

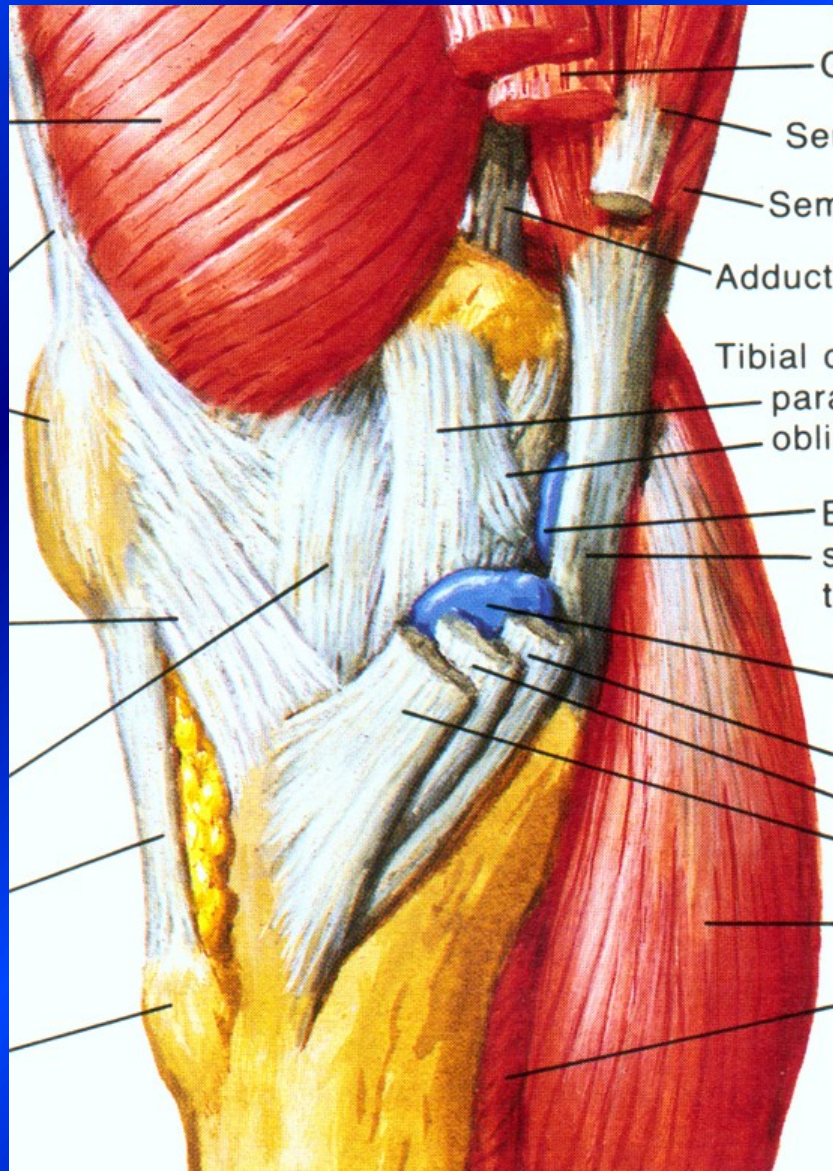
# Knee joint

Anatomy, clinical examination,  
imaging, pathology

# Anatomy- skeleton

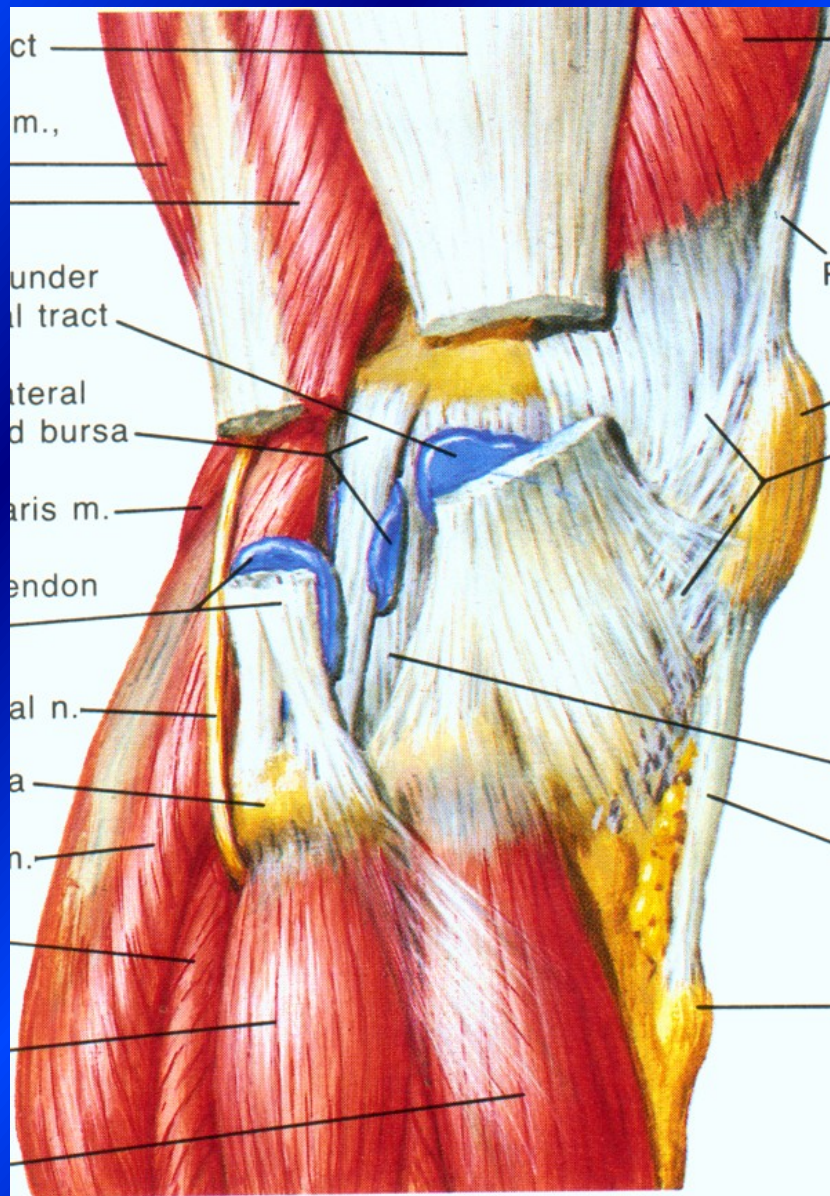


Complicated osseous structure- soft tissue for stability is needed



Medial side



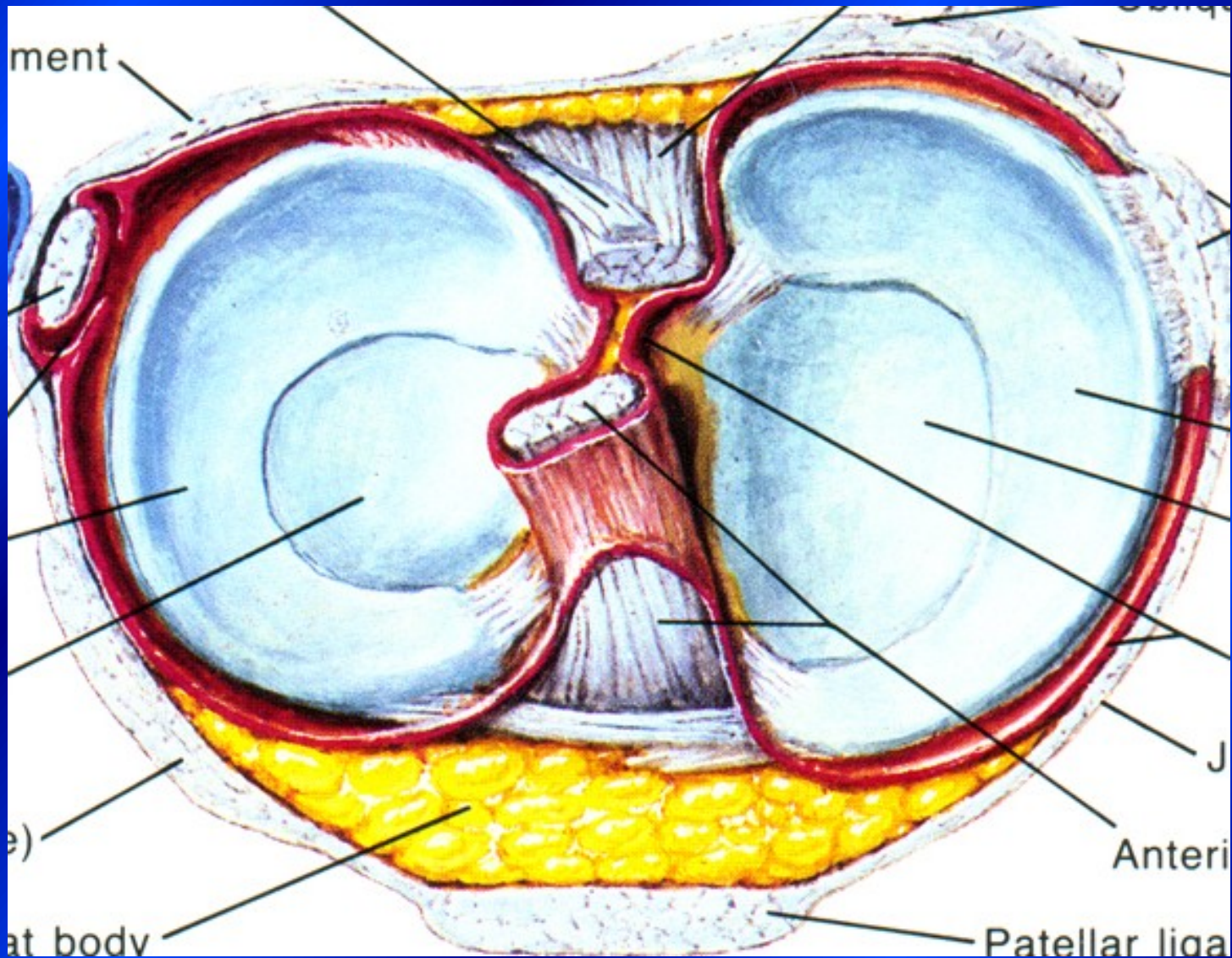


Lateral side

