

The traumatic knee

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Service de chirurgie orthopédique et traumatologie de l'appareil moteur

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Type of pathologies

- Ligamentous lesions
- Meniscal lesions
- Cartilage lesions
- Patella dislocation
- Tendon avulsions

Epidemiology

- ACL injury: 130'000/year
- MCL injury: 60'000/year
- MCL+ACL injury: 30'000/year

Anamnesis

- Injury mechanism
- Notion of "Cracking"
- History of trauma

Injury mechanism



Injury mechanism



Ligaments

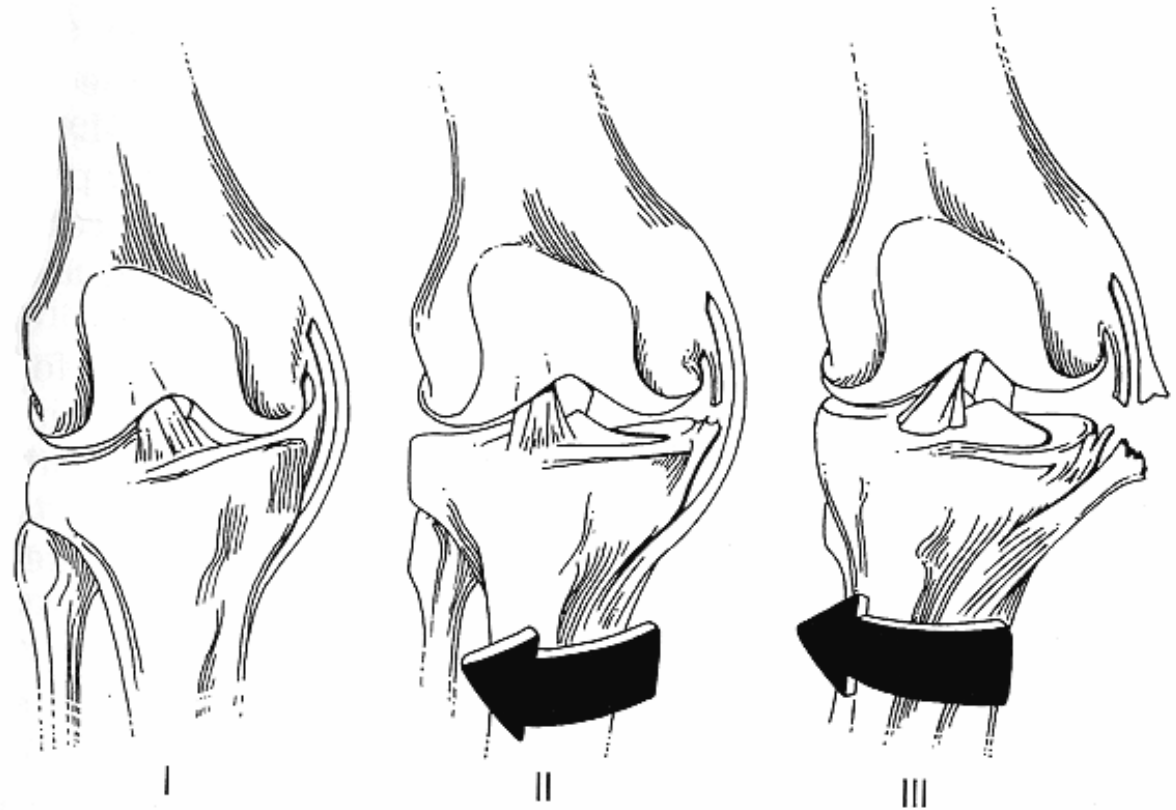
Pure valgus sprain

- Extension:
 - PMC
 - POL
 - MCL
- Flexion:
 - MCL
 - PMC
 - POL



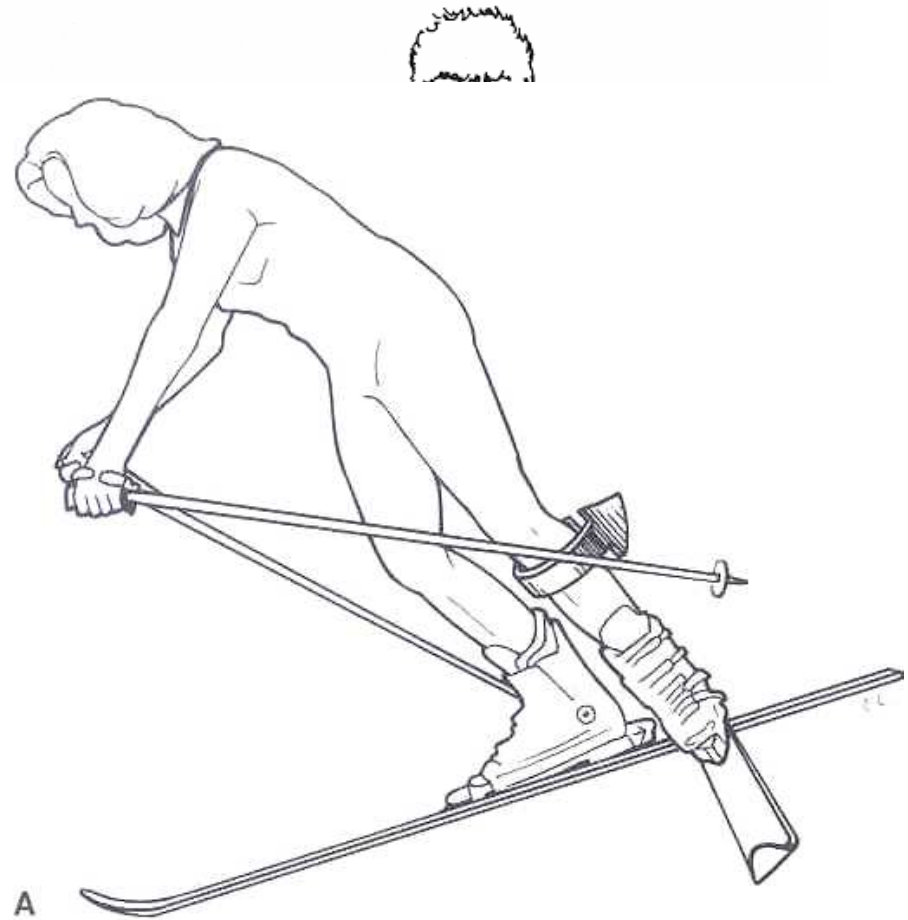
Valgus sprain

- Classification:
 - Grade 1
 - Grade 2
 - Grade 3



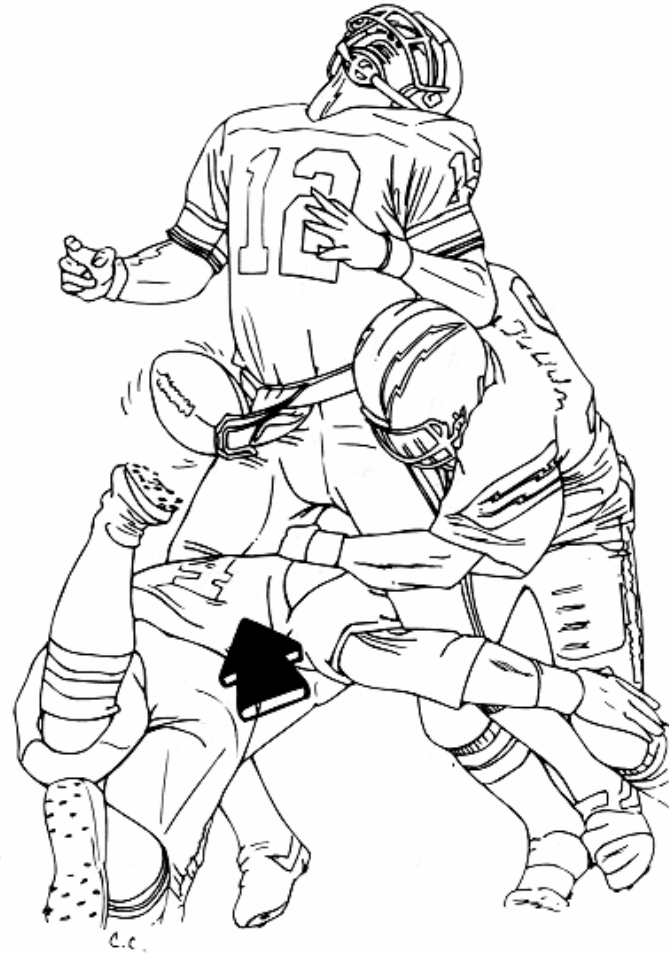
Valgus - flexion- ext-rot.

- Most frequent:
 - PMC-MCL-POL
 - ACL
 - Lat meniscus
- ...then:
 - PCL if valgus > ER
 - PLC then PCL if ER > valgus



Varus

- LCL
 - Grade 1
 - Grade 2
 - Grade 3



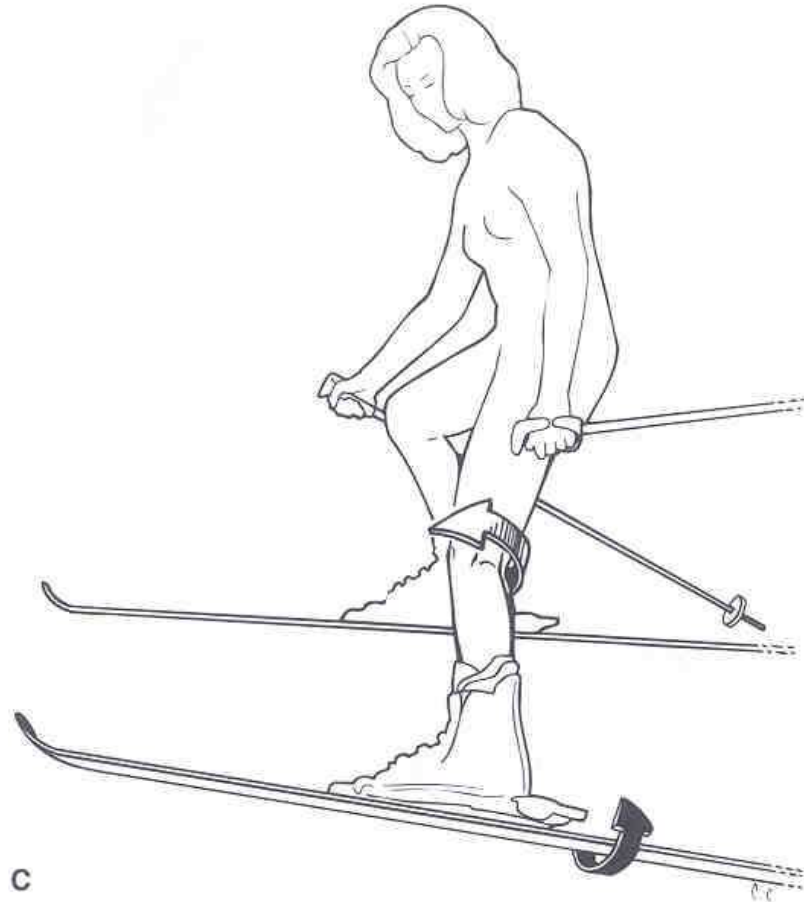
Varus - internal rot.

- Alpine skiing:
Basketball:
 - PLC
 - Desinsertion du LM
 - LCL
- ...then:
 - ACL
 - Popliteus tendon
 - Tendon biceps crural (SPE!!!)
 - PCL



Pure IR

- Ski:
Football:
 - ACL
- ..then:
 - PLC



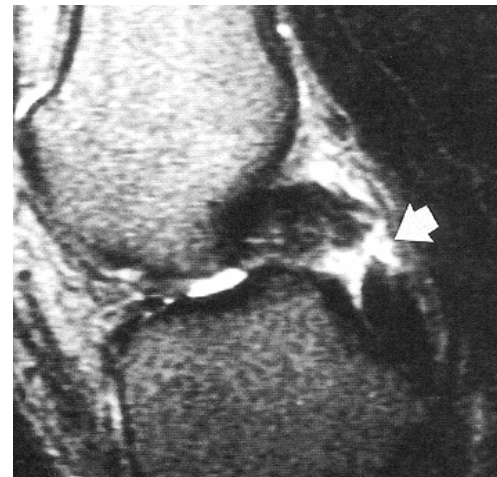
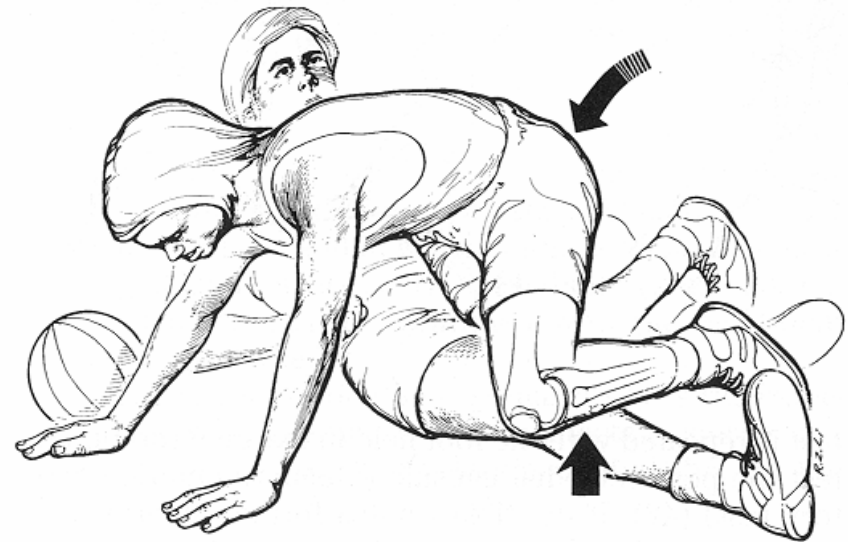
Hyperextension

- If the leg is not on the ground:
 - ACL
- If the leg is applied on a support :
 - PCL
 - PLC
 - PMC

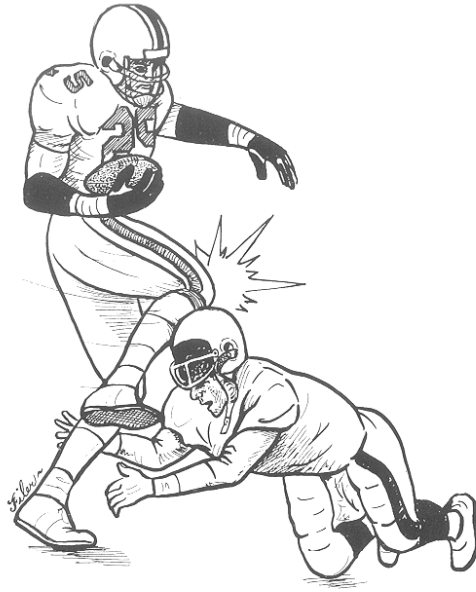


Hyperflexion

- Isolated PCL:

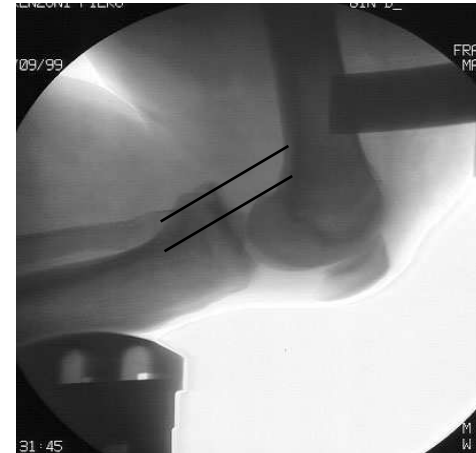


PCL

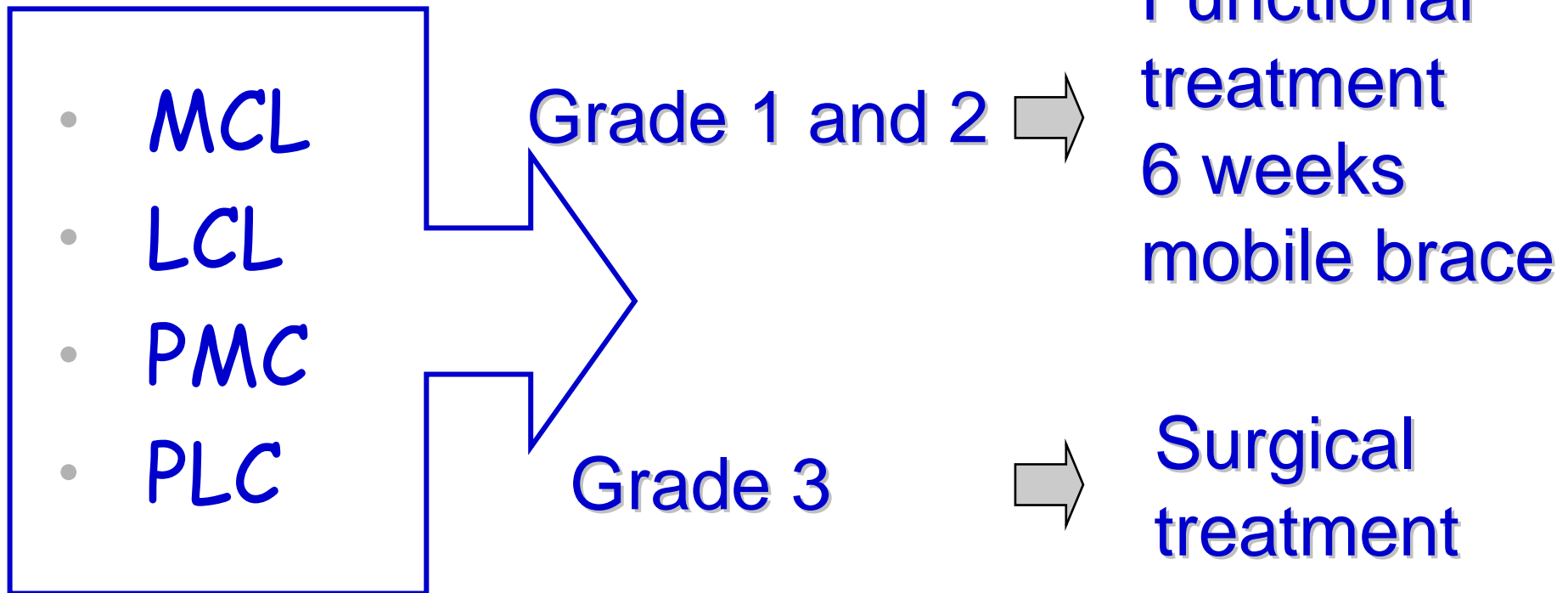


PCL

Telos technique Classification of the lesion Garavaglia, Menetrey *Am J Sports Med* 2007

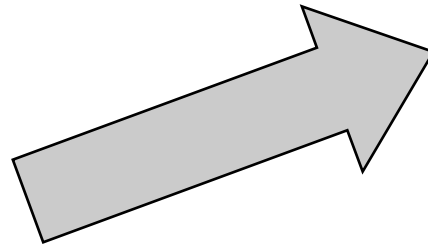


Treatment

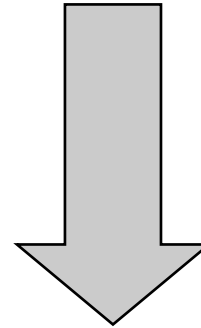
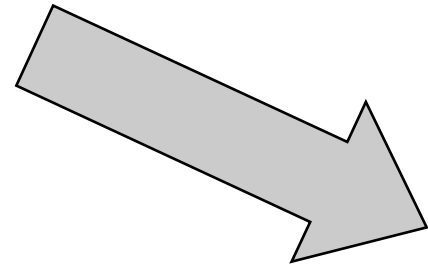


Treatment

- ACL



Conservative
treatment



Surgical
treatment

Conservative versus surgery

- SURF: Surgery Risk Factors
 - Laxity
 - Hours of sports/year
 - Pivoting activities

What to decide ?

