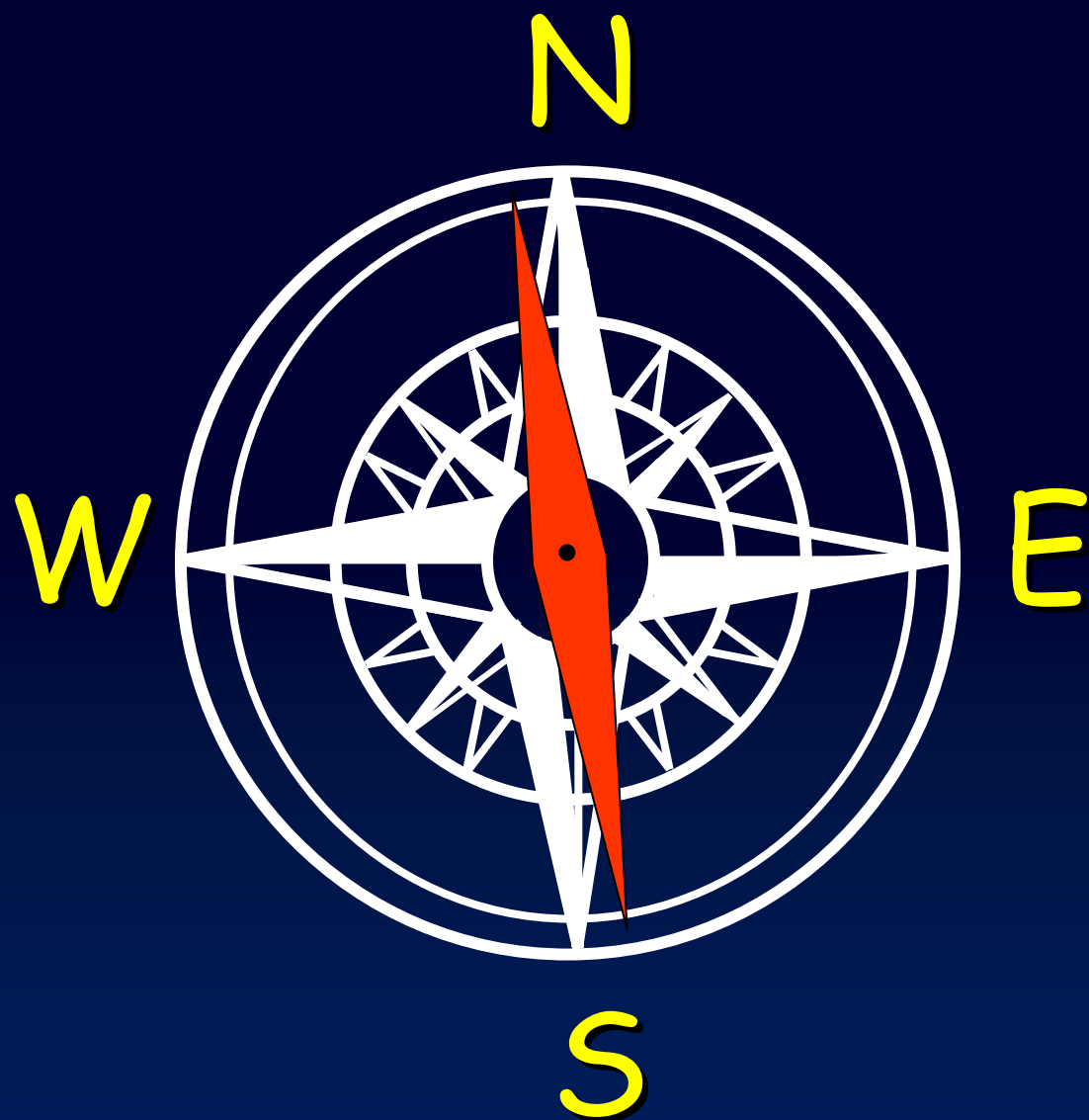
# Ricostruzione Popliteo e LCL con ST Autologo

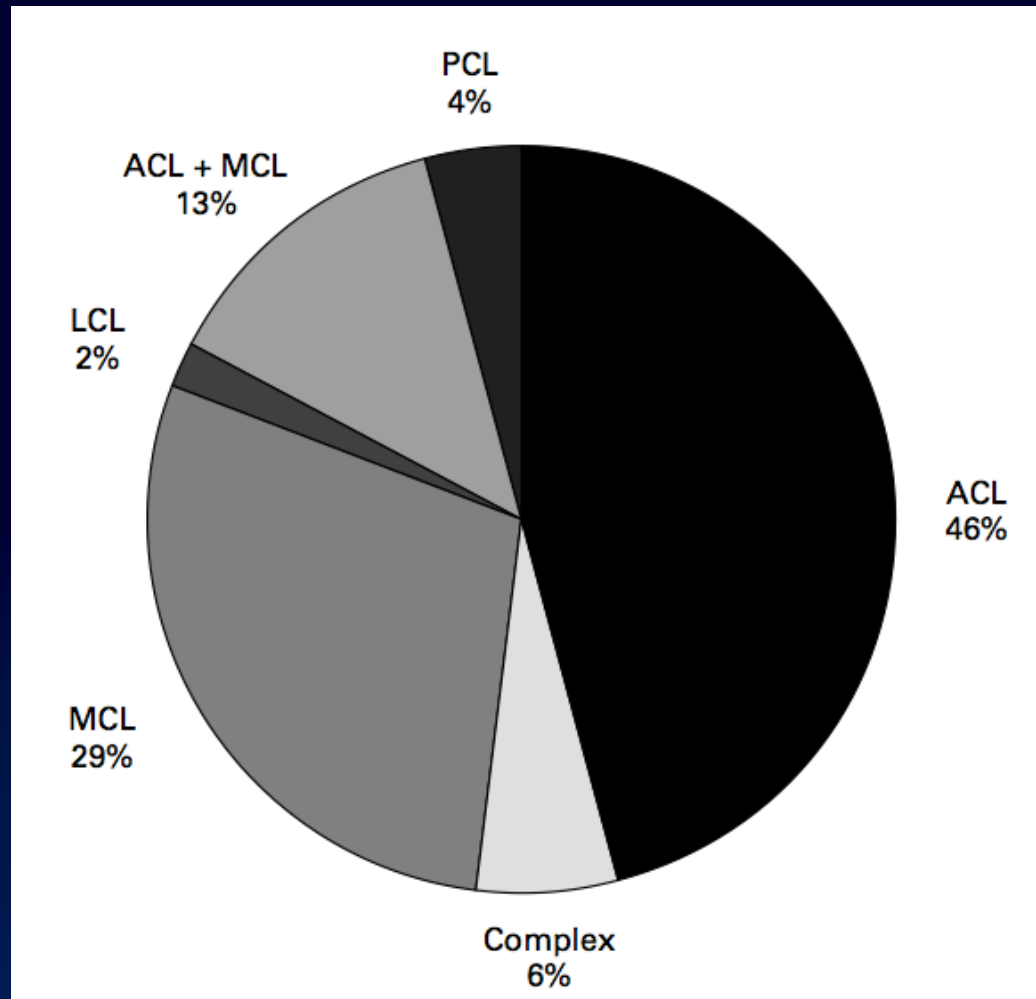


# Ricostruzione POP e LCL con ST Autologo



Incrocio dei tendini





Bollen, *Br J Sp Med* 2000



One quarter of soccer players have chronic findings in their knee

*Junge, Am J Sp Med 2000*

# KNEE ARTHRITIS

15.5 % among former football players

1.6% in age matched controls



*Roos, Am J Sp Med 1994*