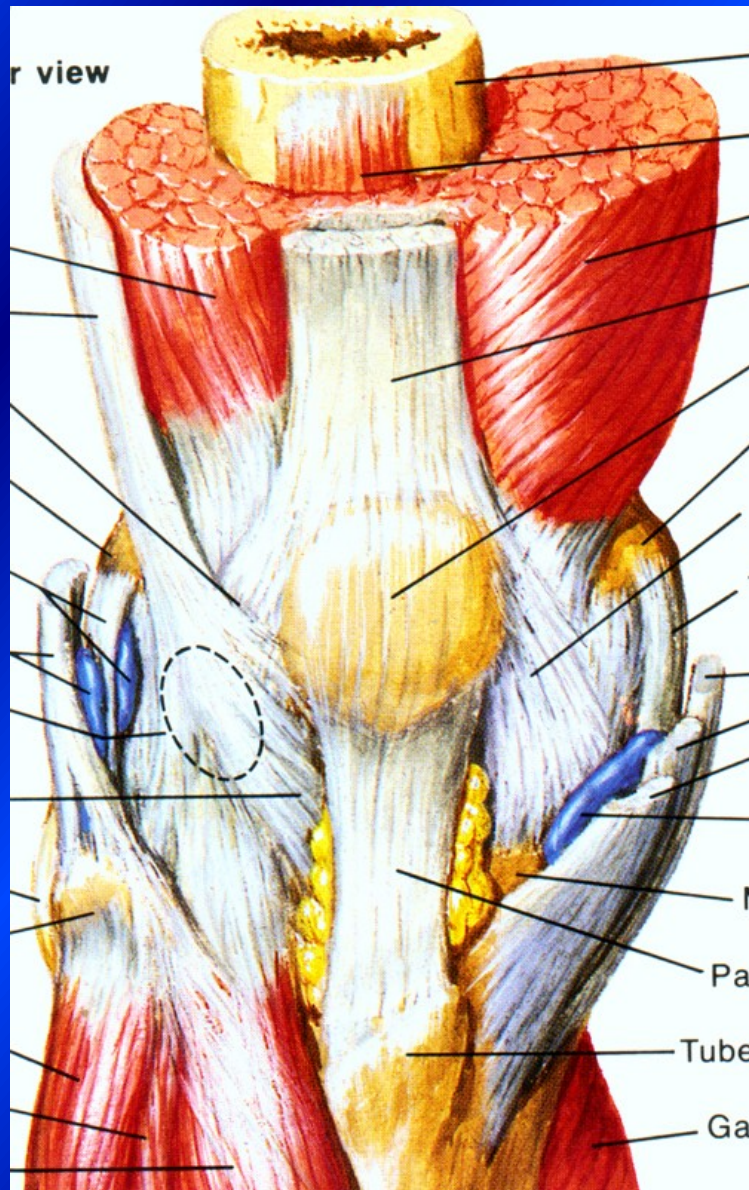








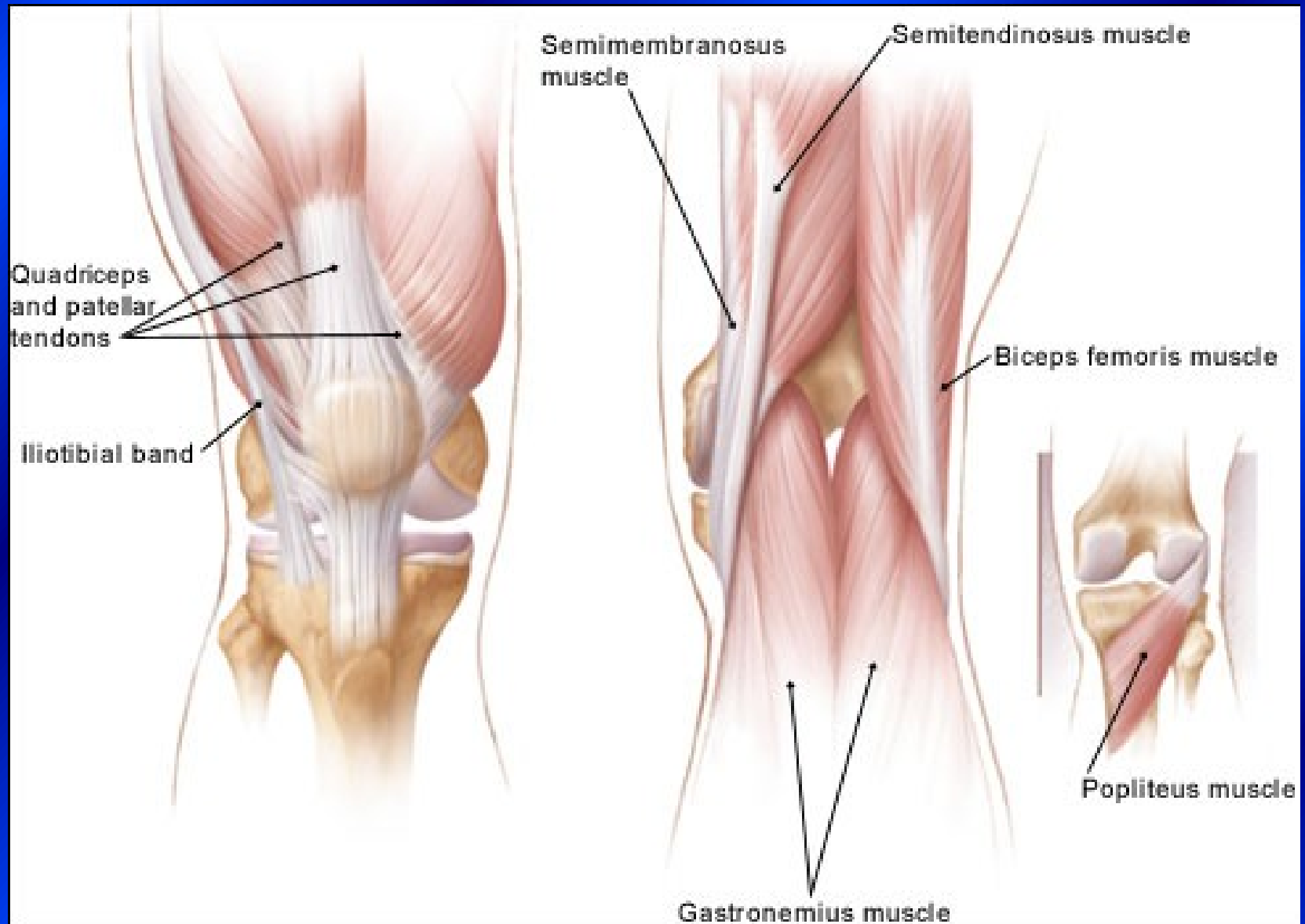
Menisci



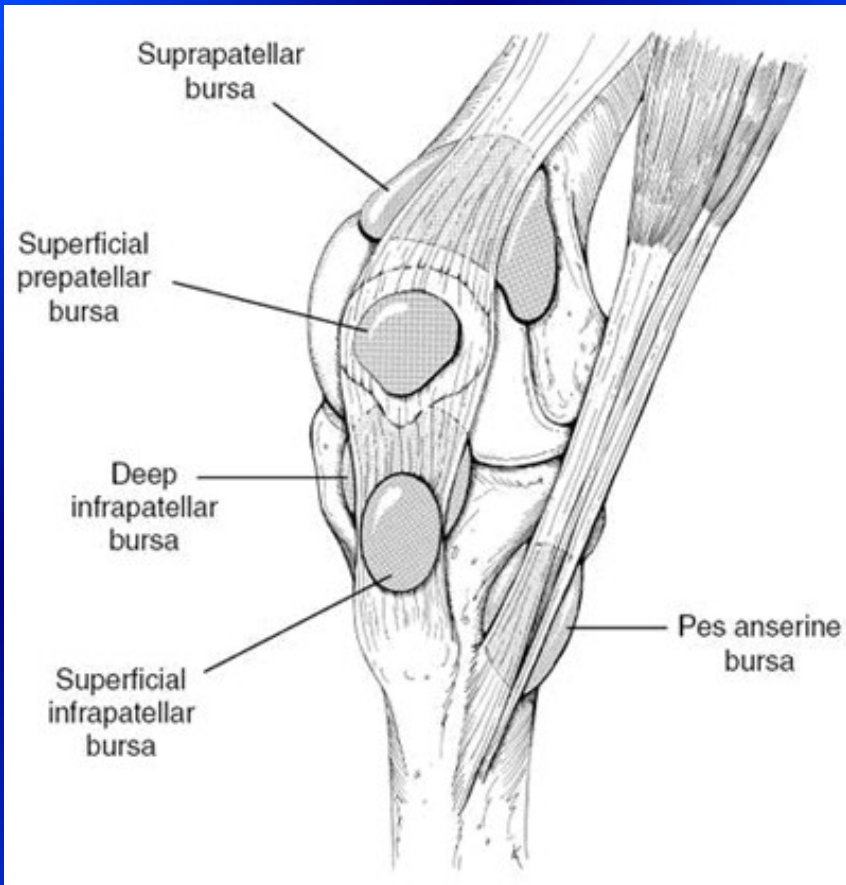
Muscles



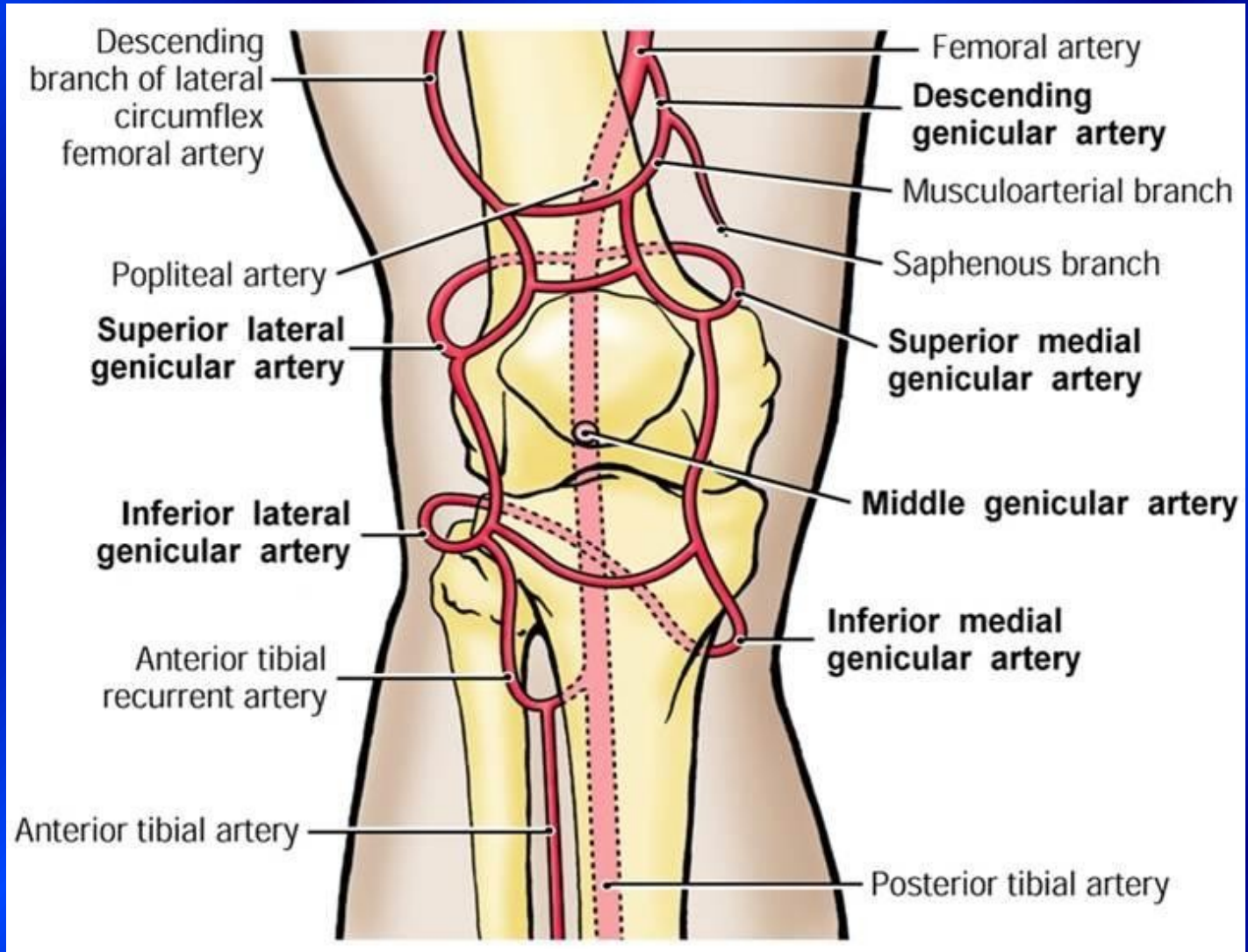
# Stability of the knee- muscles



# Anatomy- bursae

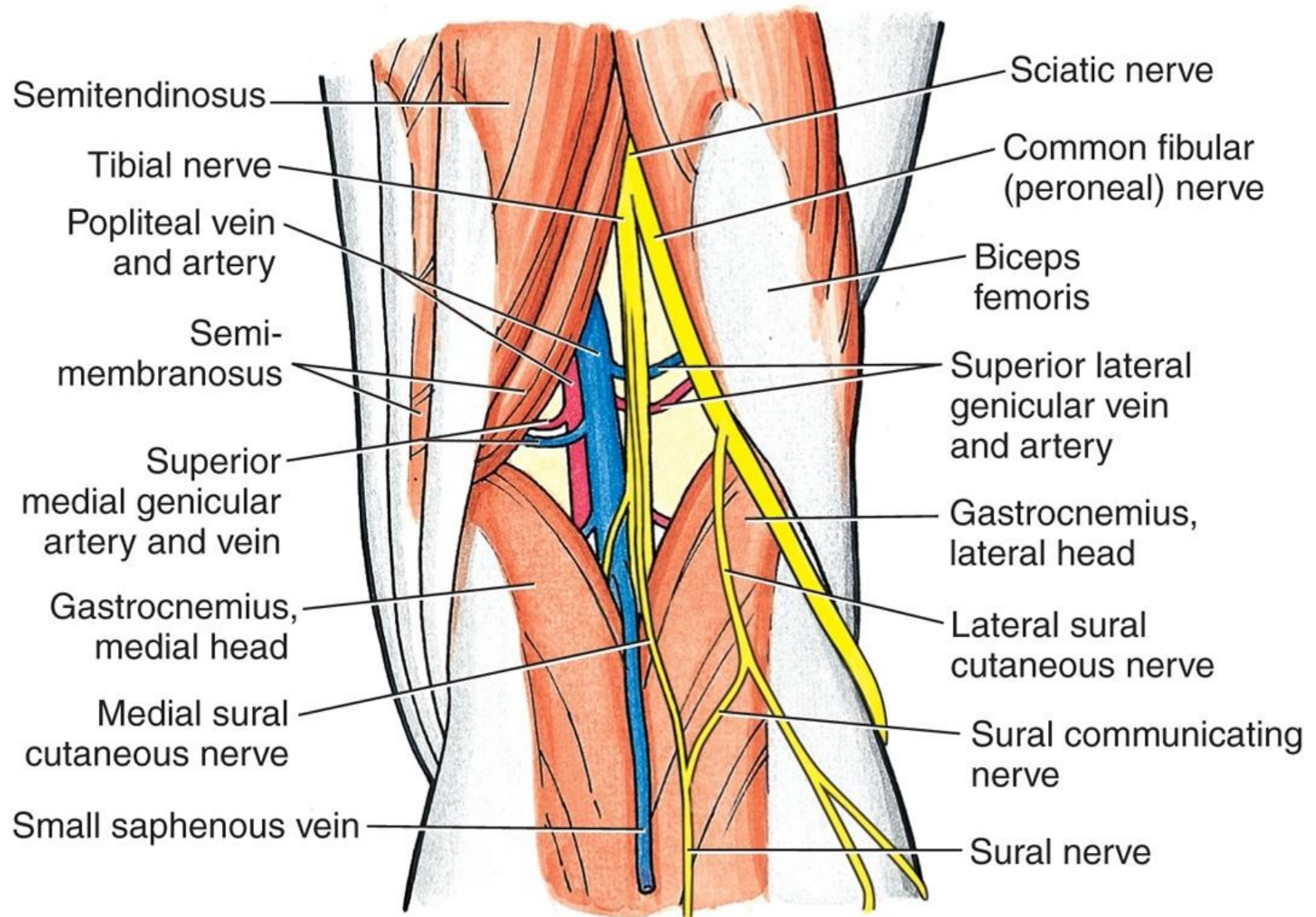


# Anatomy- vessels





# Anatomy- nerves



# Biomechanics

Level