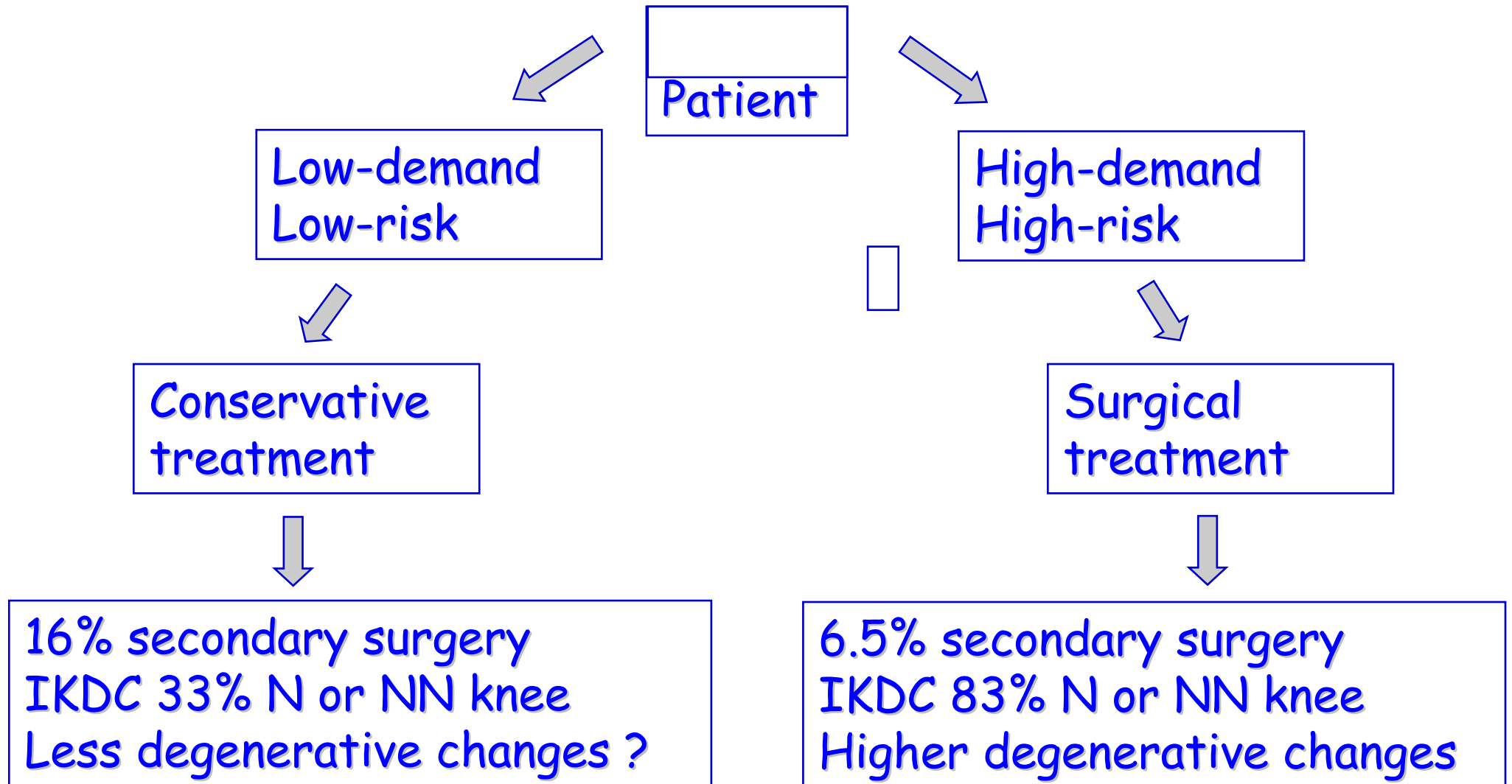
Surgical Risk Factor

KT-1000 Arthrometer Manual Maximum Injured-Normal Difference, mm	Sports Hours per Year: Level I or II Jumping or Cutting Sports ¹⁹		
	<50	50-199	>200
<5	Low	Low	Moderate
5-7	Low	Moderate	High
>7	Moderate	High	High

Fithian et al *Am J Sports Med* 2005

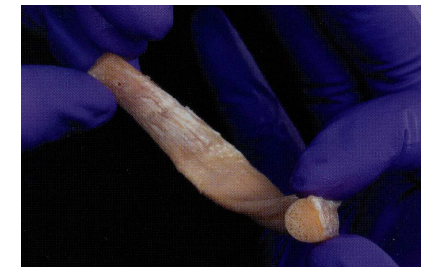
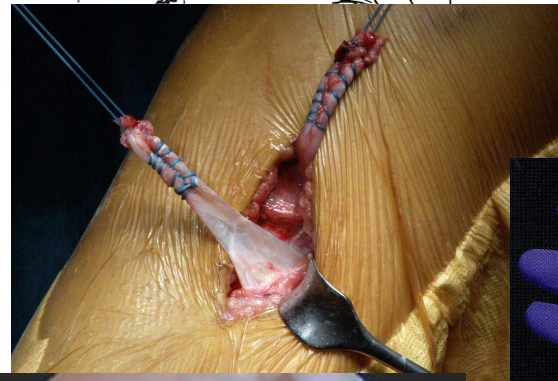
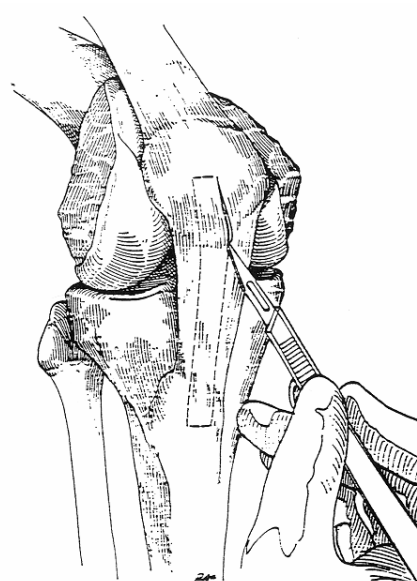
- Patient age
- Type of sports
- Competitive sports
- « Sunday morning warriors »

Natural history



Surgery

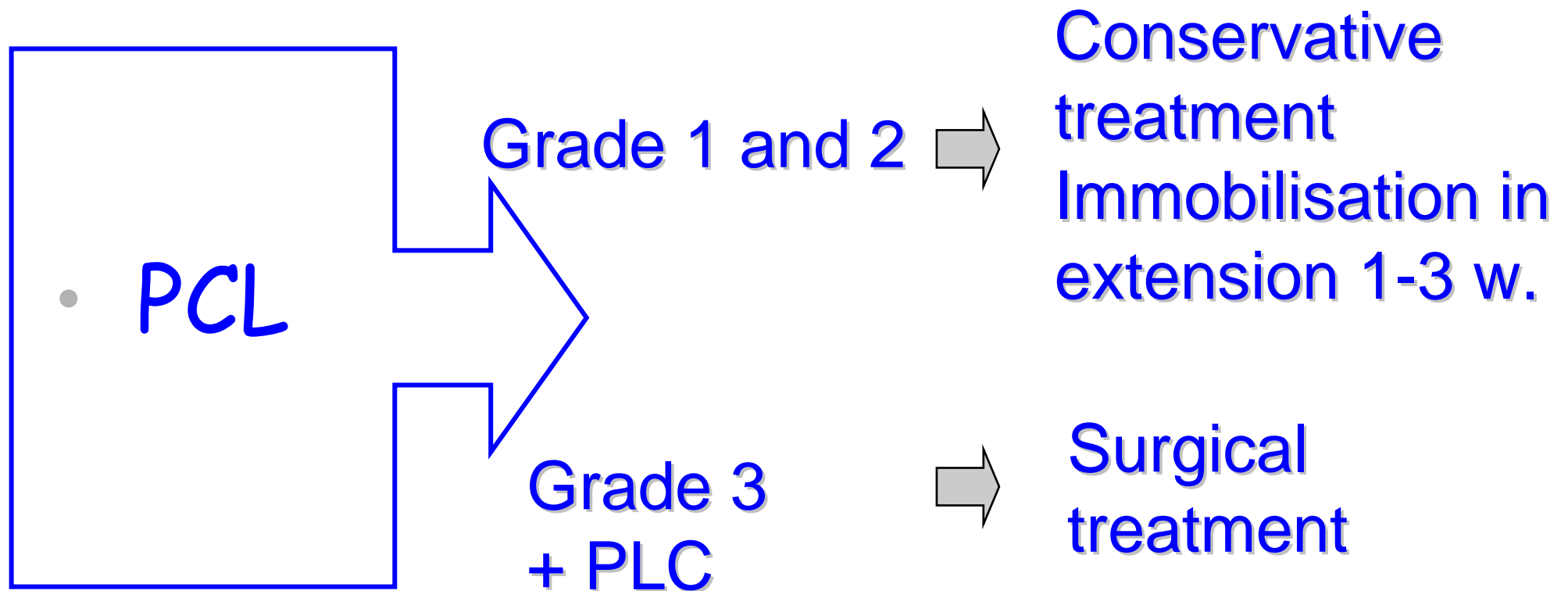
- Graft:
 - BPTB
 - QUAD
 - Hamstring
 - Allograft
- Arthroscopic



Post-op rehab

- Depends upon surgical techniques
- Relies on the patient
- Running 6-8 weeks
- Proprioceptive reconditioning
- Monitoring muscle balance and strength
- Technical re-programmation: 4-5 months
- Return pivoting sports: 6 months