Movement

Sagittal

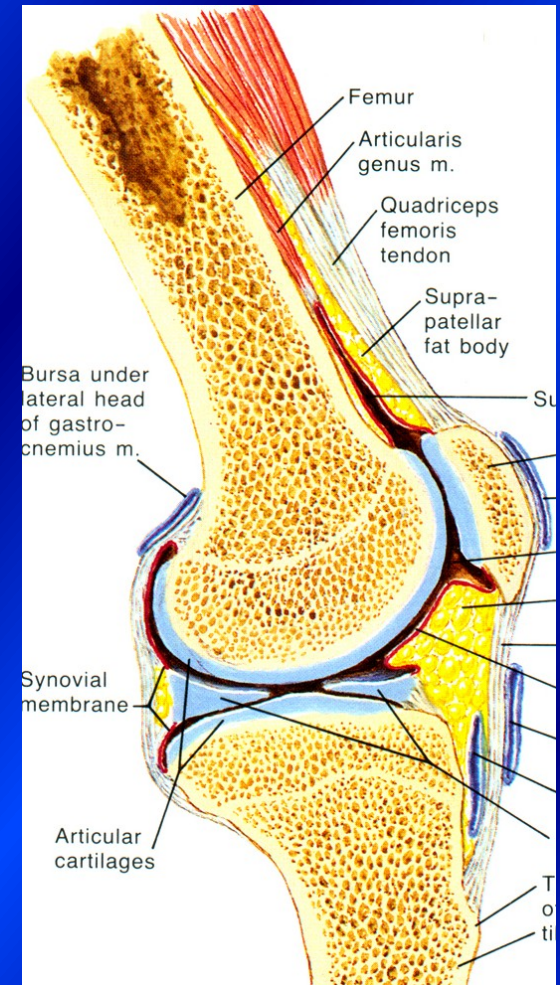
flexion/extension  
- rolling  
- gliding

Transversal

ext/ int roration

Frontal

adduction/abduction



# Clinical examination

- skin
- swelling
- alignment
- deformity
- contracture
- active and passive movement
- stability
- meniscus maneuvers
- femoropatellar joint