Treatment



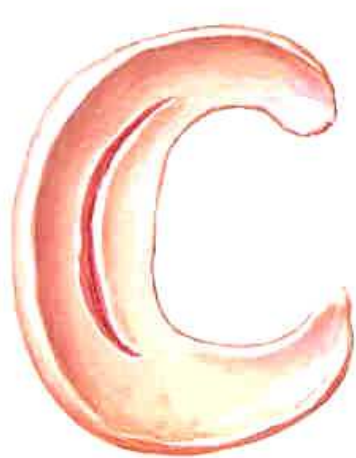
Meniscus

Injury mechanism

- Rotation
- Flexion
- Compression

Type of tears

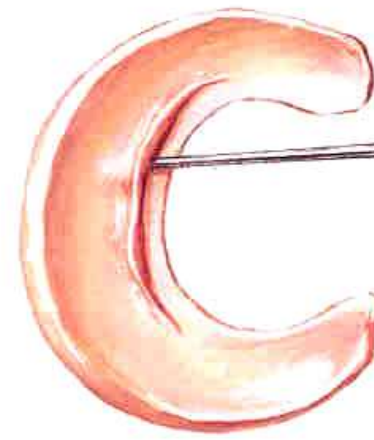
Types and Derivatives of Meniscal Tears



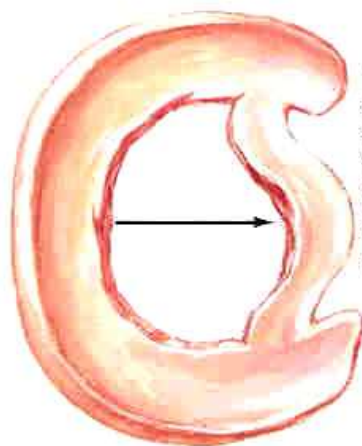
Vertical tear



Radial tear



Horizontal (cleavage) tear



"Bucket-handle" tear

"Handle"
often
migrates
into
inter-
condylar
notch



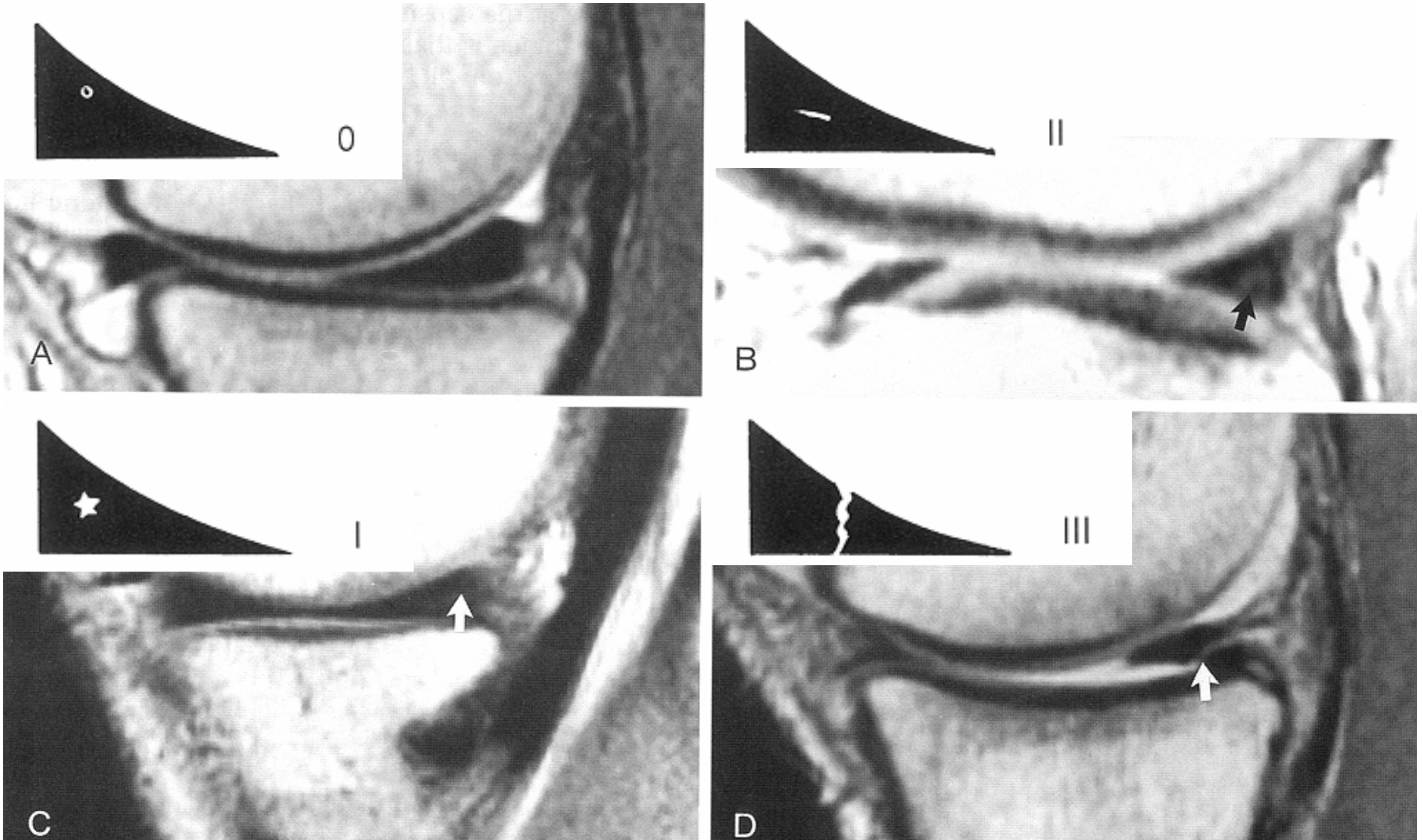
"Parrot-beak" tear



Flap tear

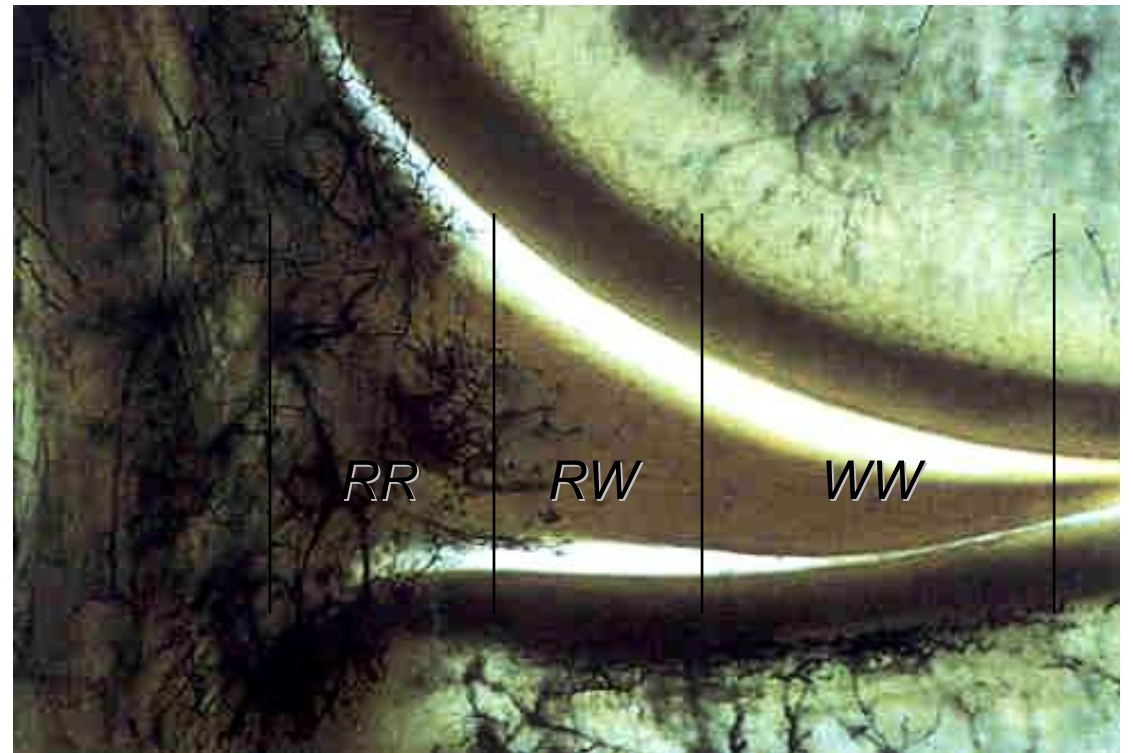
F. Netter M.D.
© 1989, GEIGY

Investigations



Treatment

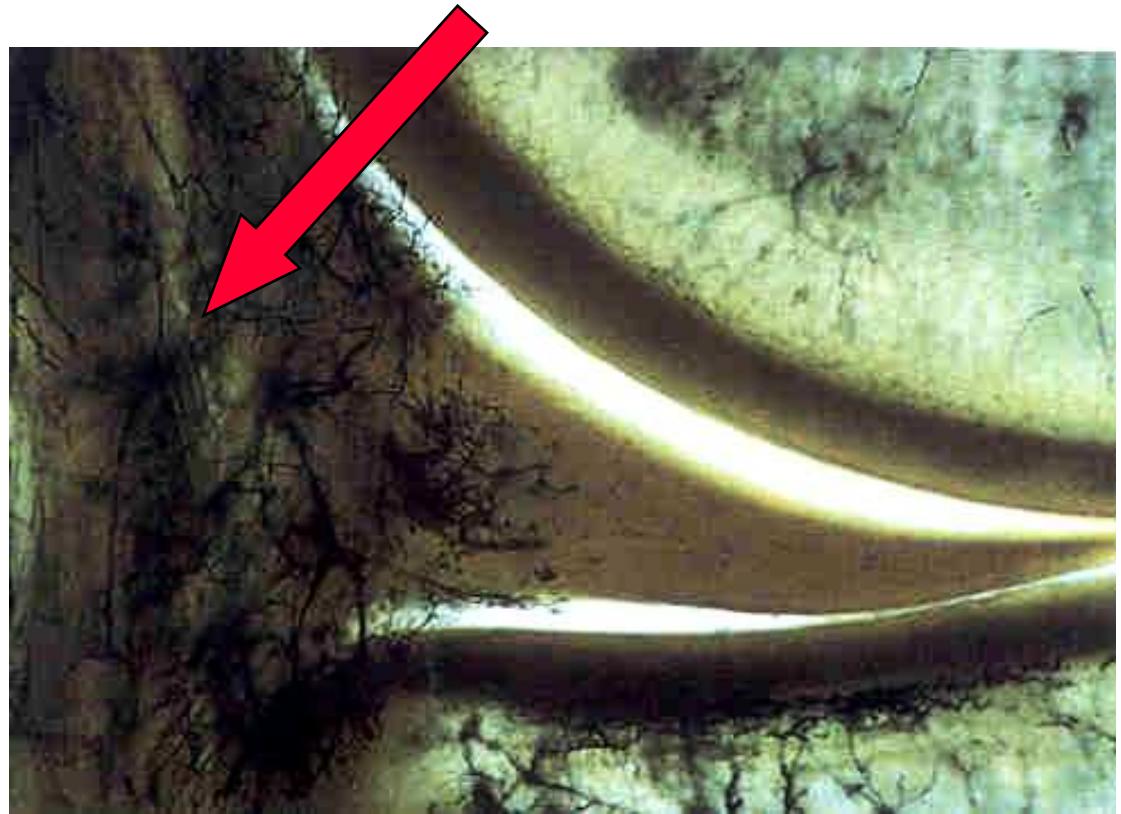
- Type of tear
- Location
- Size



Treatment

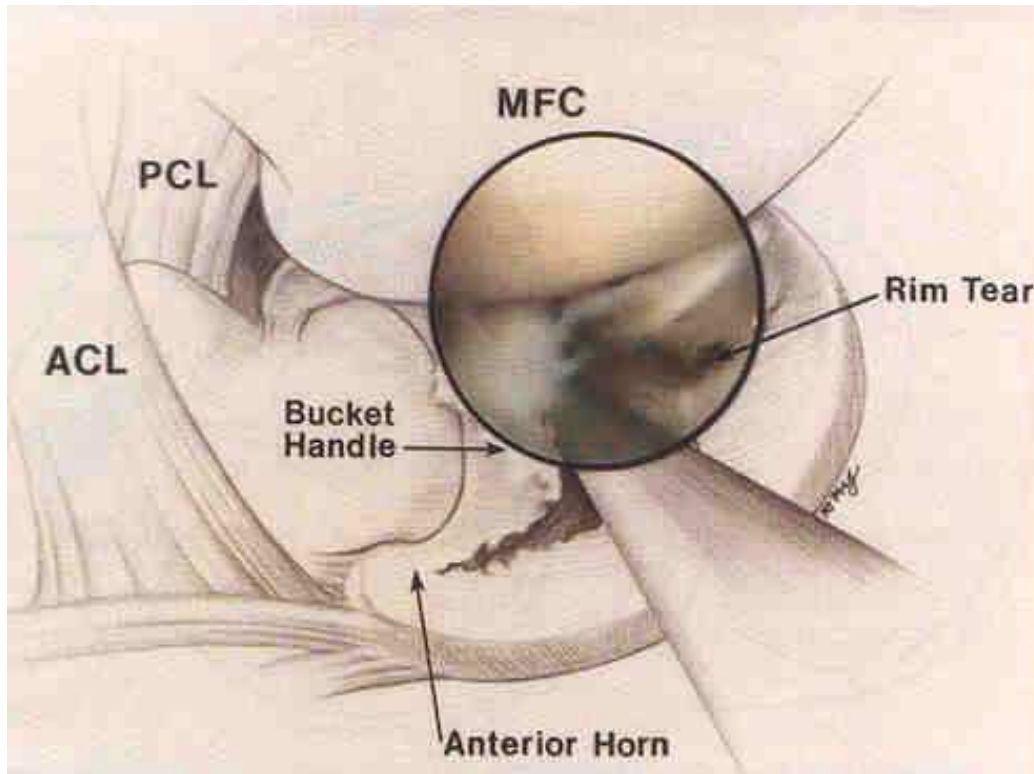
- Lesion jct capsulo-meniscal

Conservative
treatment:
Non weight-bearing
Physio



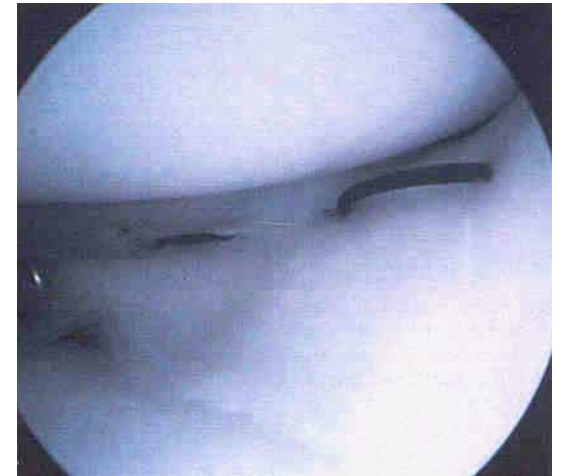
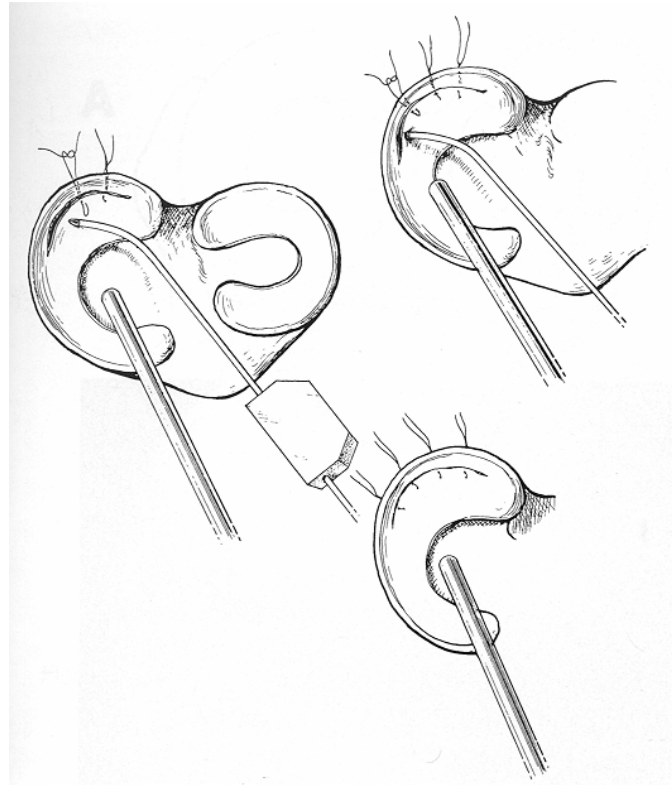
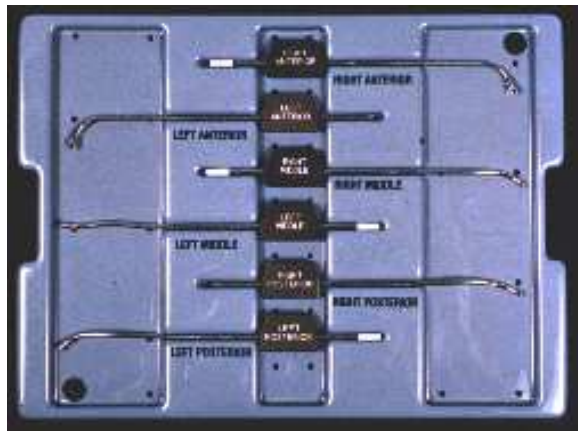
Treatment

- Central lesion



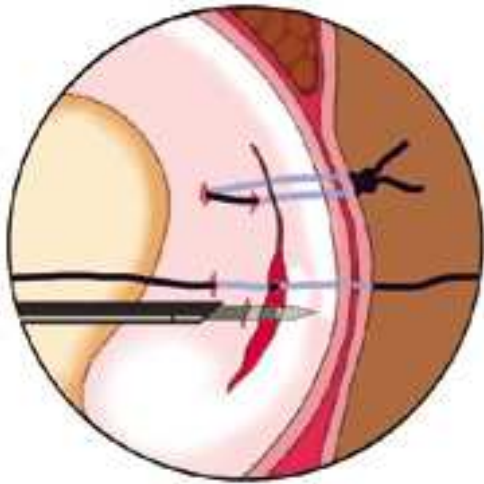
Treatment

- Peripheral lesion > 10mm



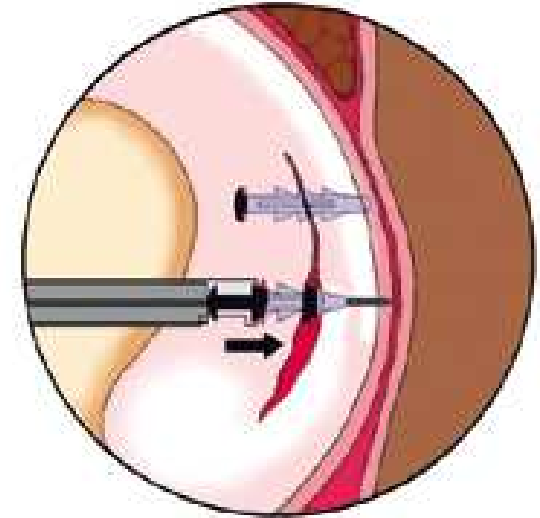
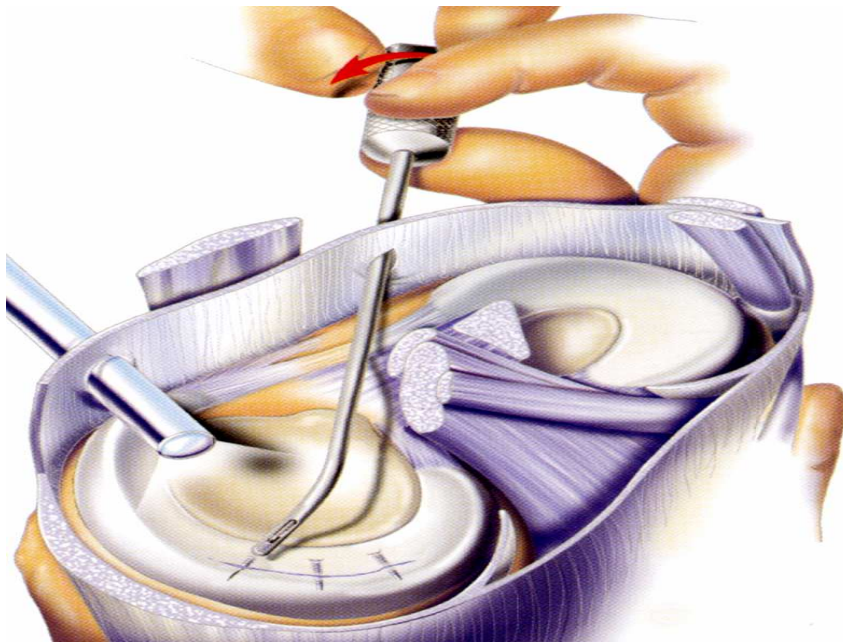
Treatment

- Peripheral lesion > 10mm



Treatment

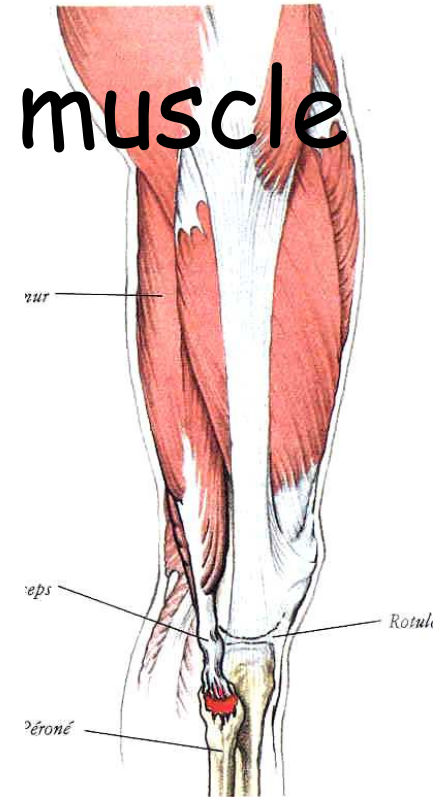
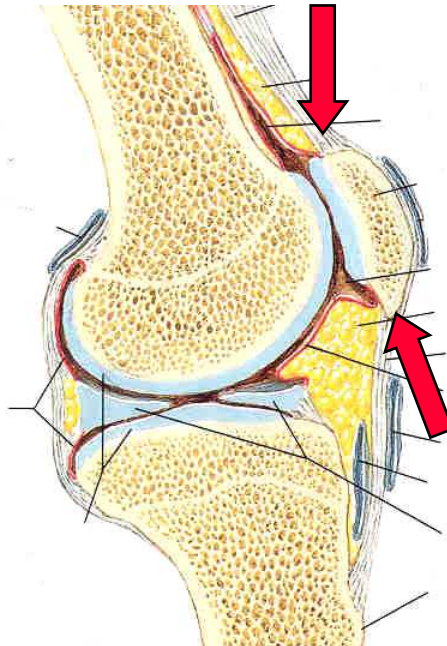
- Peripheral lesion > 10mm



Tendon avulsions

Location

- Quadriceps tendon
- Patellar tendon
- Tendon of biceps crural muscle

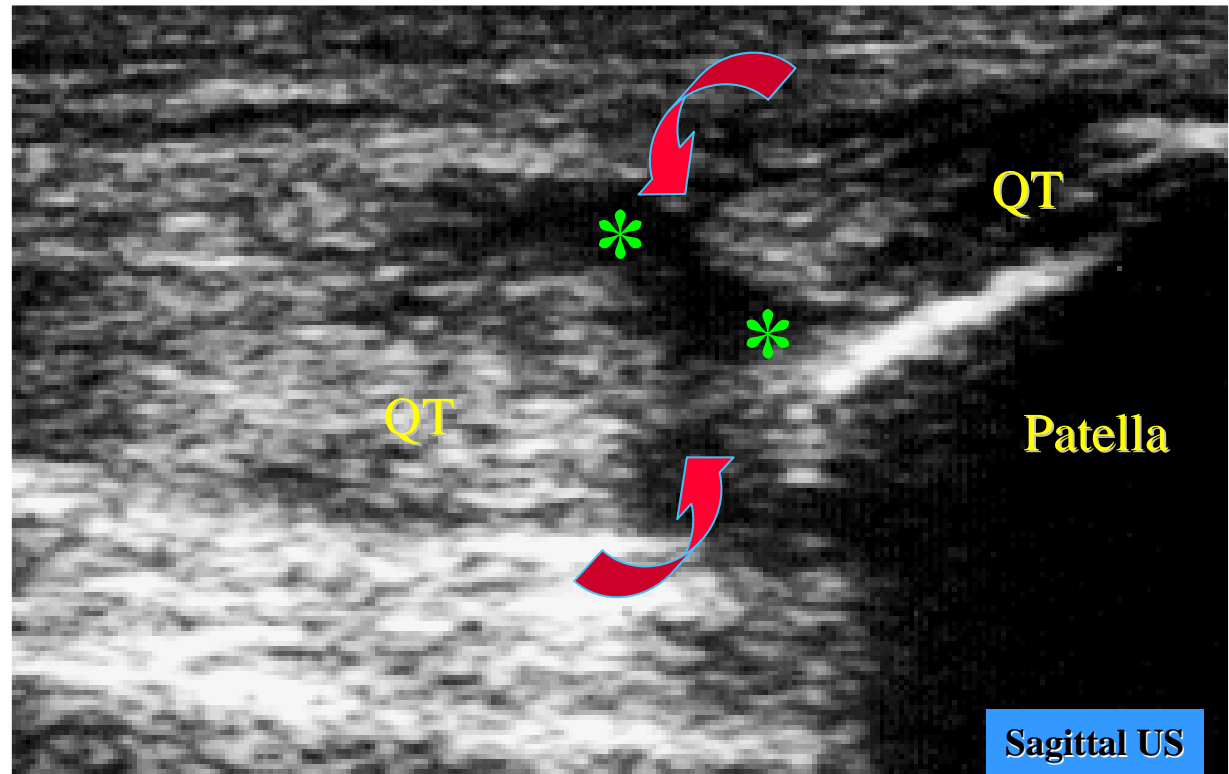


Manifestation

- Localized pain
- Loss of function

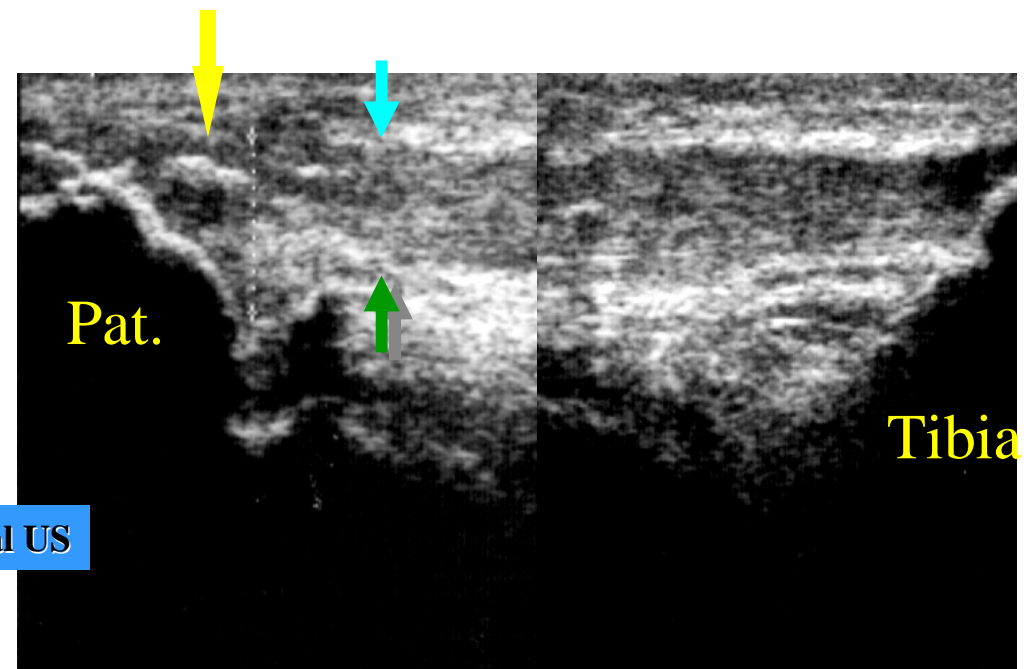
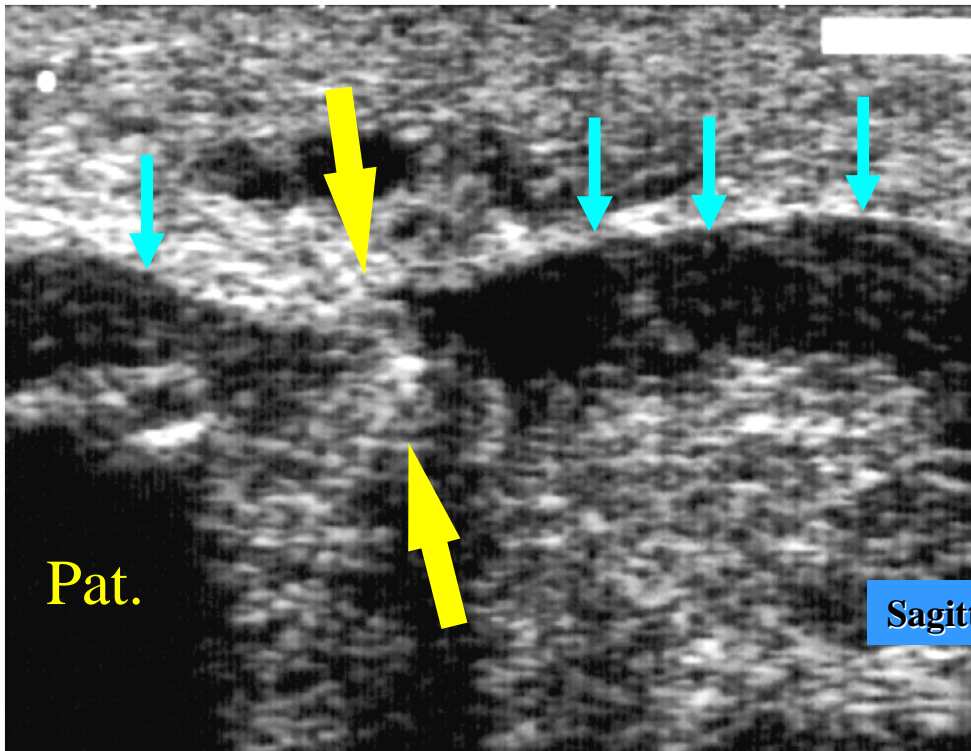
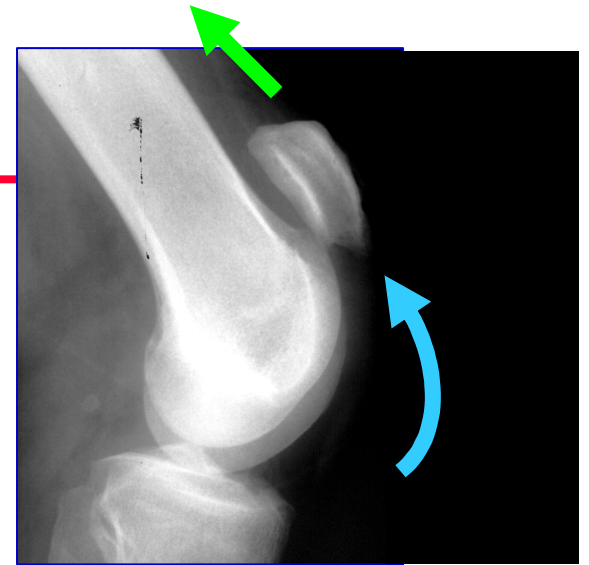
Tendon