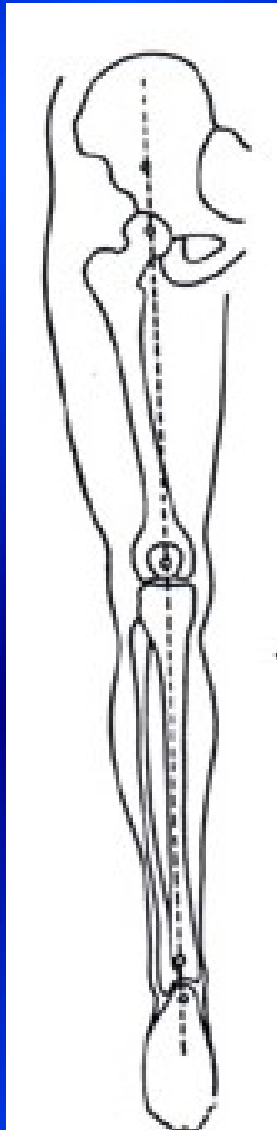


# Swelling in the knee region

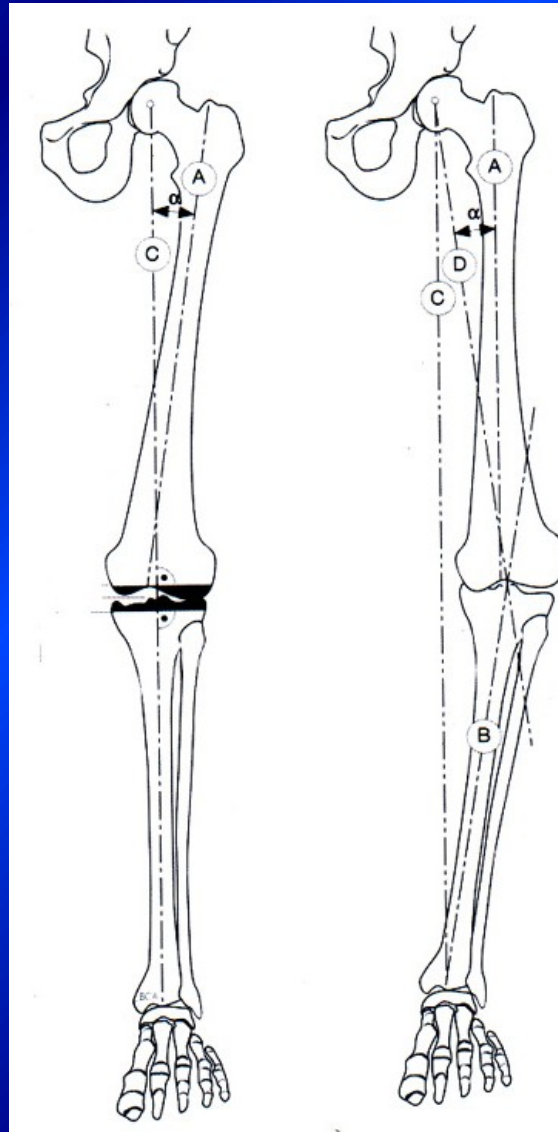
- Effusion
- Synovitis
- Cysts, ganglion
- Tumors
- Haematoma



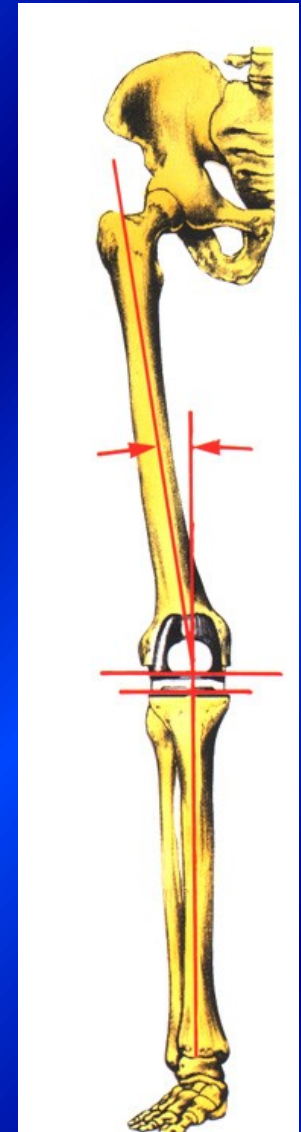
# Alignment of lower extremity



Mikulicz line

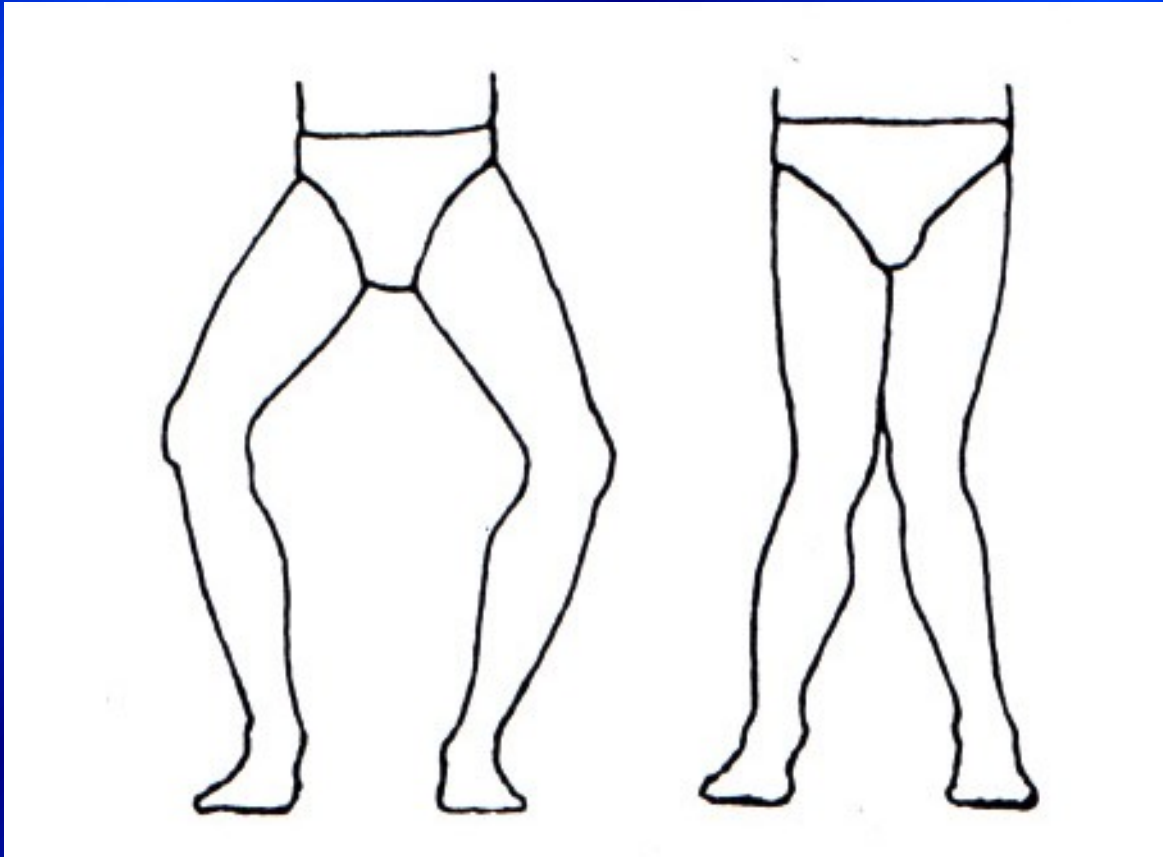


Mechanical



Anatomical

# Deformity of the knee joint



**Genu varum**

- M.Blount
- rachitis
- posttraumatic
- O.A.

**Genu valgum**

- rachitis
- posttraumatic
- R.A.
- O.A.

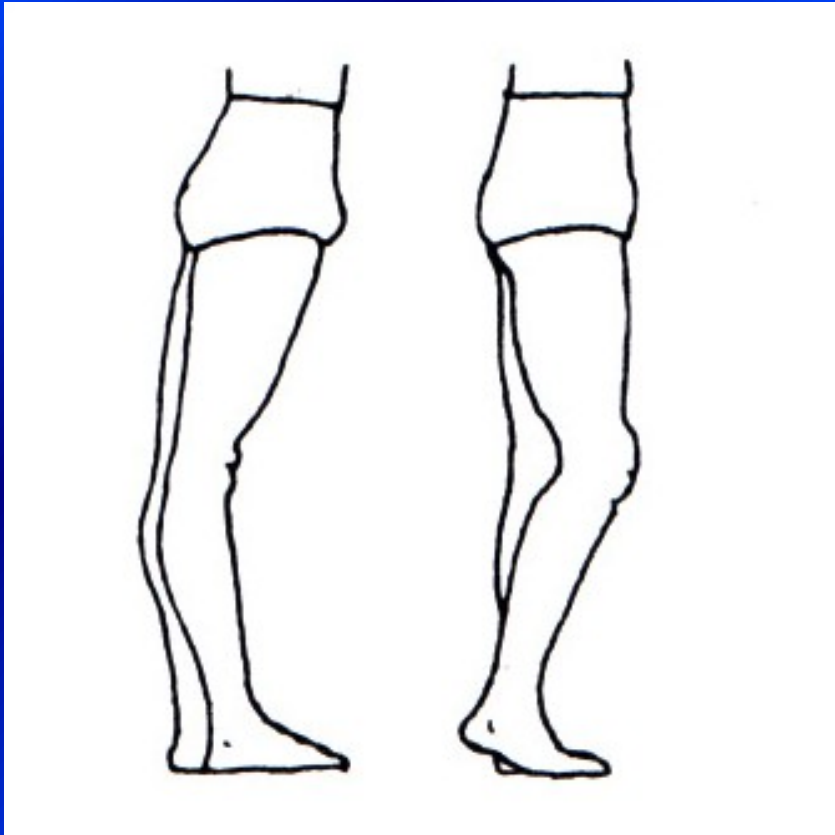
**M. Blount**



Disorder of the growth plate of proximal tibia



# Deformity of the knee joint



**Genu recurvatum**

- congenital
- aplasia of ext. apparatus
- laxity of mesenchyme

**Genu recurvatum  
congenitum**



**Genu flectum**

- cerebral palsy
- other neurological disorders
- O.A., R.A, post infection

# Position of the knee joint

- **Semiflexion**
  - antalgic
  - extension blockage
    - Rupture of meniscus
    - Loose body
    - Entrapement of synovial plica