- Quadriceps tendon tear



Tendon

- Patellar tendon tear



Treatment

◆ Surgical repair

Medial compartment injury of the knee in hockey



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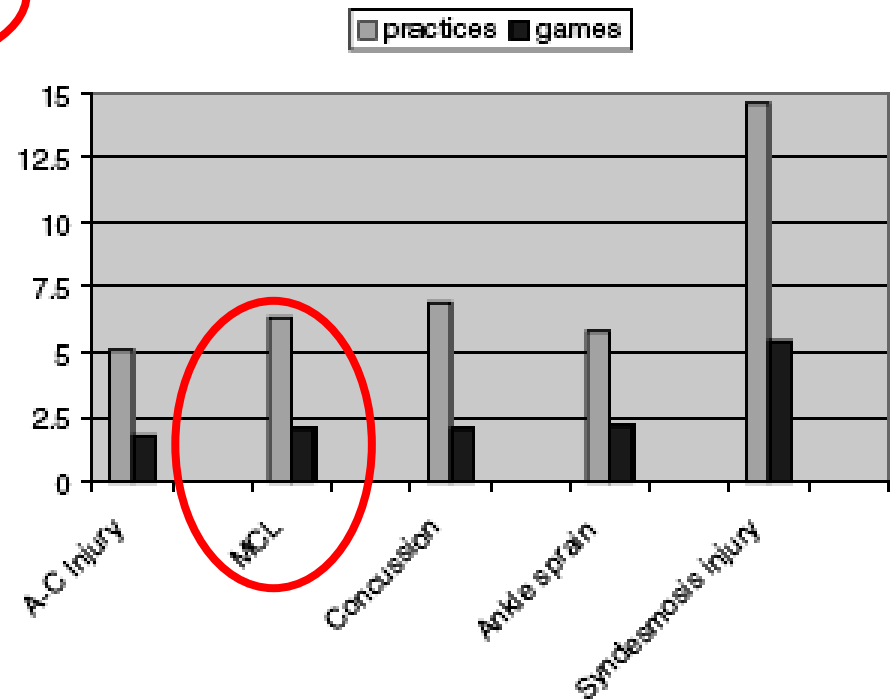
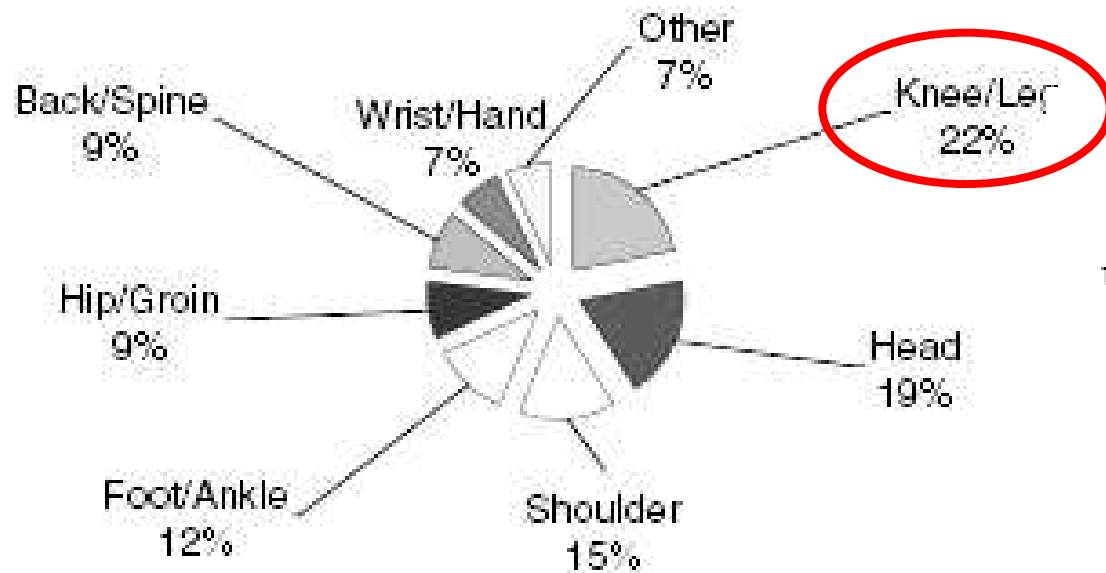


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HUG  
Hôpitaux Universitaires de Genève

Epidemiology

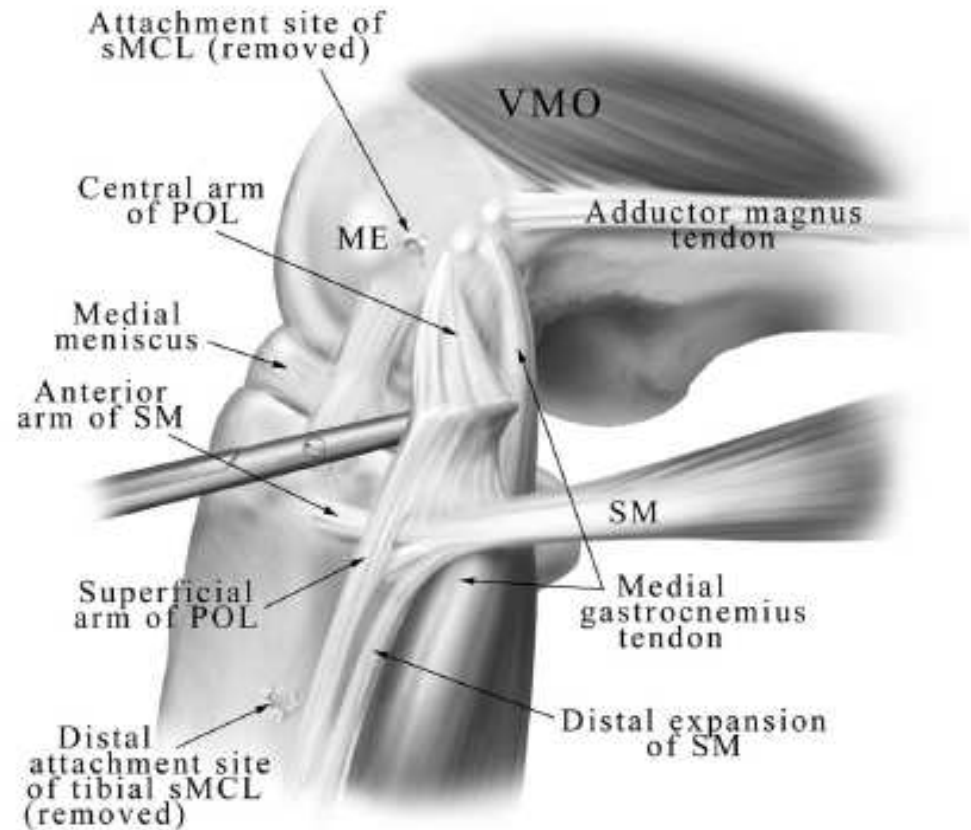
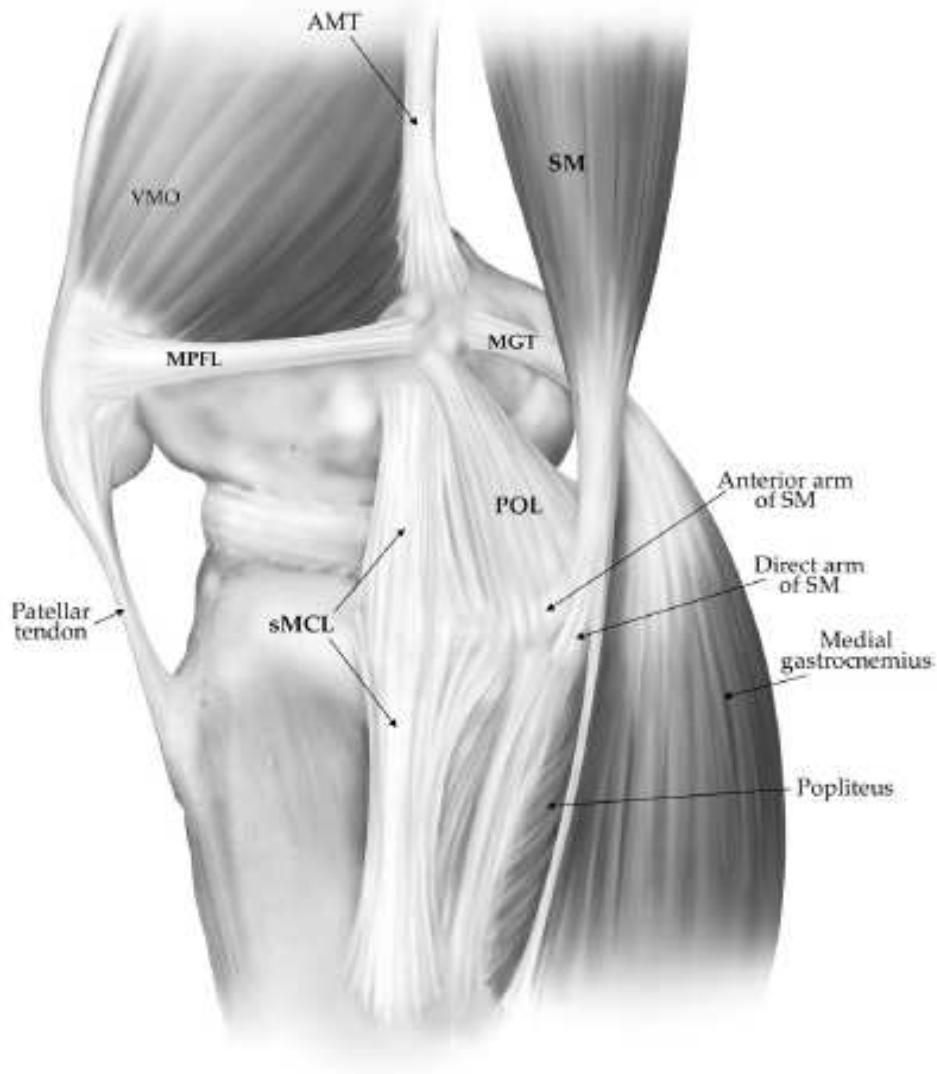
- 2nd most frequent hockey injury



Epidemiology

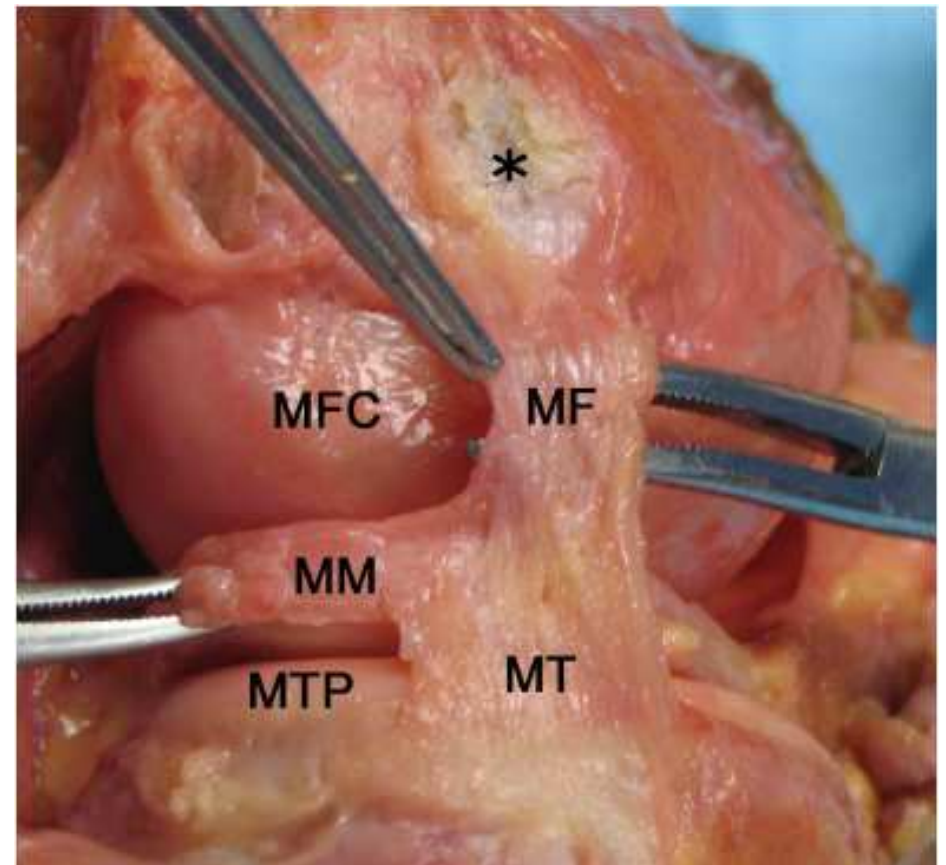
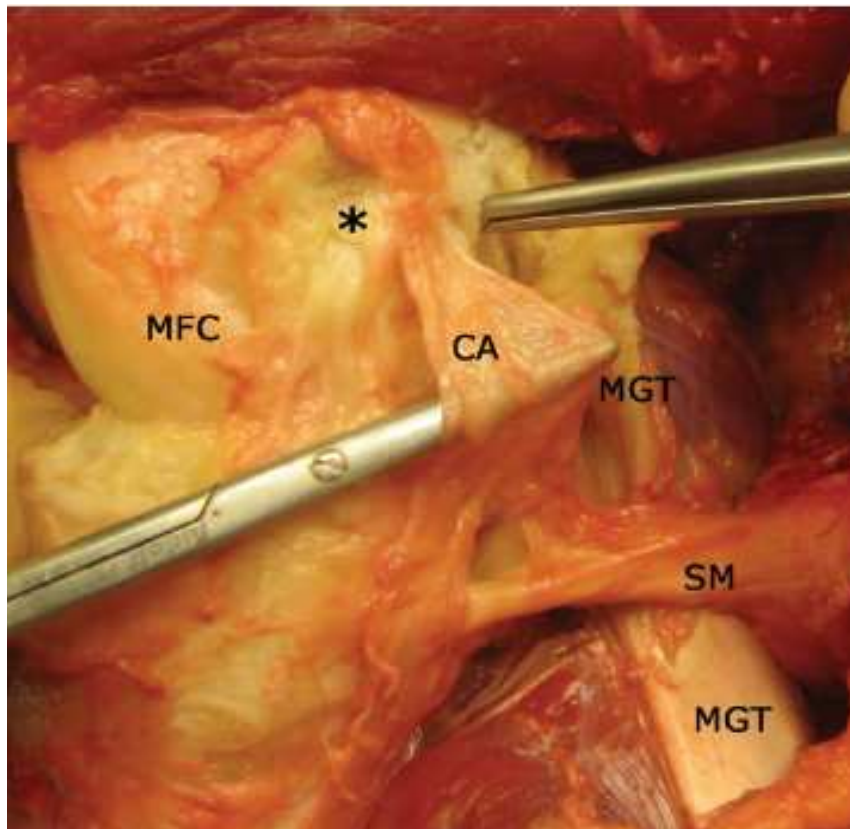
- Most frequent knee injury
 - n=254
 - 60% MCL
 - 15% Meniscus
 - 12% ACL

Anatomy



LaPrade et al *J Bone Joint Surg* 2007

Anatomy



LaPrade et al *J Bone Joint Surg* 2007

Mechanism of injury

- Valgus - a small ER component
- Fall of a player on the injured leg

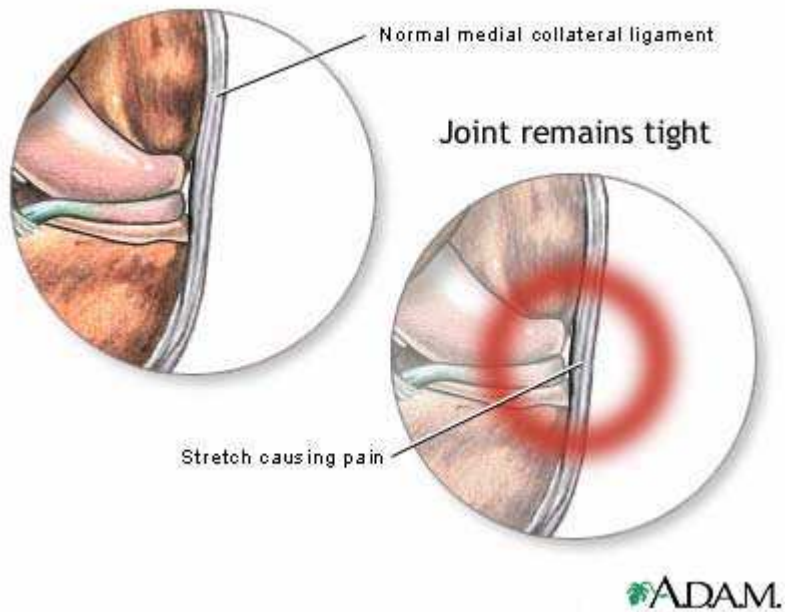


Diagnostic

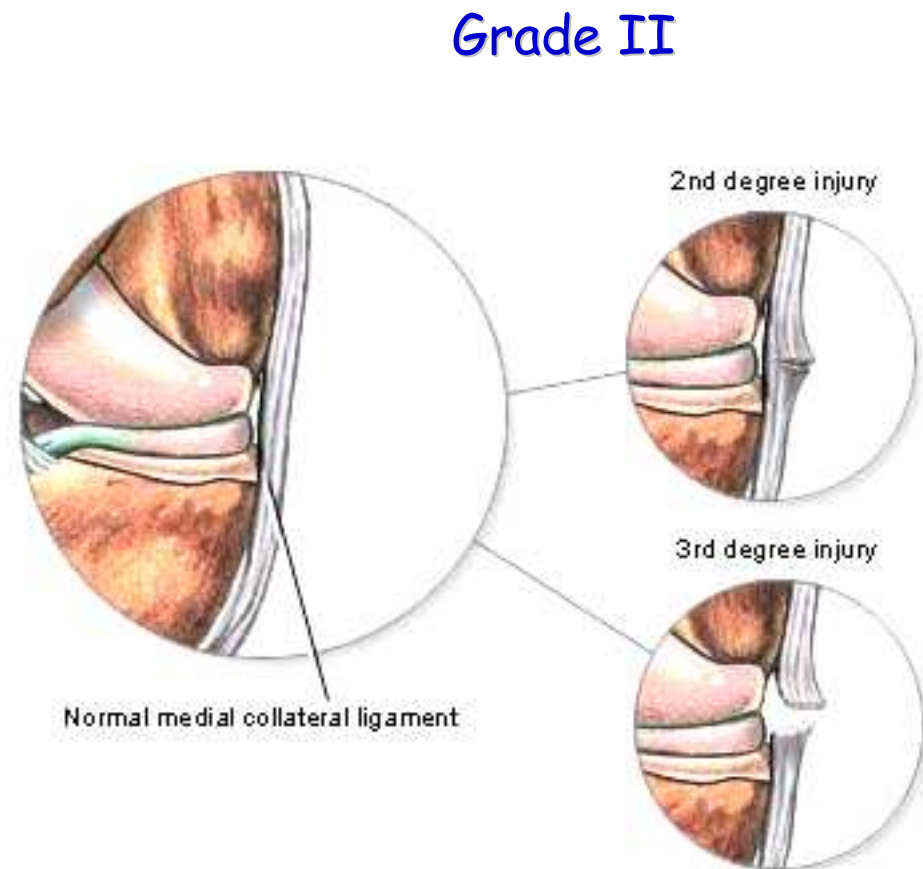
- Clinical examination
 - Palpation
 - Laxity in extension
 - Laxity at 30° of flexion
 - Rotational laxity
- Radiographs
- MRI



Diagnostic




Grade I



© ADAM, Inc.

Grade III

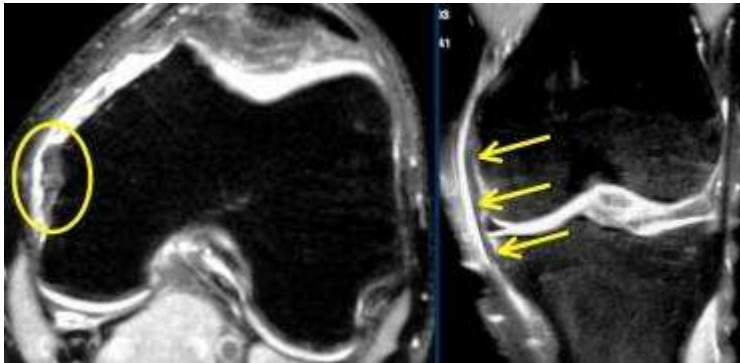
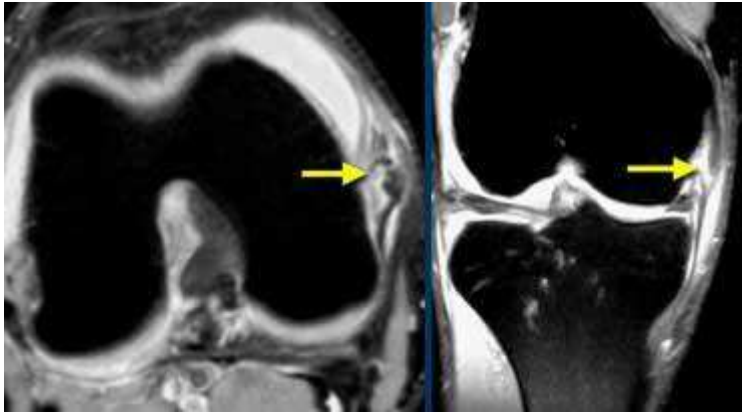
Game management

- Try to evaluate the energy of the injury
- Laxity
- Knowledge of the initial laxity
- Palpation ( pain not a good indicator)
- First decision
- Return to play ??

Day after

- Always re-examine
- Radiographs
- MRI
- Diagnostic
 - Grade I, II, III

MRI

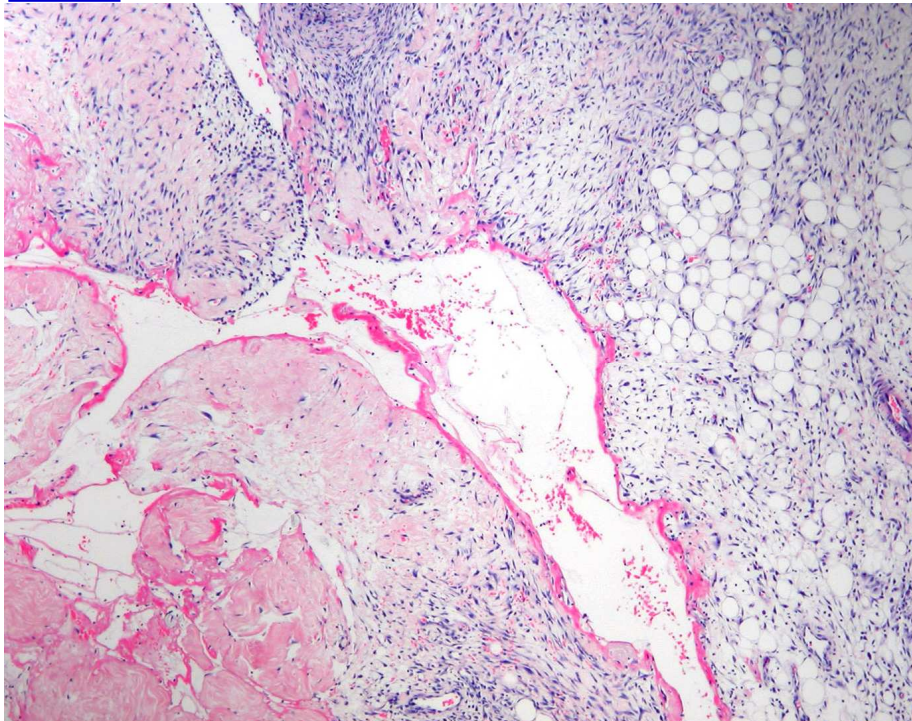


Management

Healing process MCL

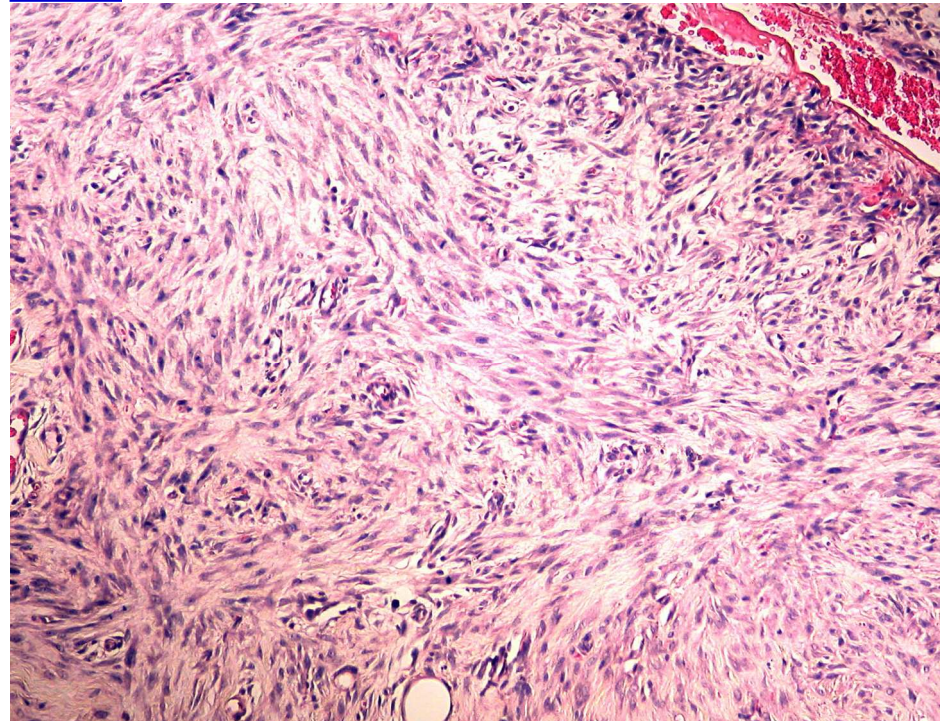
- Inflammatory phase (day 3 - 7)

D3



HE magnification x4

D7

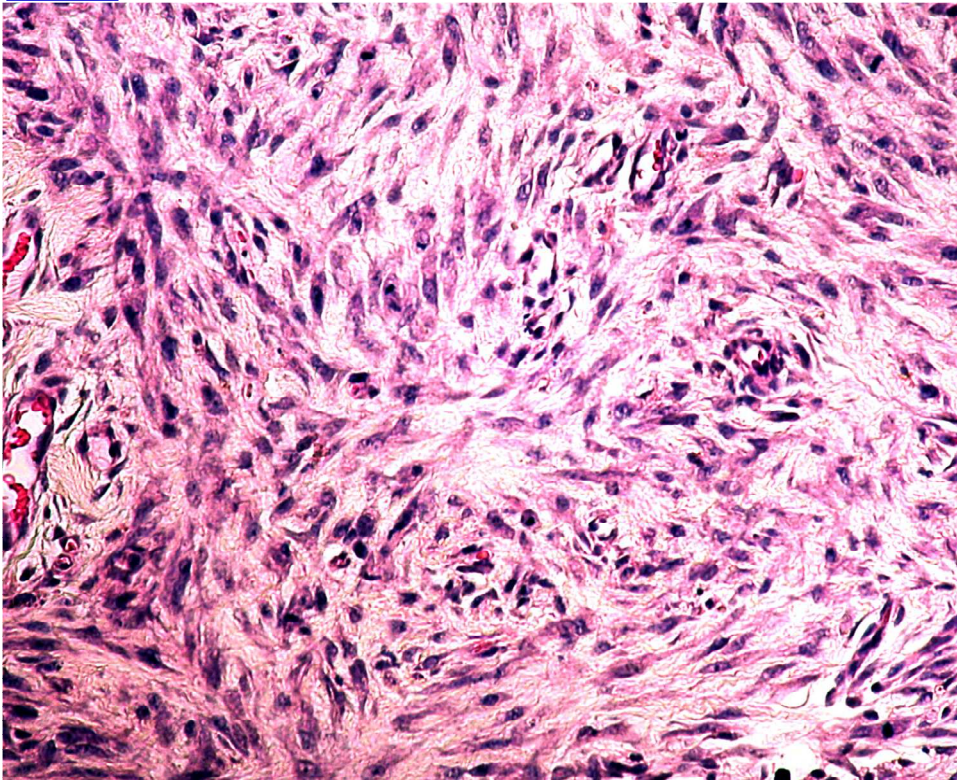


HE magnification x10

Healing process MCL

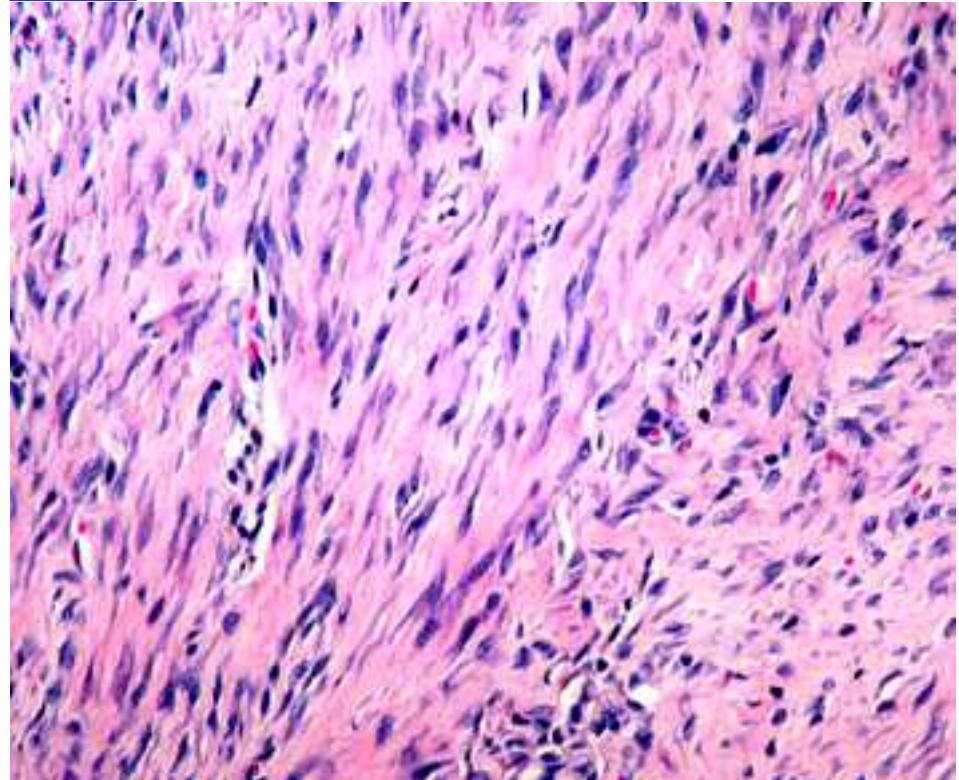
- Proliferation phase (day 7 - 21)

D7



HE magnification x20

3 w

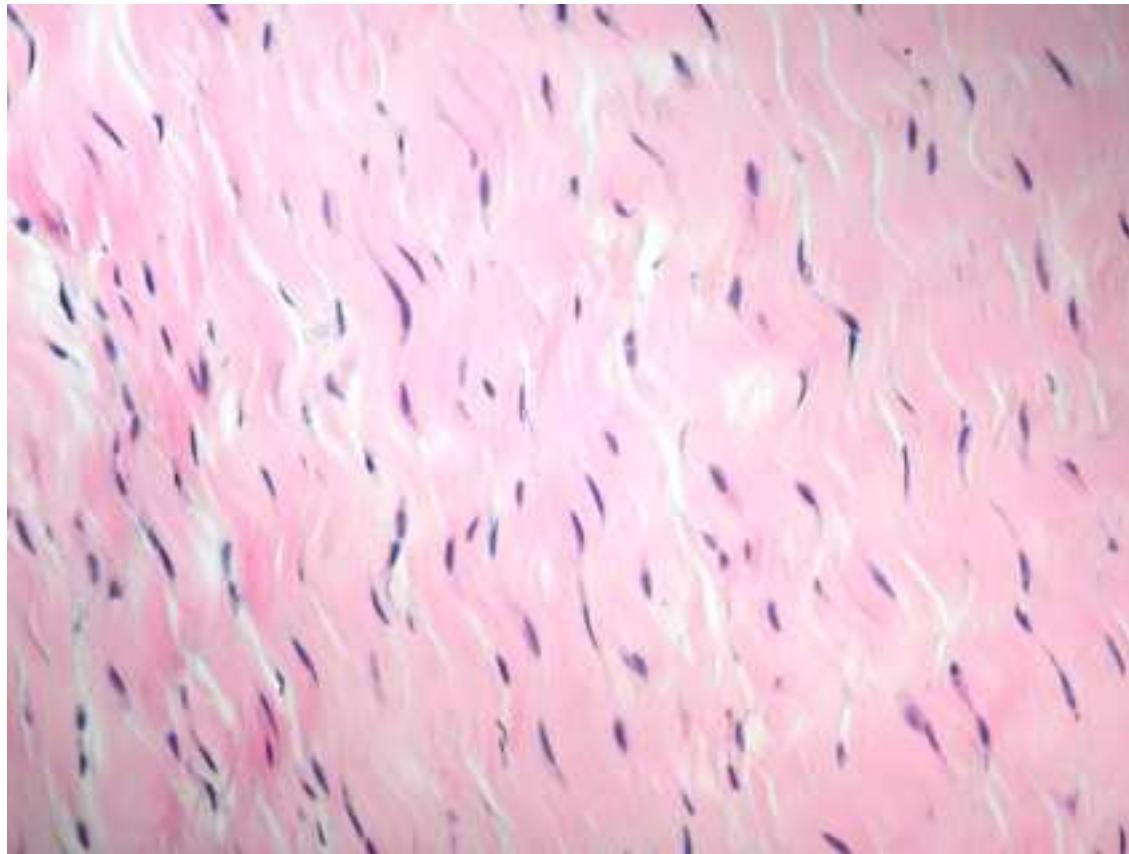


HE magnification x20

Healing process MCL

- Maturation phase (6 - 12 weeks)