# Flexion contracture in cerebral palsy



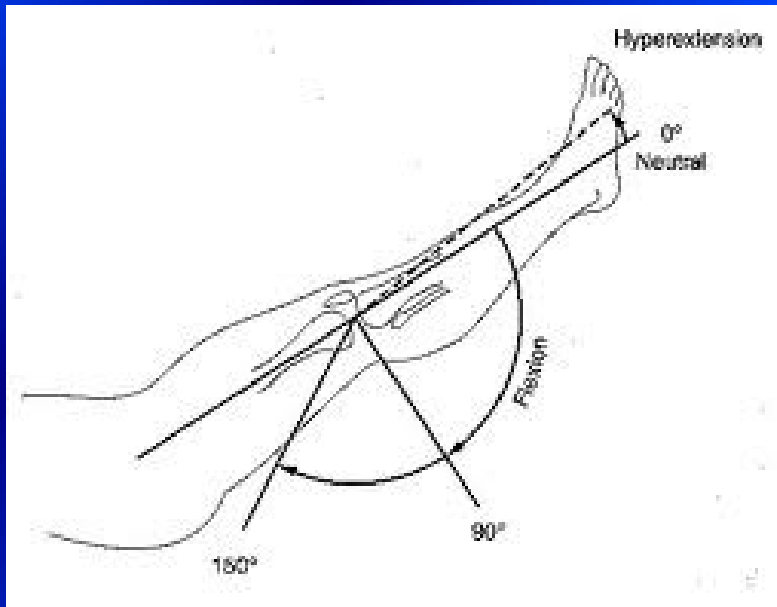
- **Contracture of hamstrings** (m. semitendinosus, m. semimembranosus, m. gracilis, m. biceps femoris)
- **Patella alta**





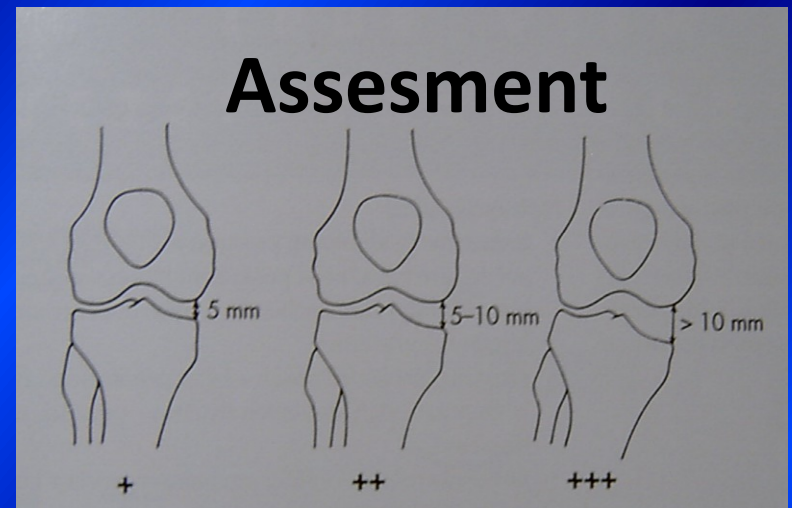
# Movement in the knee joint

- active, pasive



S extension - 0 - flexion  
S 0 - 0 - 140

# Test for stability



Valgus stress test (LCM)

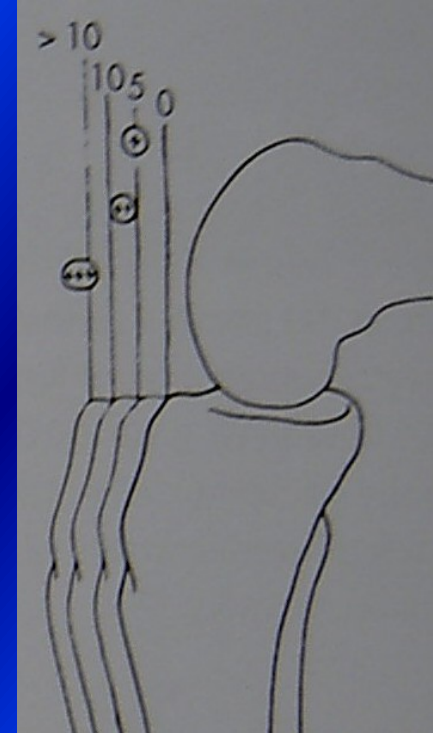


Varus stress test (LCL)