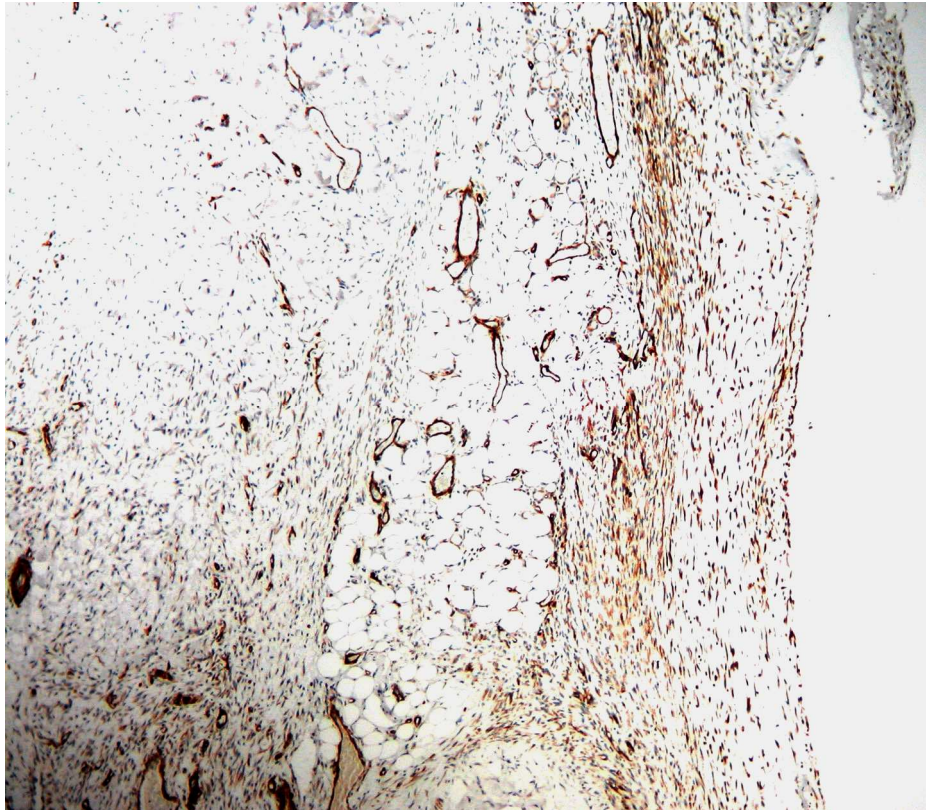
12 w



HE magnification x20

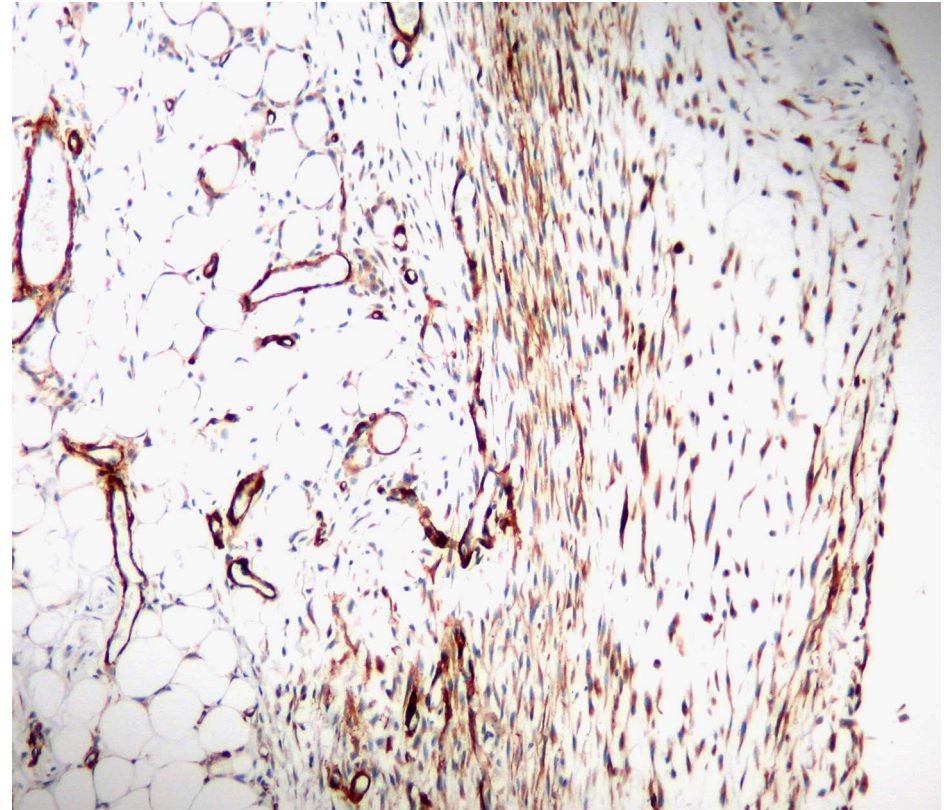
Healing process MCL α -SMA in the MCL

3 d



SMA magnification x4

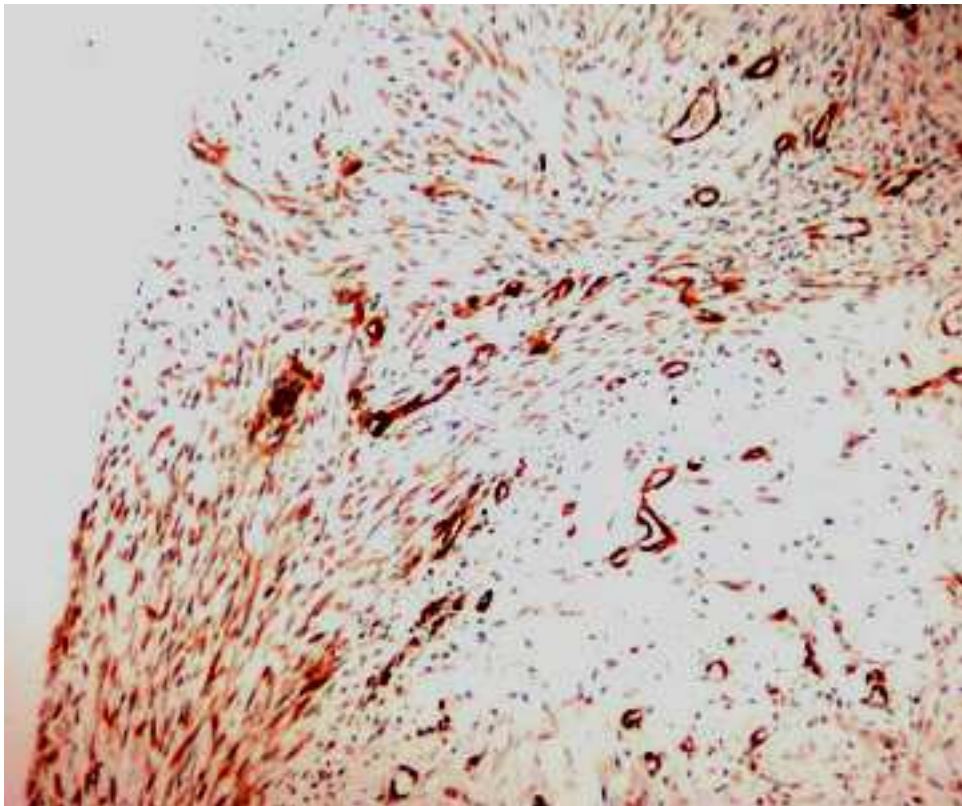
3 d



SMA magnification x10

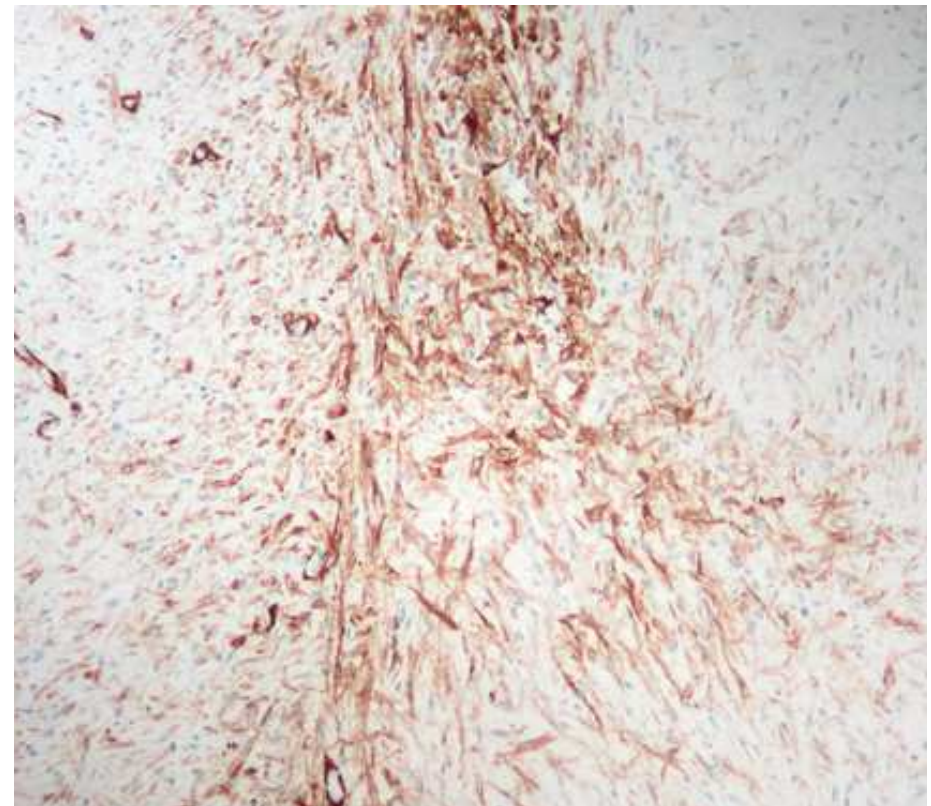
Healing process MCL α -SMA in the MCL

1 w



SMA magnification x10

3 w



SMA magnification x10

Principles of treatment

- 4 phases:
 - Protection
 - Stimulation of the healing
 - Rehabilitation
 - Reconditioning

Protection

- Crutches
- Ice 2-3 days
- Immediate bracing



Protection

- Custom-made brace



How to favor initial healing ?

- Immediate work-out (D2-3)
 - 27% increase of IGF-1 after 10' moderate exercise (10-28 microg/l)

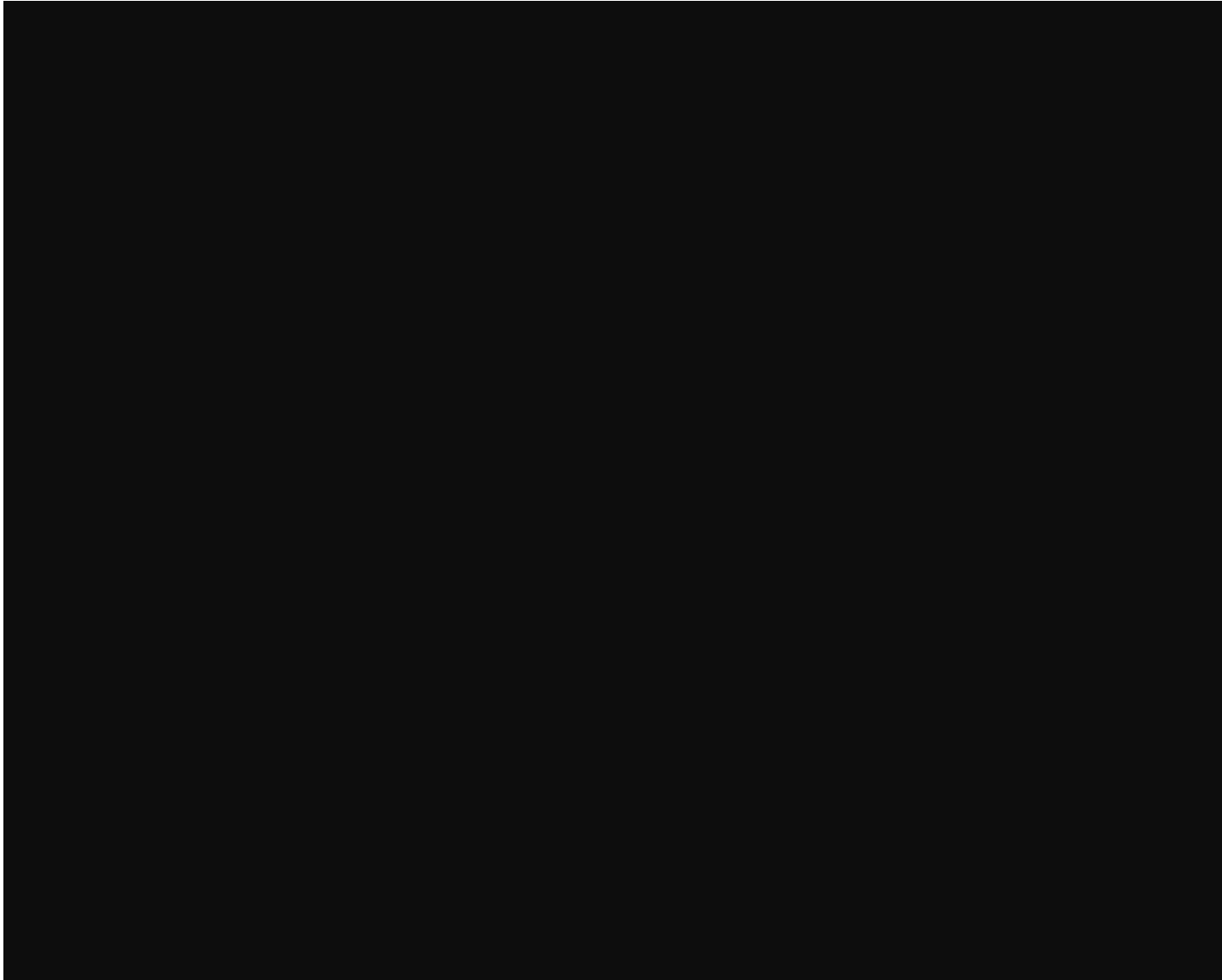


Berg & Bang *Horm Res* 2004

Rehabilitation

- From D5 - D7:
 - Rehabilitation
 - Standard
 - Reconditioning (Stimulation of the healing !!)

Reconditioning



Grade I

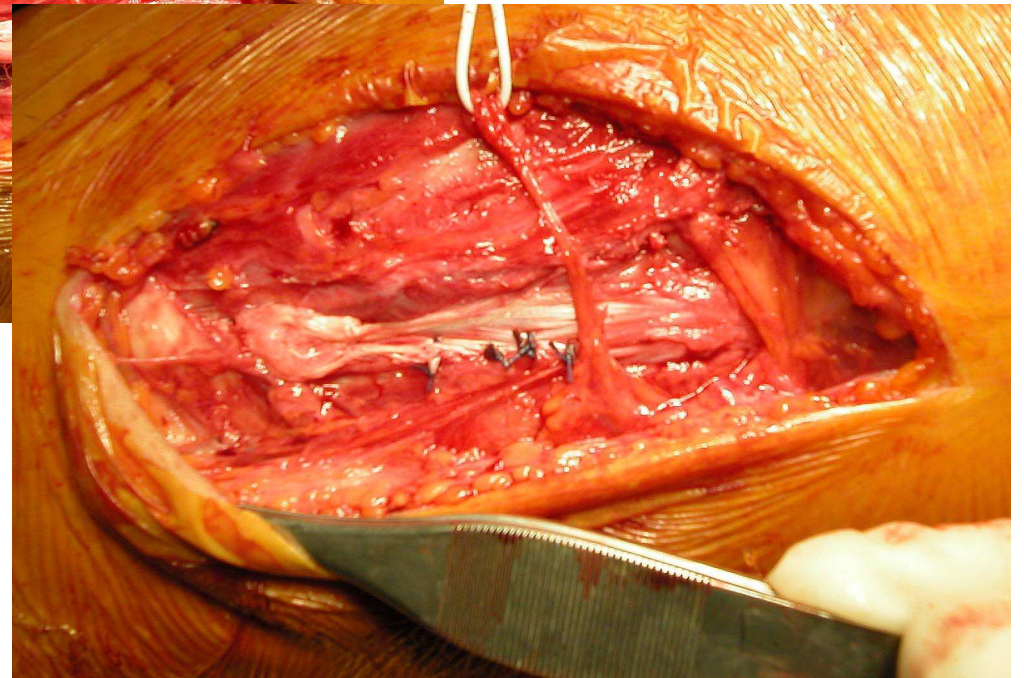
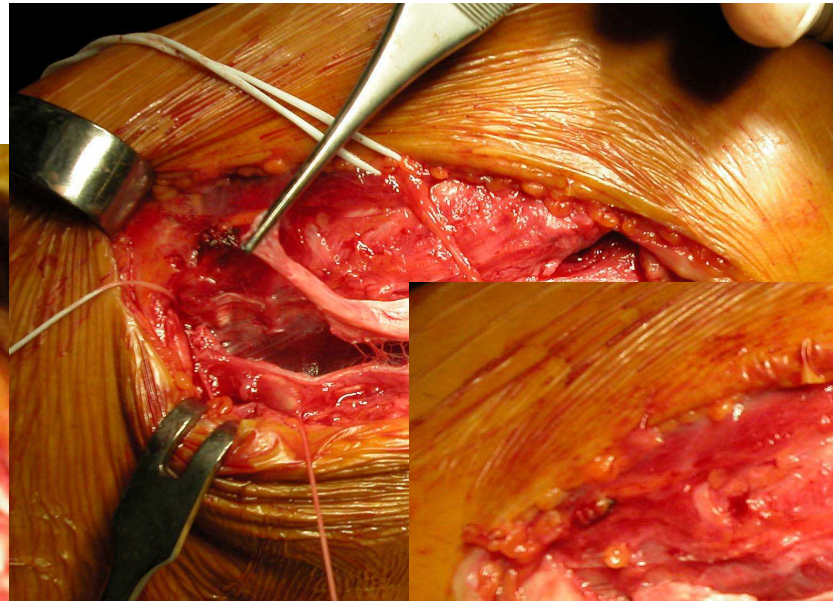
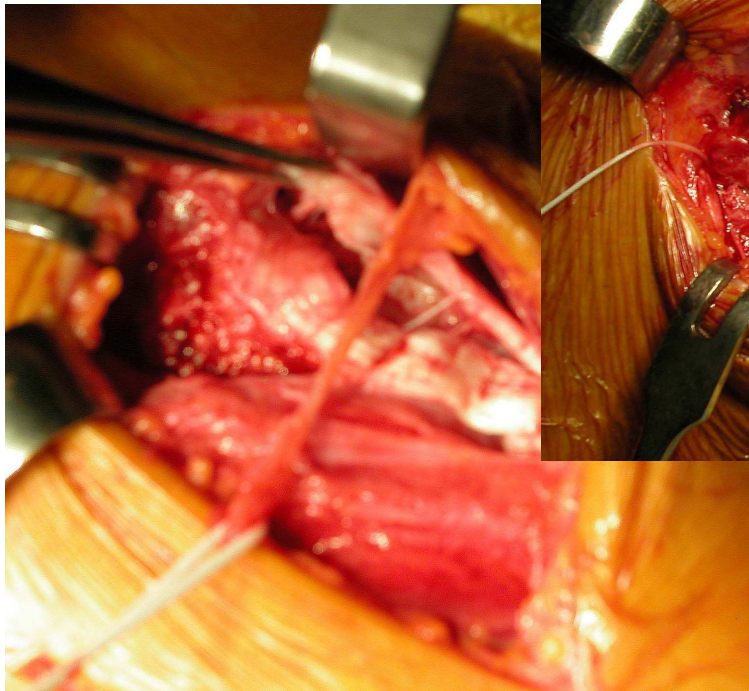
- Functional treatment
- Protect 1-2 days
- Immediate stimulation
- Custom-made knee brace
- Back to play at 7 days

Grade II

- Functional treatment
- Protect 5-7 days
- Stimulation of healing from D5
- Custom-made knee brace at a week
- Back to practice at 10 days
- Back to play at 14-21 days

Grade III

- Surgical treatment within the first 48 hours



Results

- $n=5$
- Grade II
 - Return to practice 7 to 10 days
 - Return to play 10 to 21 days

Discussion

- Play with the brace at least 3 months
- Train harder than in the summer time
- Monitor the inflammatory state of the knee
- NSAID ???
- Transient, but sharp residual pain is the usage

Discussion

- Discuss permanently with the player his ability to perform, to skate, to play
- Pursue the reconditioning even after the return on the ice
- Explain, explain, explain, and explain...!!!

Conclusions - recommendations

- Rapid and precise diagnostic
- Create an optimal biological environment
- Reconditioning
- Protect +++ with a brace for a long time



14th ESSKA Congress
June 9-12, 2010 • Oslo/Norway

www.esska2010.com

 **swiss** olympic
medical center

 UOTS
UNITÉ D'ORTHOPÉDIE ET DE TRAUMATOLOGIE DU SPORT

Thank you for your attention



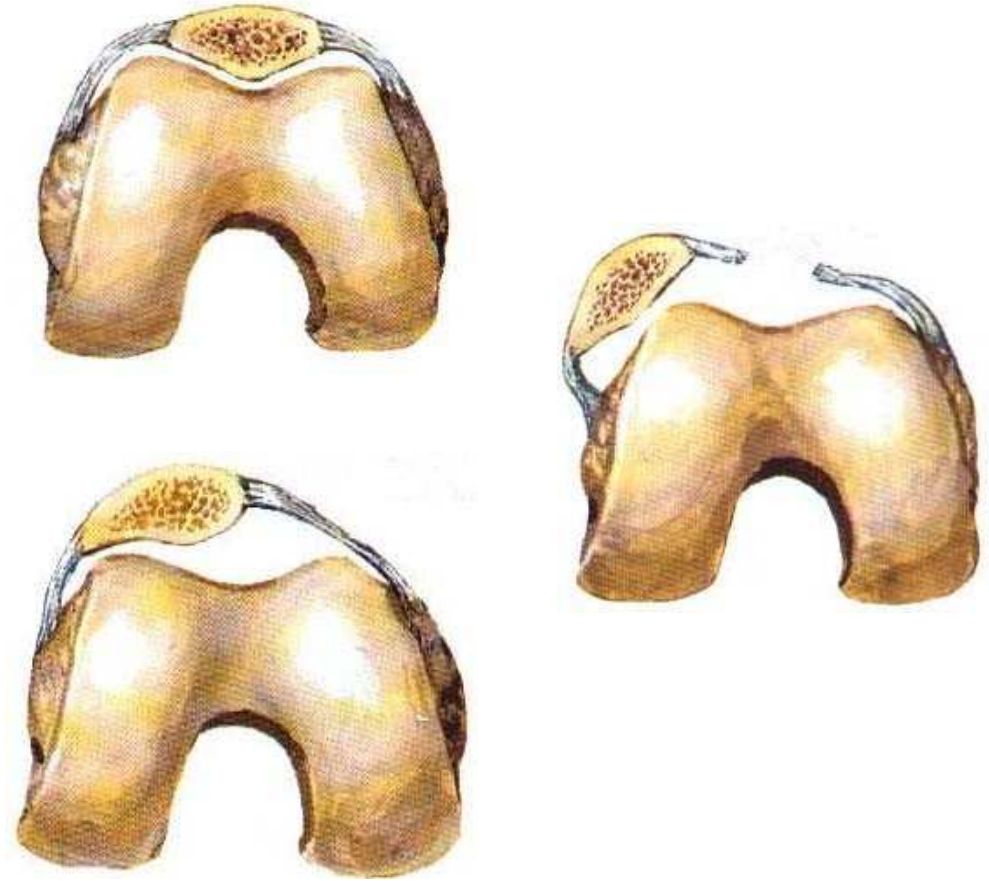
Dislocation of the patella

Injury mechanism

- Valgus - external rotation movement
- Eccentric movement
- Trauma

- ... common sports movements
- ... common daily movements

Dislocation of the patella

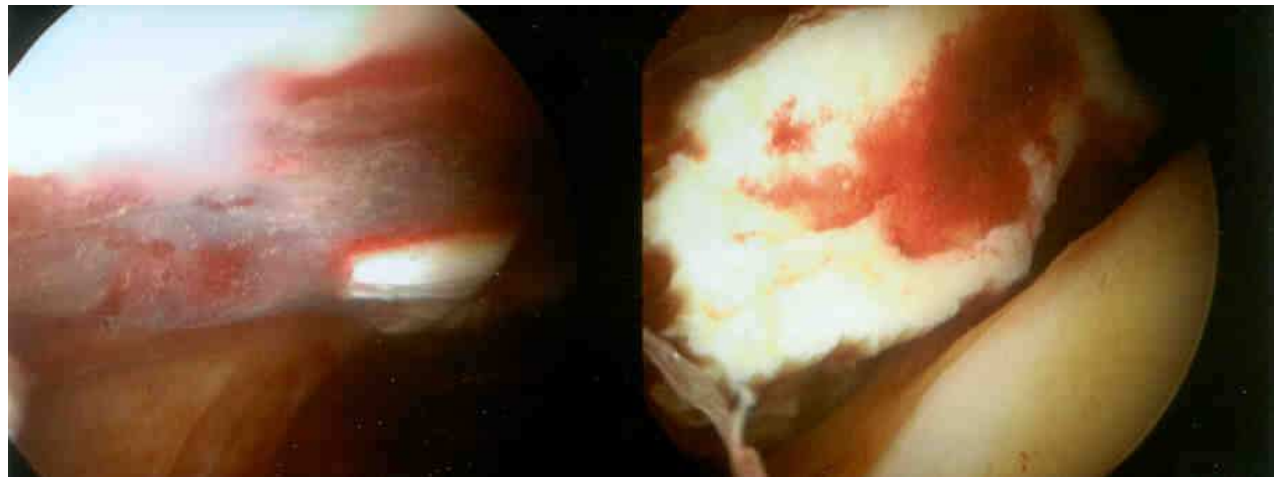


Attitude

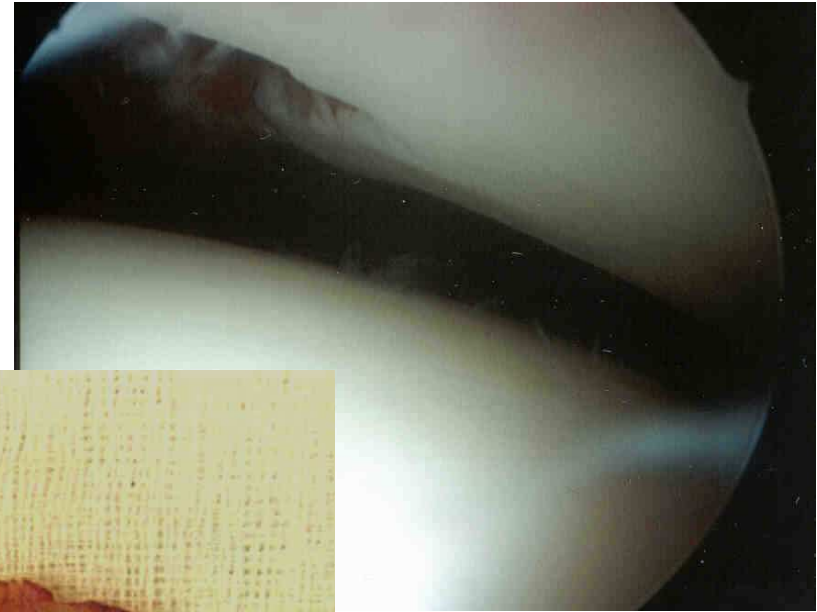
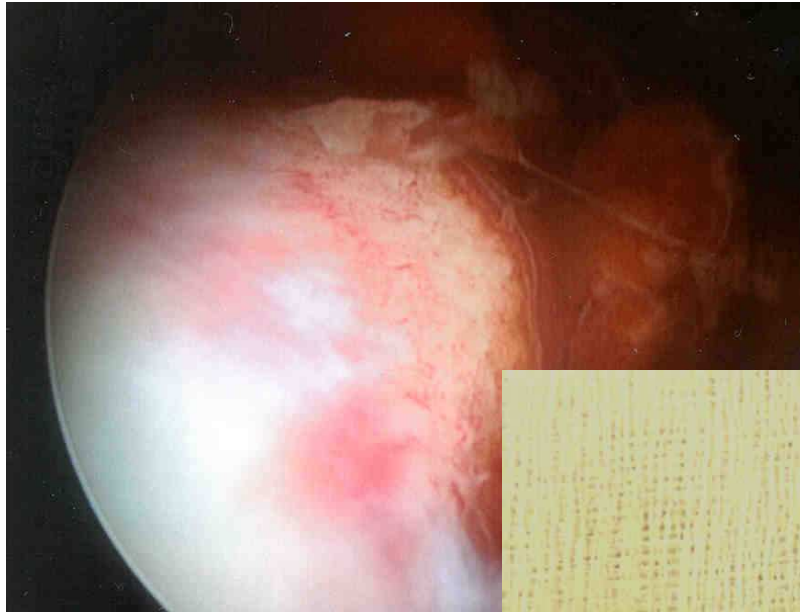
- Clinical examination
- Gentle extension of the knee in its axis
- Patellar guiding
- Immobilisation for comfort
- Rapid transfer

Lateral dislocation of the patella

- Characterization of lesions
- Excision of osteochondral fragments



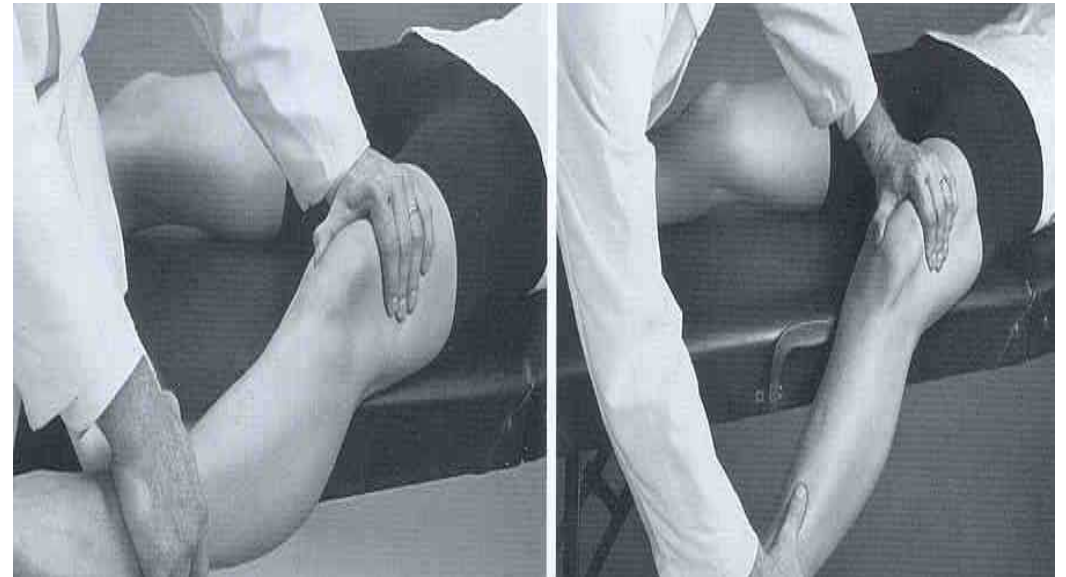
Lateral dislocation of the patella



Treatment

- Walking in full weight-bearing, leg immobilised in extension (1 week)
- Physio since the 3rd week
- At 12 weeks:

Apprehension test
or Smilie test



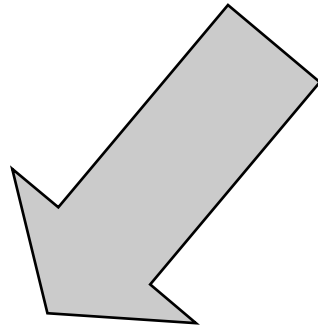
Osteo-chondral lesions

Type

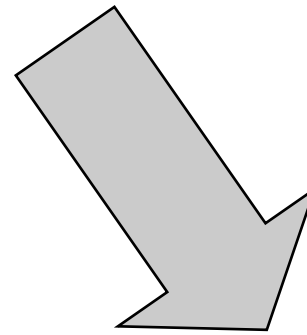
- Intra-articular fracture of the tibia and/or femur
- Patella dislocation
- Osteochondritis dissecans (OCD)
- Severe sprain with bone bruise

Treatment

- Size of the fragment
- Location
- Sub-chondral bone

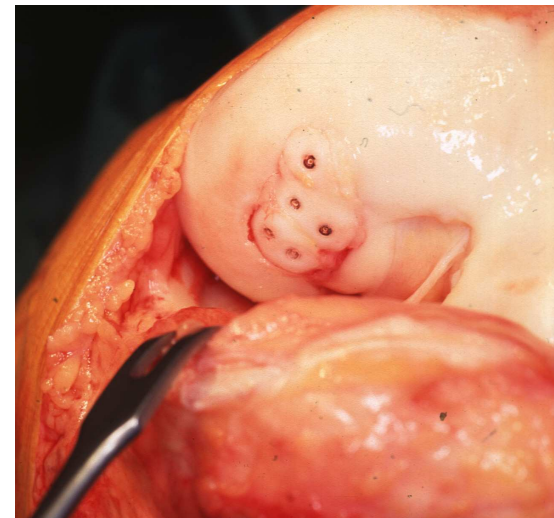
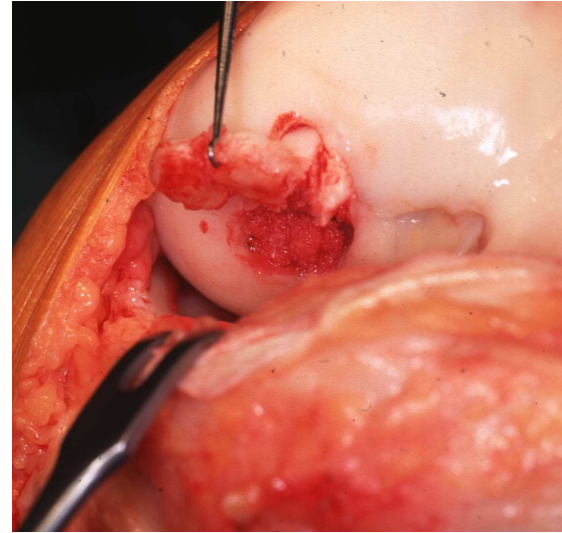


Excision

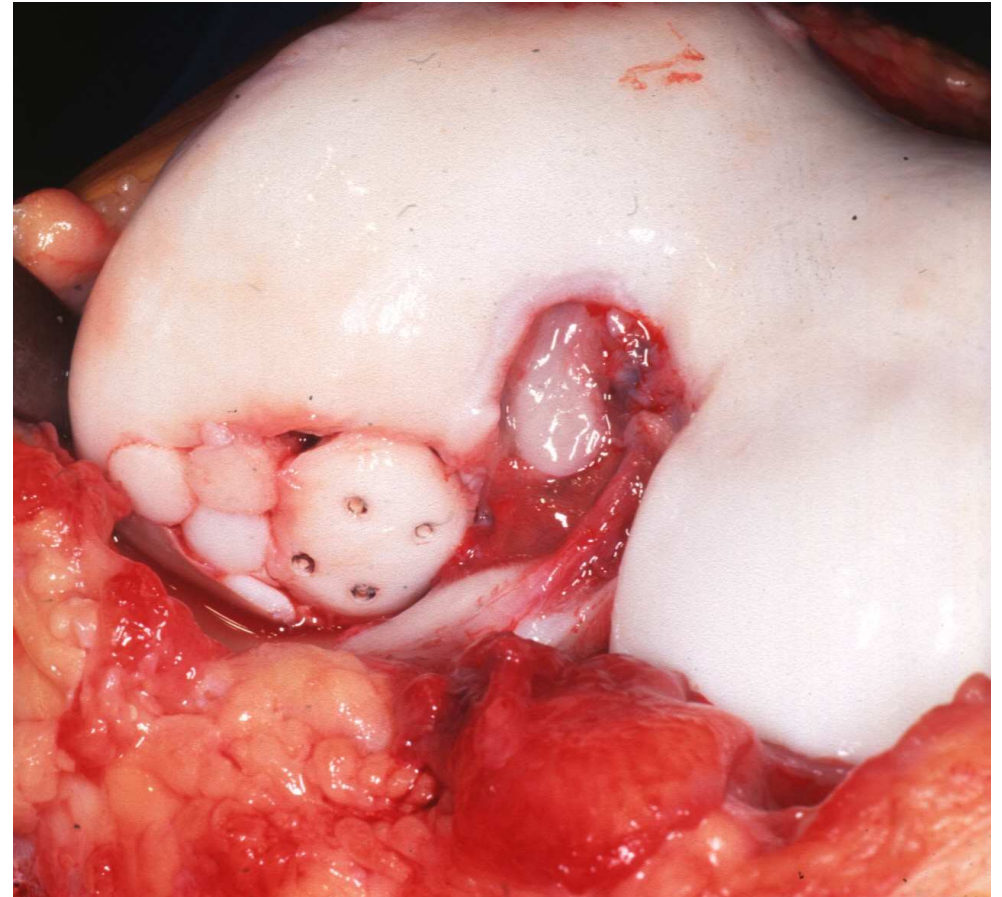
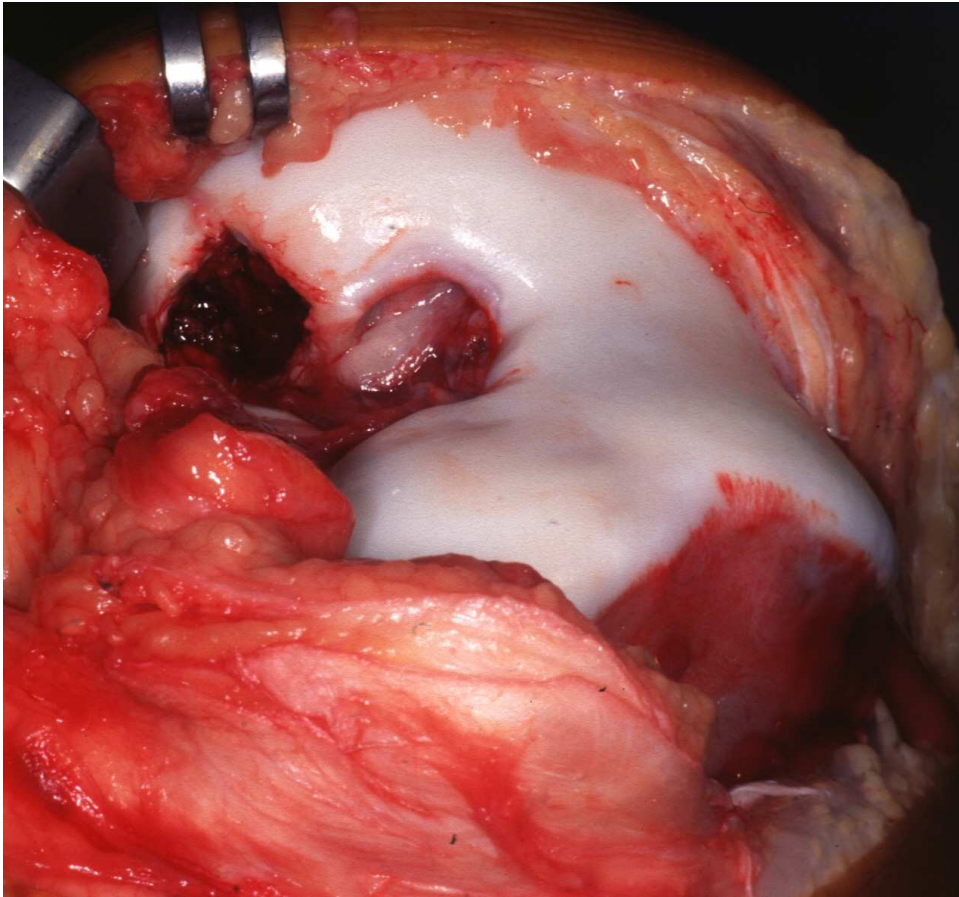


**Surgical
refixation**

OCD

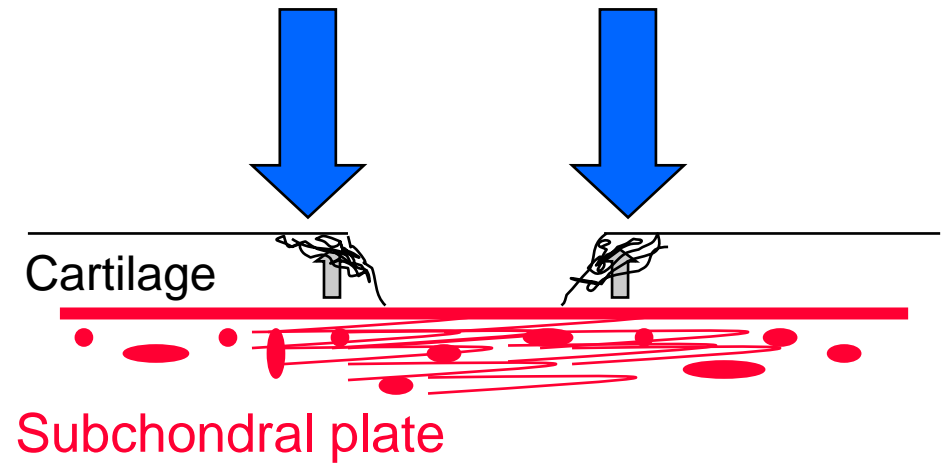
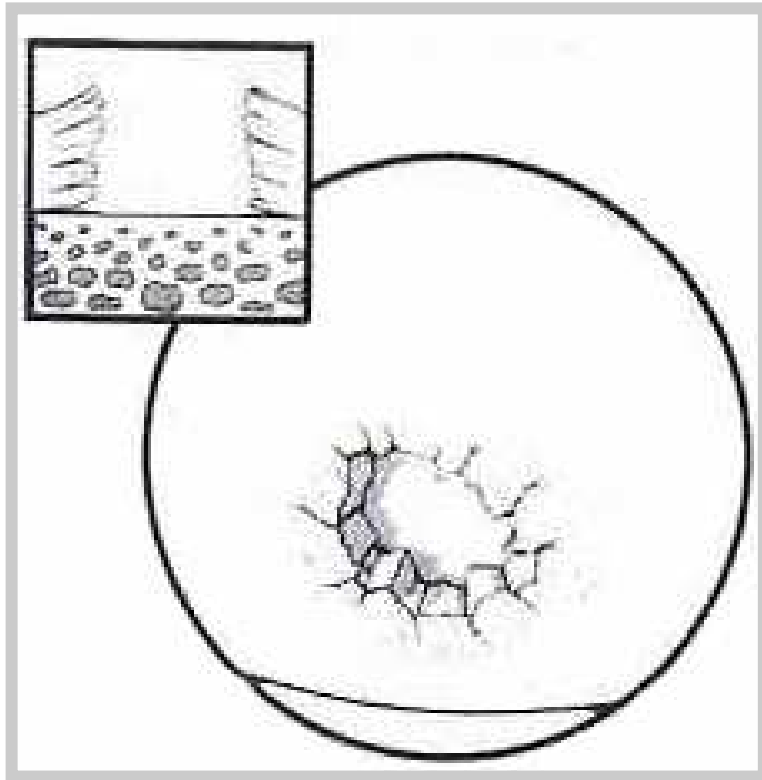