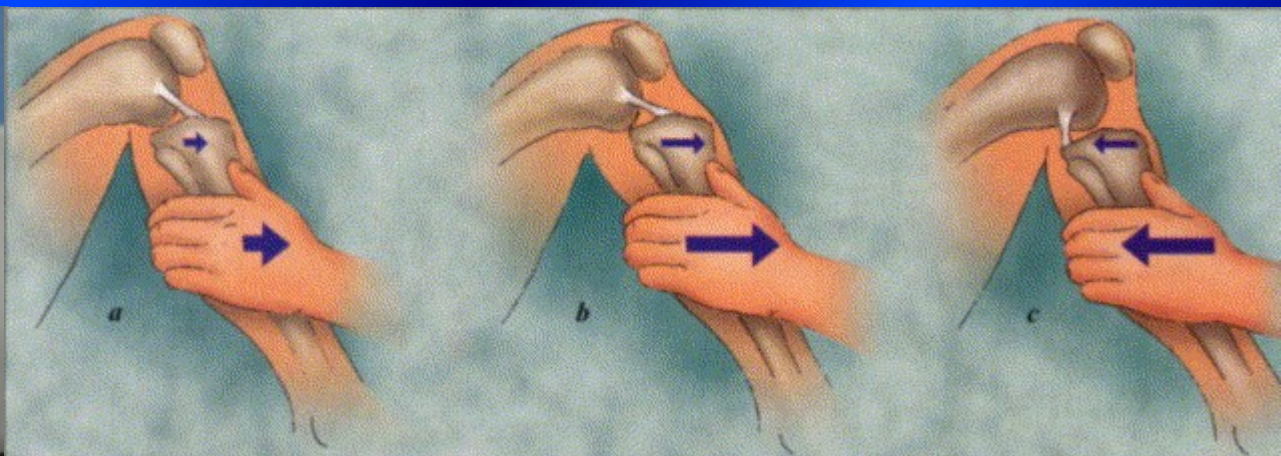
# Cruciate ligaments



Lachmann test



Ant. drawer sign , post. drawer sign



normal

ant

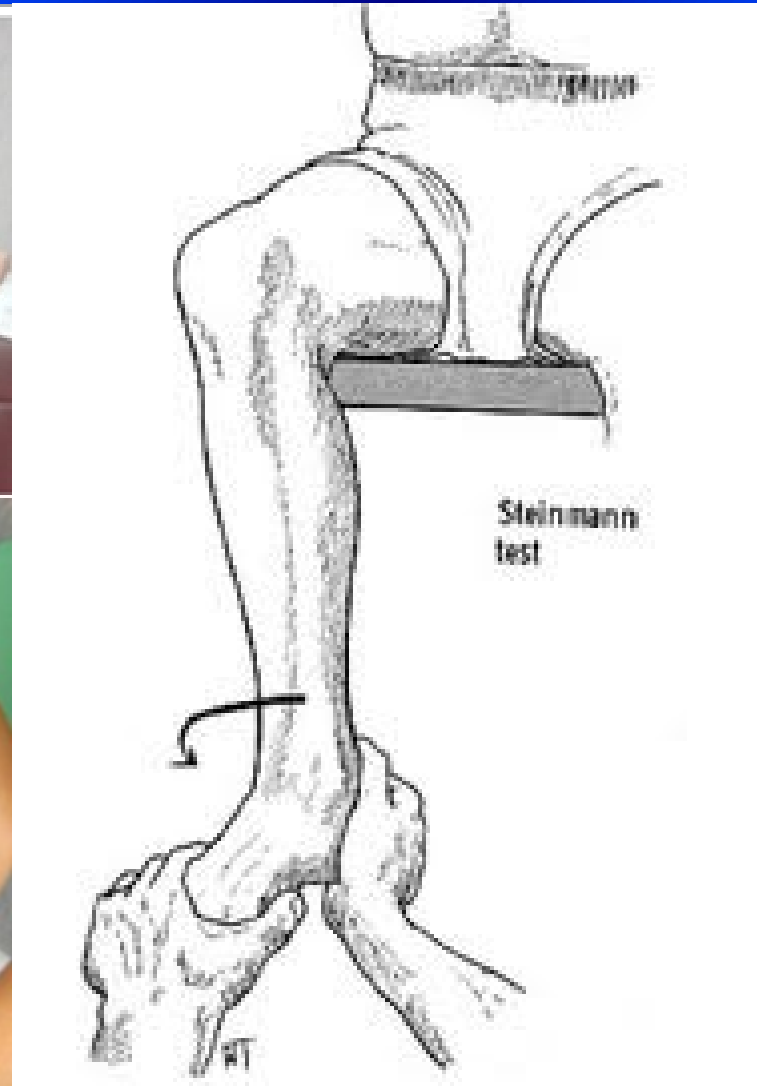
post



# Meniscus manoeuvres

## McMurray test

## Steinmann test

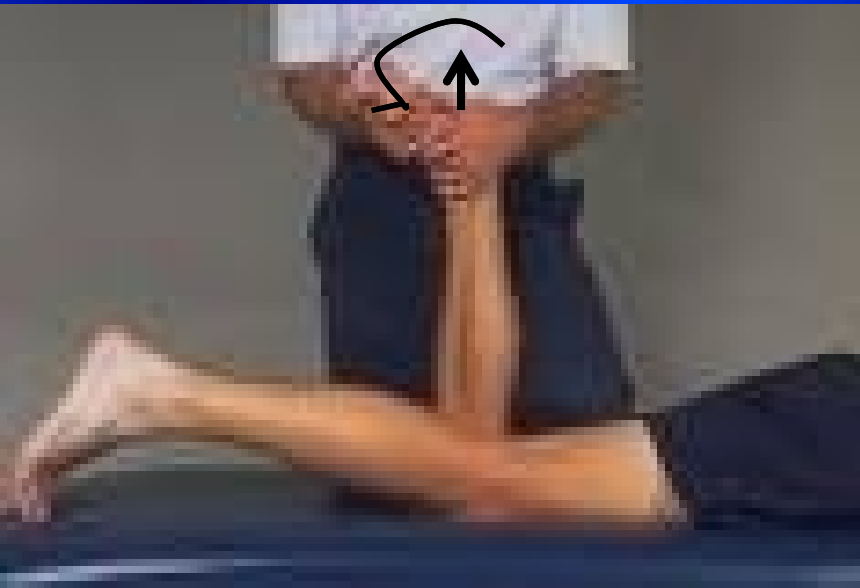


# Meniscus manouevres

## Payer test



## Appley test

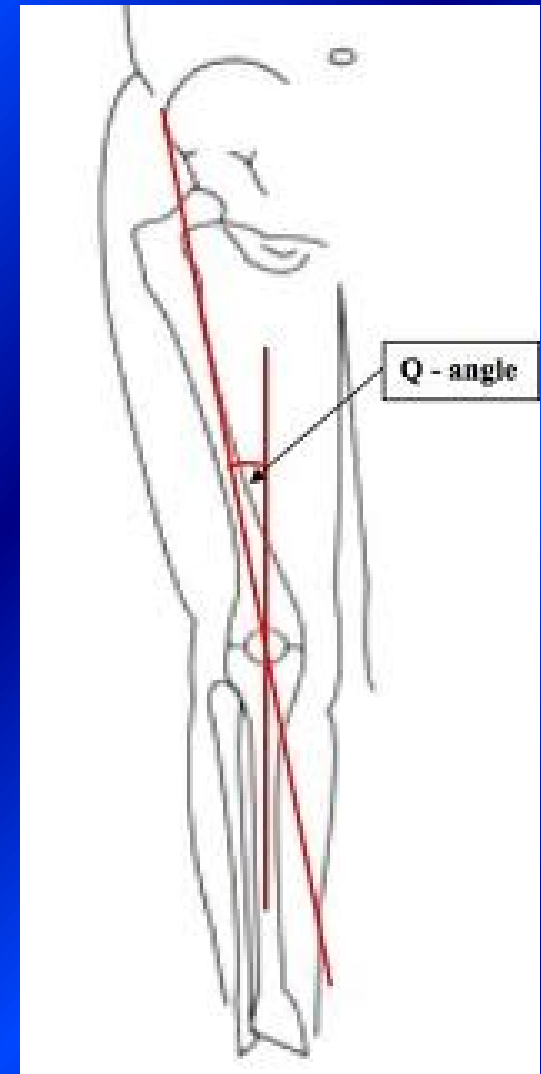


## Childress test



# Patella

- history- retropatellar pain
- kneeling, squatting, down hill gait
- giwing away phenomenon
- position of the patella
  - alta / baja)
  - lateral
- patelar tracking
- stability
- Patellar retinacular ligament
- Patellar facets, base, apex
- FP manoeuvres (Zohlen, grinding)
- Q- angle



M 8-10

F 15 ± 5

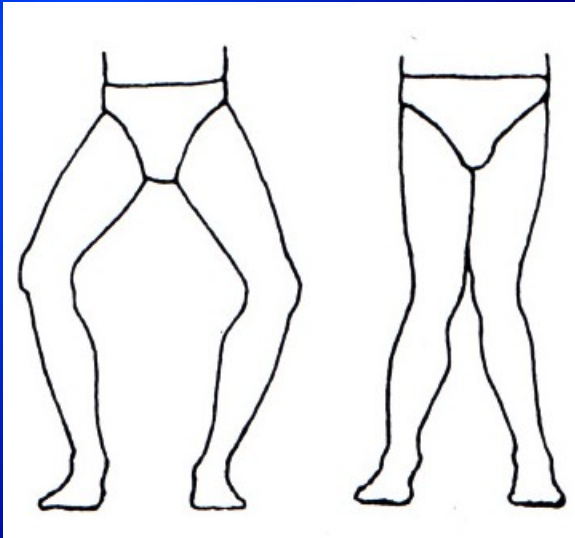


# Imaging methods

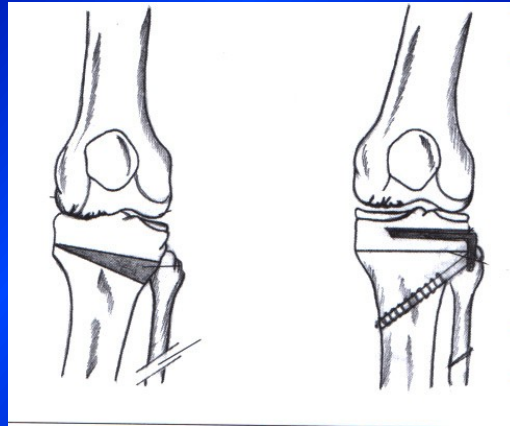
- X ray, AP, lateral, axial
- USG
- CT , MRI
- Scintigraphy
- Arthroscopy

# Deformity of the knee joint

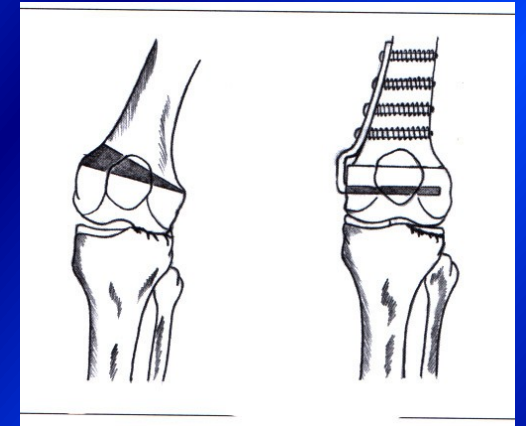
- in children- hemiepiphyseodesis
- in adults osteotomy