**Basketball player, 20 years, OCD Grade IV,
medial femoral condyle**



Focal cartilage lesion

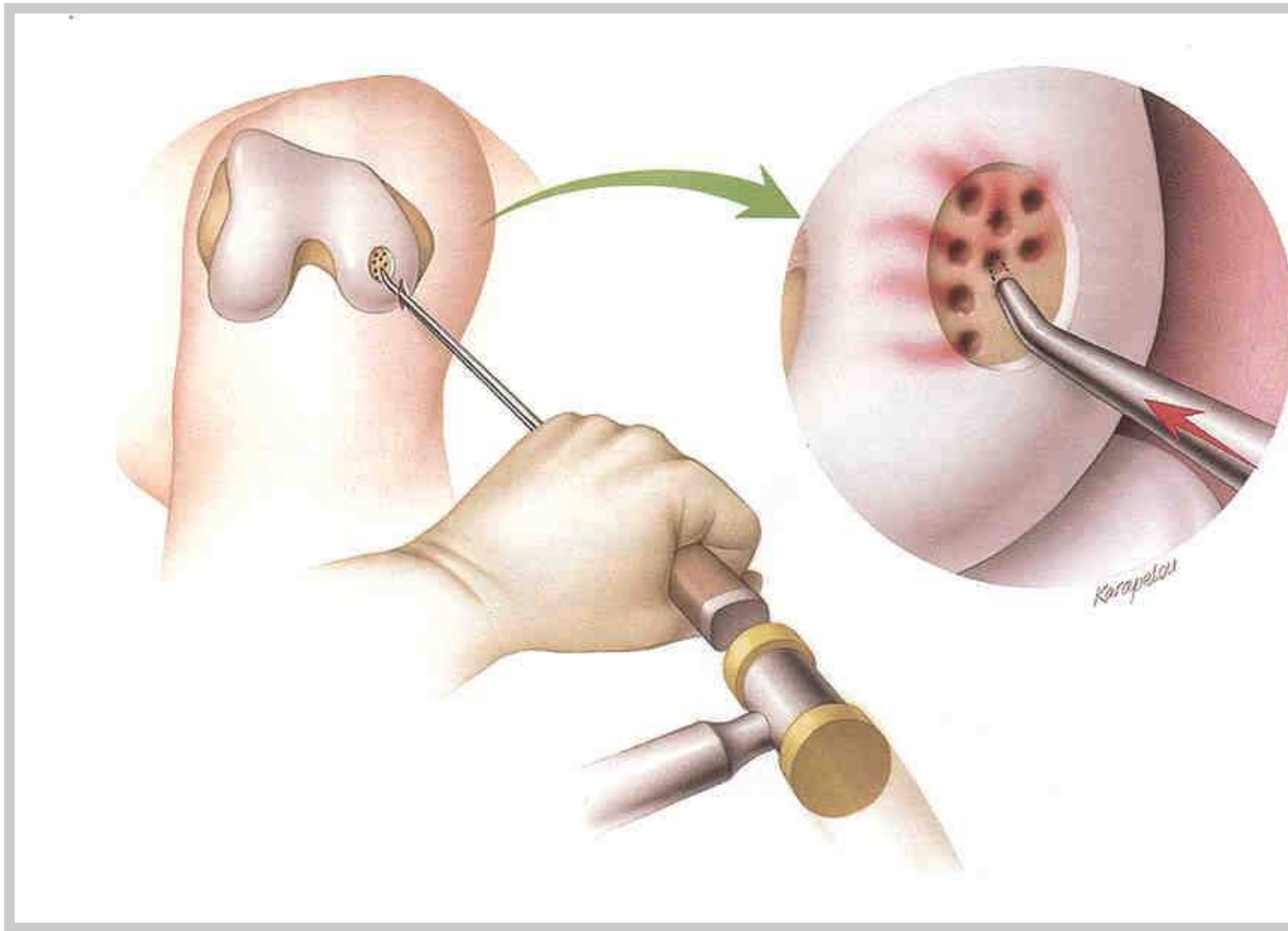
Bad natural evolution !!



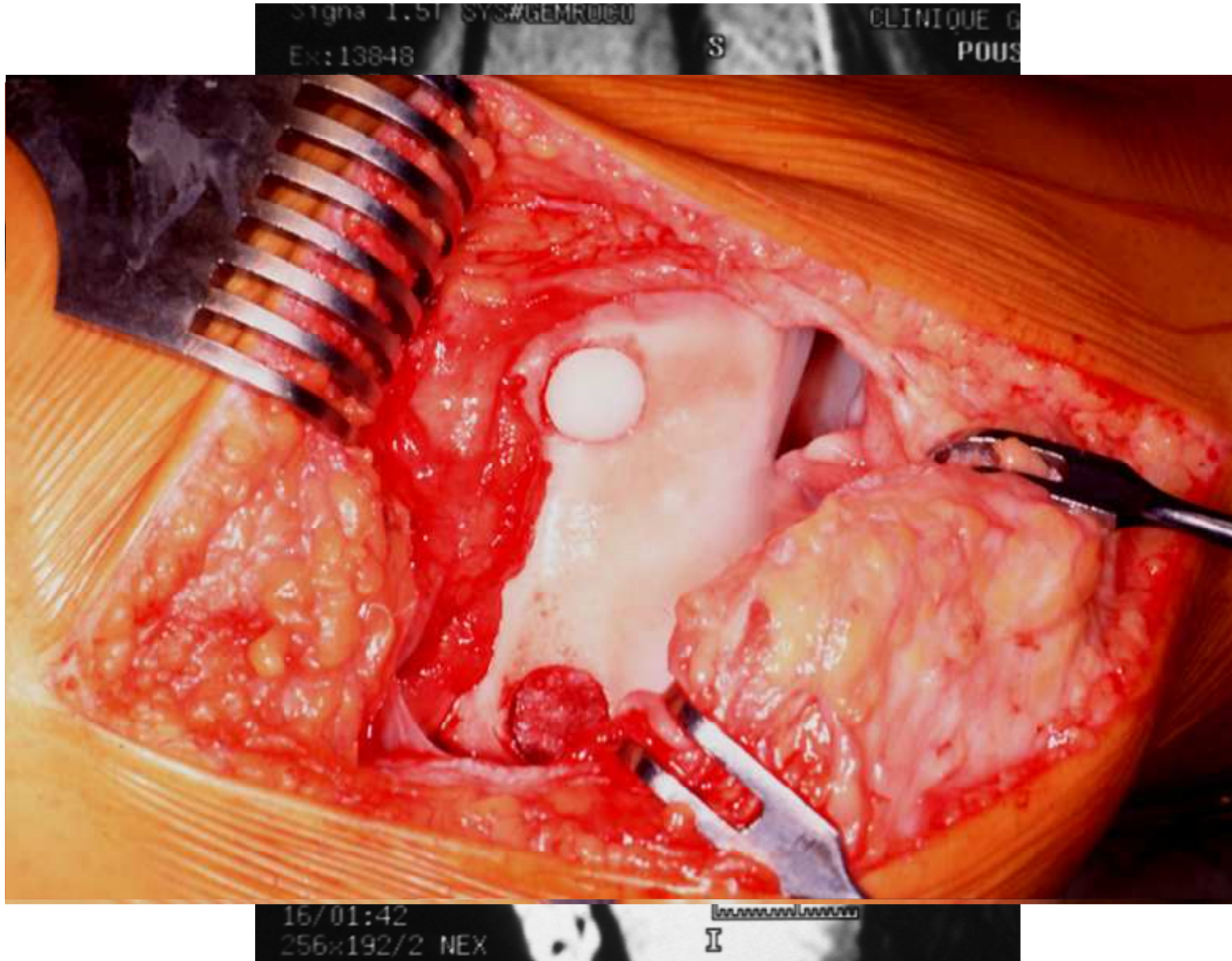
Cartilage: surgical ttr

- Stimulation of the cartilage intrinsic capacities of healing by microfracturing
- Autologous osteochondral transplantation (mosaicplasty)
- Autologous chondrocytes transplantation (ACI)

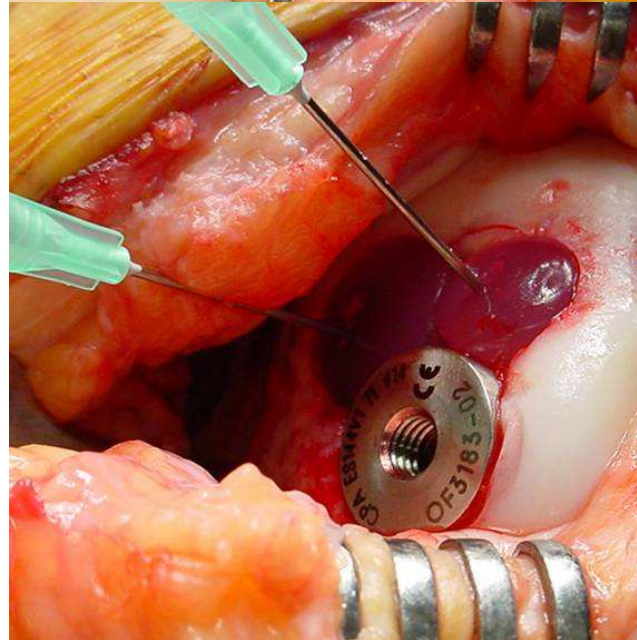
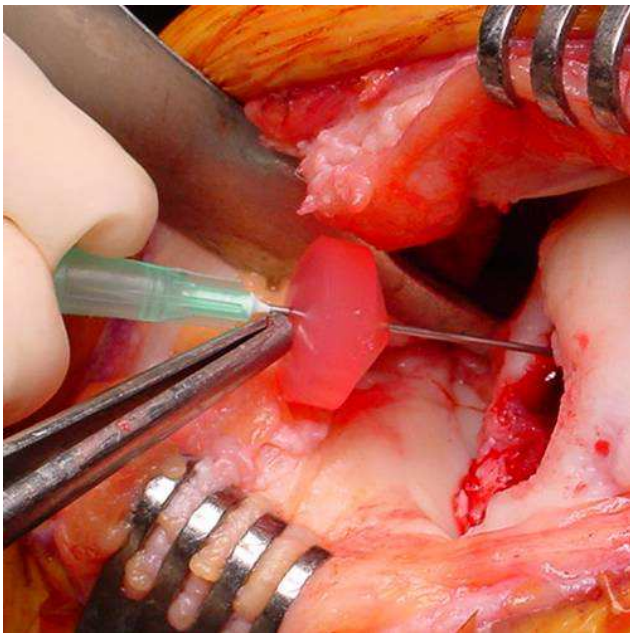
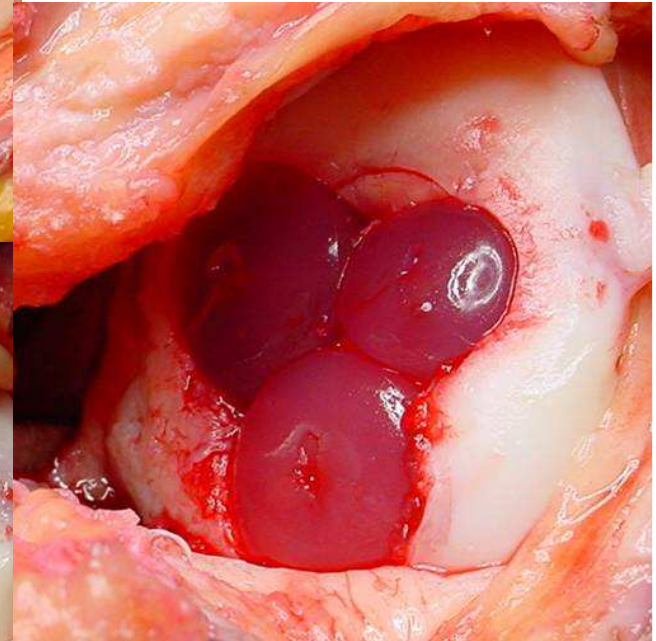
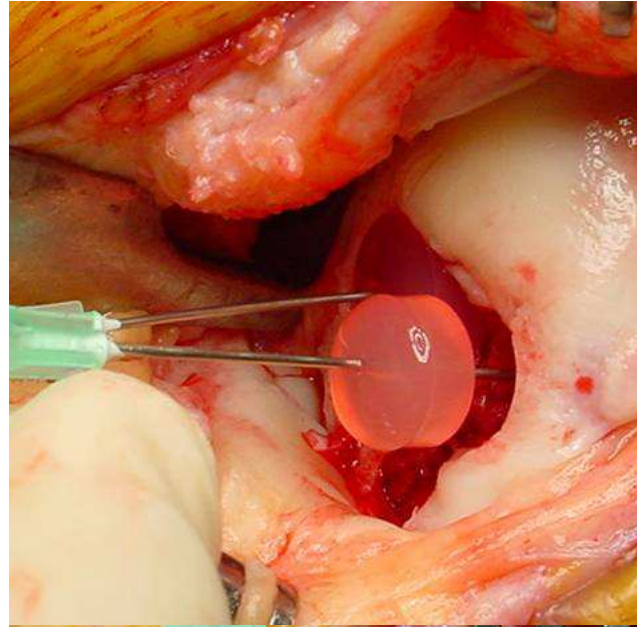
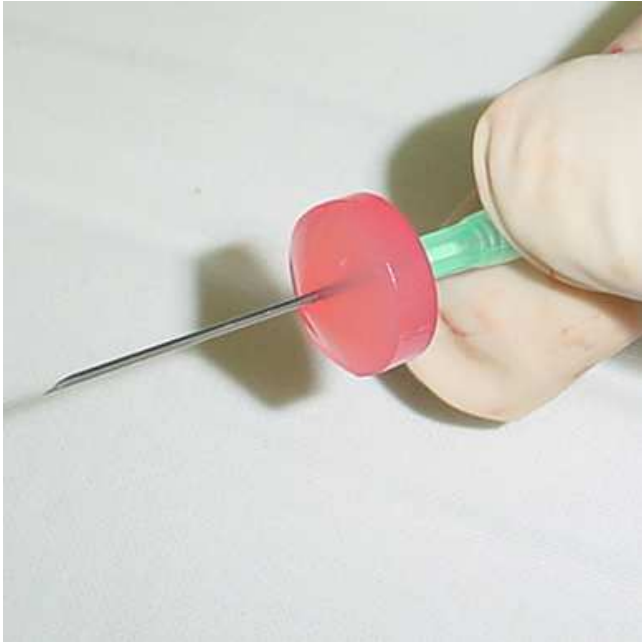
Microfracture



Case - Example



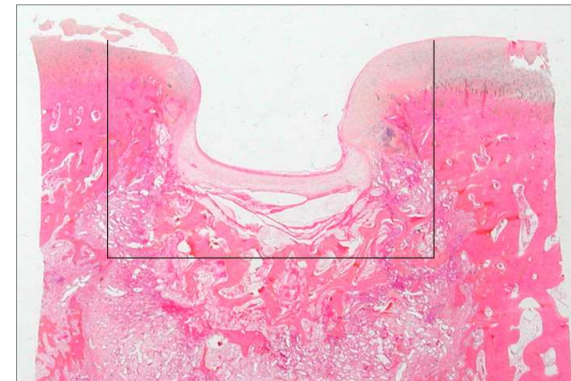
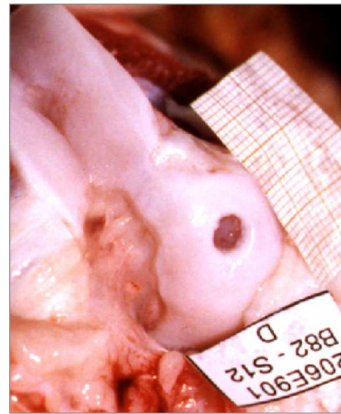
Clinical example



Preclinical study (sheep)

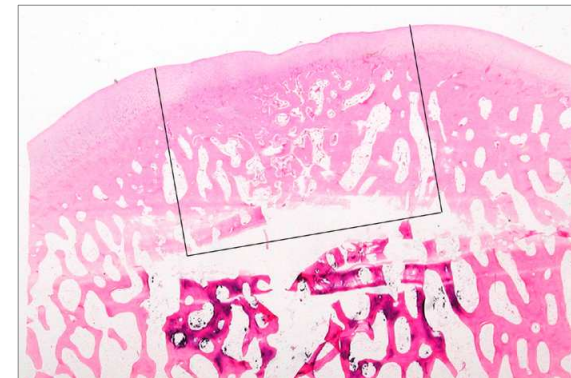
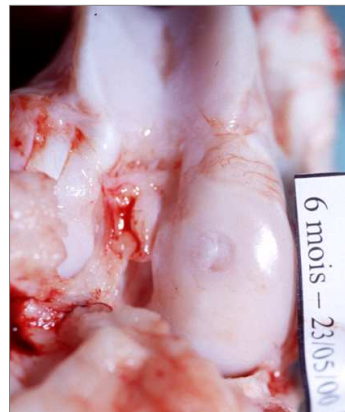
- Adult sheep
- Cells associated to the gel
- Lesion of the condyle : 6 mm diameter / 4 mm deep

Control
(Matrix
without cells)



6 months

CARTIPATCH



Phase II clinical study

- 20 patients (16 à 50 ans)
- Prospective / Multicenter
- Isolated femoral condyle lesion ICRS III ou IV
- Traumatic, OCD
- Significant clinical symptoms (score IKDC < 55)
- FU 2 years
- Evaluation : IKDC / Arthroscopy / MRI

Results arthroscopy n=9



Degree of repair:

Flush : 6/9

Slightly over above (<1mm) : 1/9

Below : 2/9

Integration of margins

Continuous < 1 mm : 7/9

Discontinuous: 2/9

Aspect

Even abd smooth : 4/9

Striated: 1/9

Fissuration : 2/9 minor, 2/9 more

ACI indication

- Isolated lesion
- Medial condyle > lateral condyle > patella
- 3 - 8 cm²
- < 6mm in depth, tidemark preserved
- Young patient (< 45 years)
- Recent lesion (< 1 year)
- Failed initial treatment (second approach)

Contra-indications

- Patient > 45 years
- Osteoarthritis
- < 1cm² - > 8 cm²
- Kissing lesions
- Malalignment > 5°
- Instability
- Inflammatory disease

Contra-indications

- Total meniscectomy
- Overweight
- Multiple operations on the same knee
- Smokers

In summary

- Promising technology in very well selected patients
- Single traumatic cartilage lesion
- Still under investigation