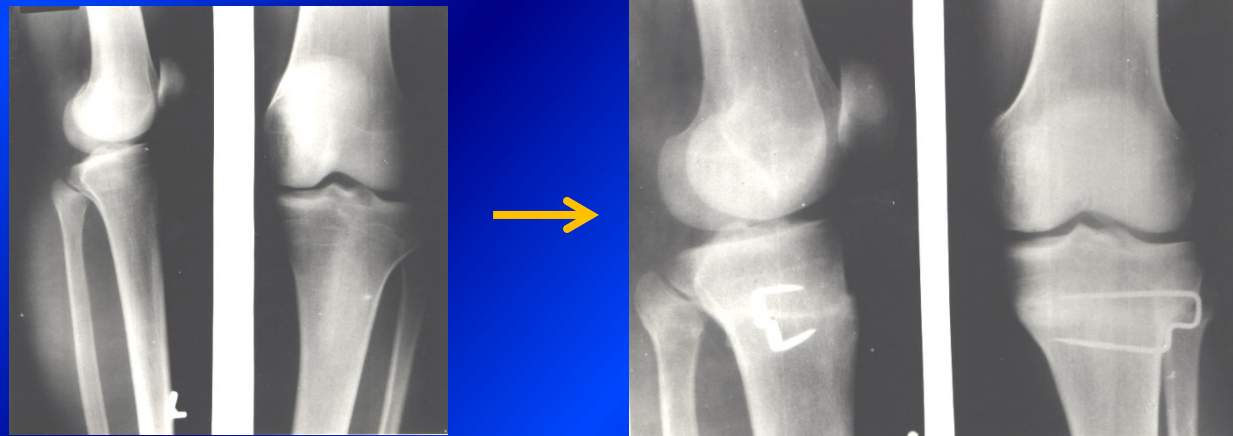
**genu varum /genu valgum**



**Valgus OT**



**varus OT**



# Meniscus

Mechanism of injury

Tests: Mc Murray

Steinmann I

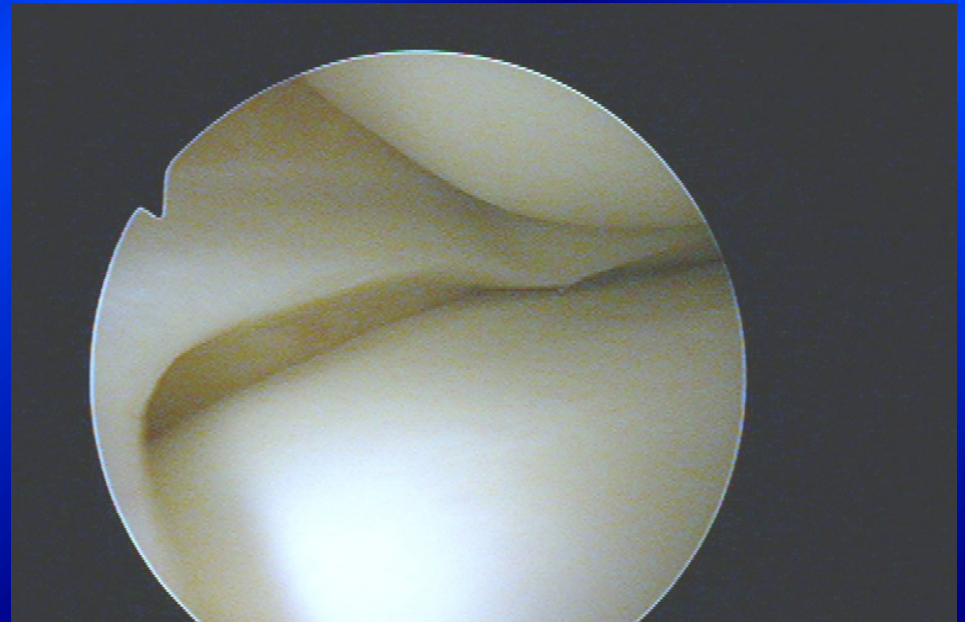
Steinmann II

Appley

Turner

Payer

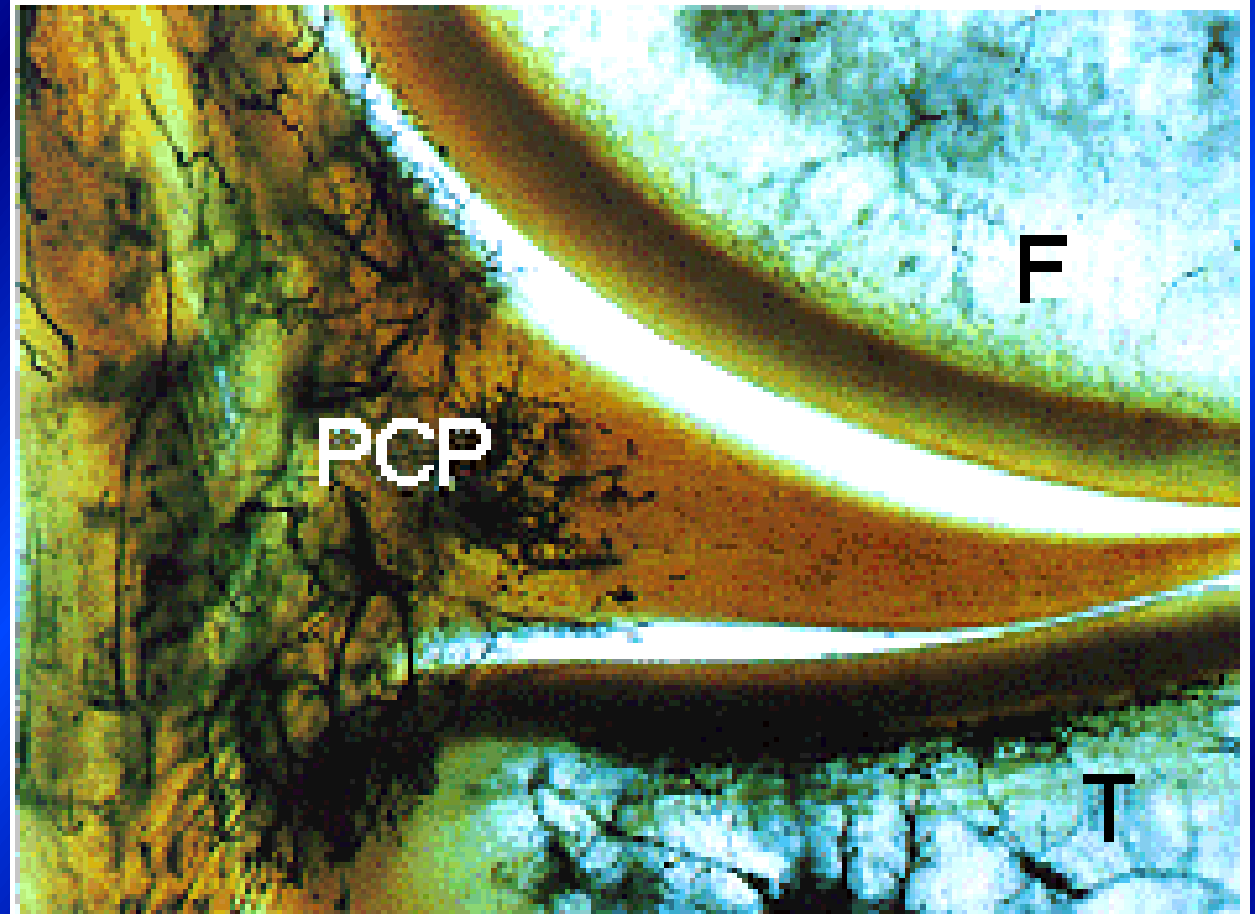
Childress- squat test





# Meniscus

- Fibrocartilago
- High elasticity
- Paracapsular zone  
- vessels



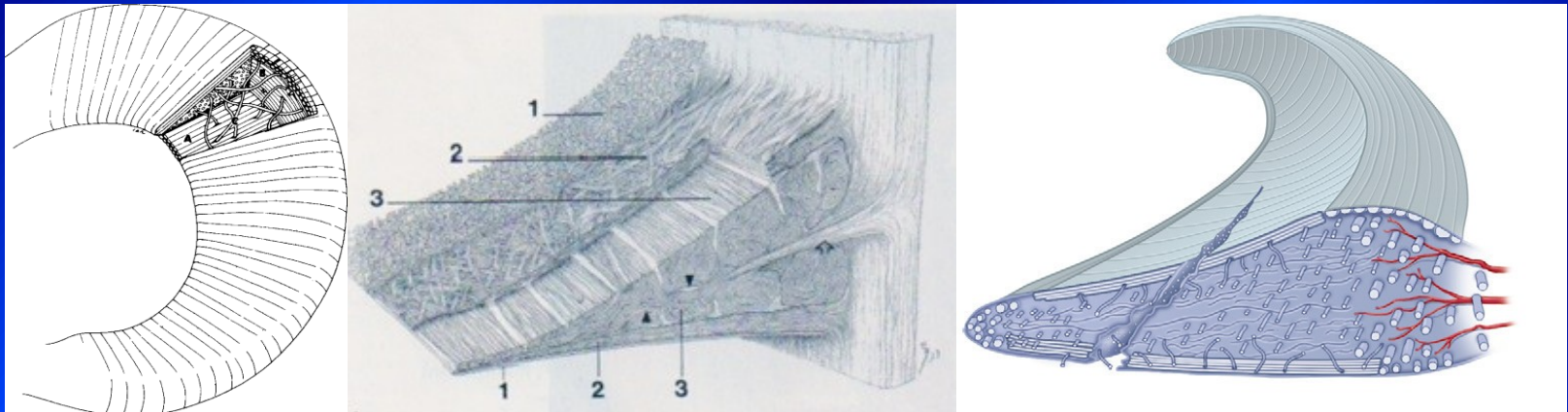
Red zone

red- white zone

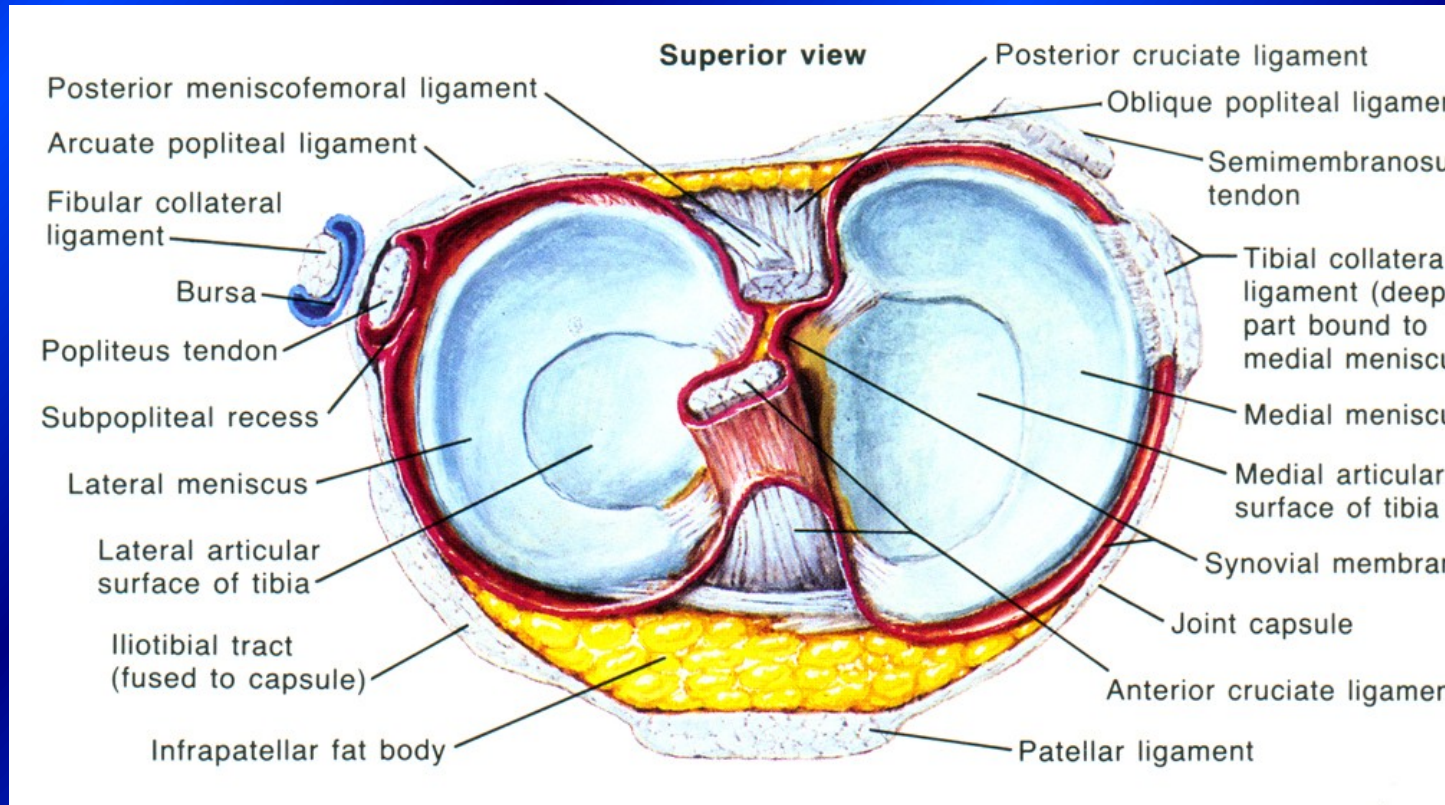
white zone

# Struktura menisku

- Kartilaginózní struktura
- Relativně acelulární
  - vaskulární zóna – fibroblast-like cells
  - avaskulární zóna – chondrocytes-like cells
- Kolagen. vlákna v matrix -
  - rozložení k přenosu kompresního tlaku + hoop stresu



# Functions



- Bumper
- Stabilisator
- More congruency
- Distribution of synovial fluid
- LM – more mobile
- MM – prone for injury



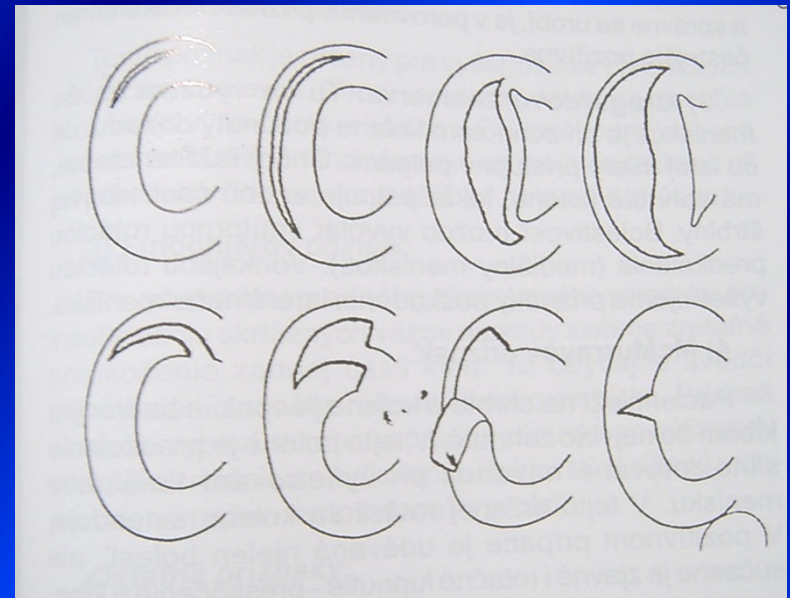
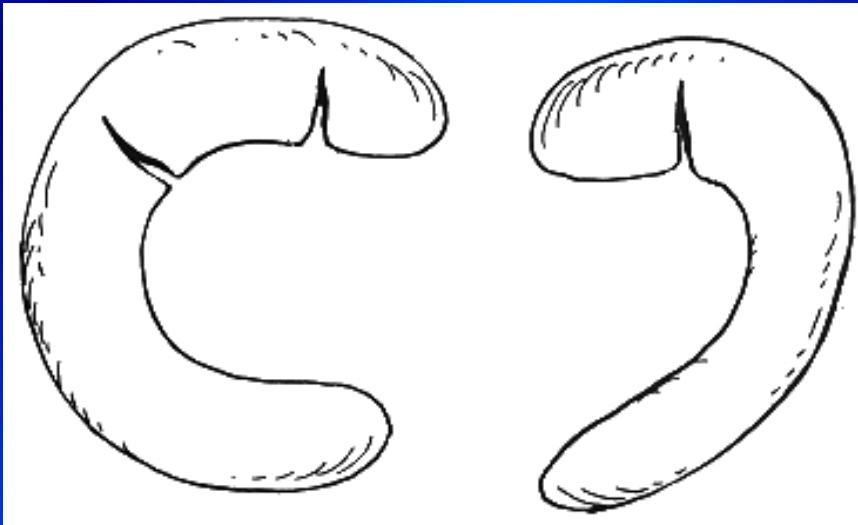
# Typy ruptur menisku

- Longitudinální
- Radiální
- Horizontální
- Šikmá
- Bucket handle
- Komplexní



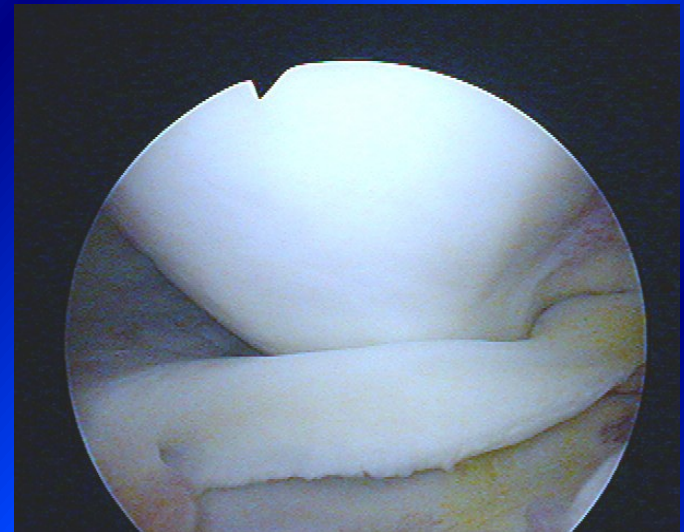
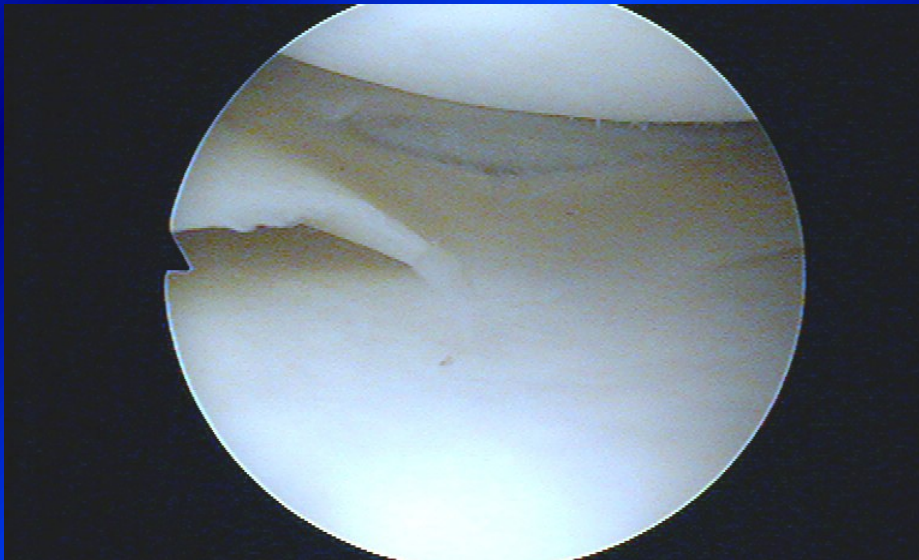
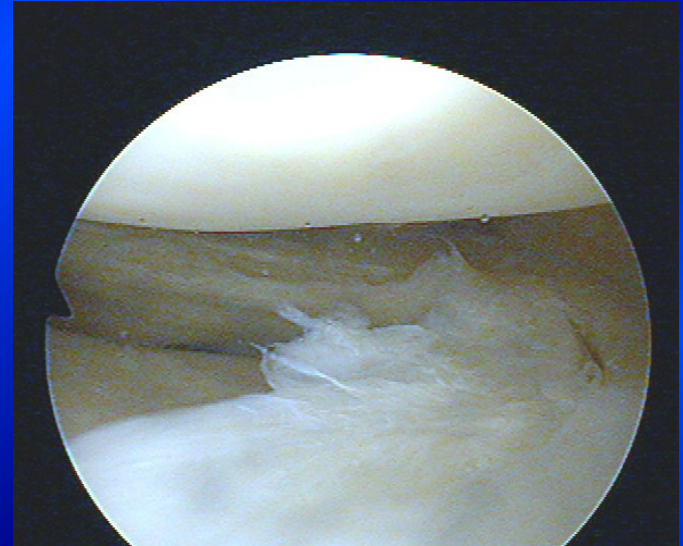
# Ruptures of menisci

- Longitudinal, horizontal, radial
- „bucket handle type“
  - Typical blockage
- Degenerative lesions
- Discoid meniscus



# Ruptures of menisci

- Longitudinal, horizontal, radial
- „bucket handle type“
  - Typical blockage
- Degenerative lesions
- Discoid meniscus

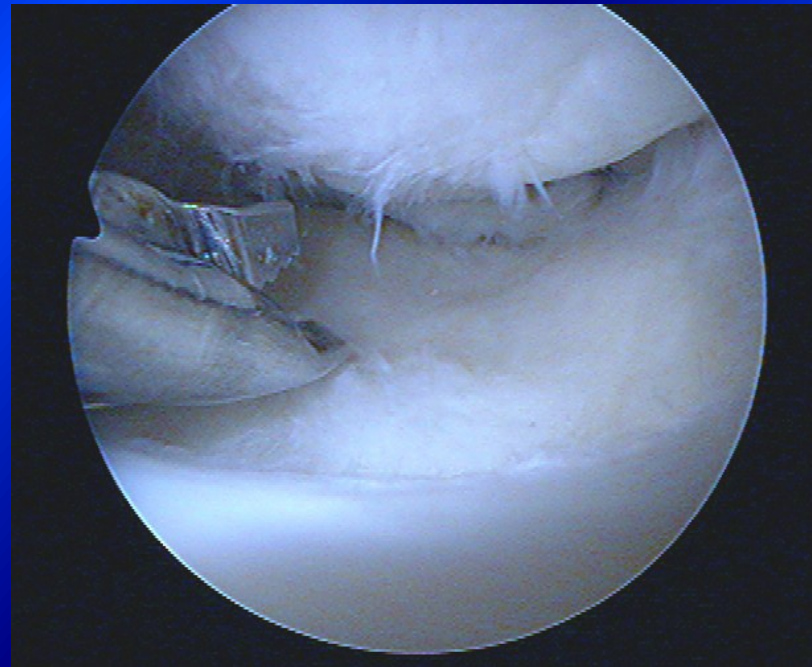




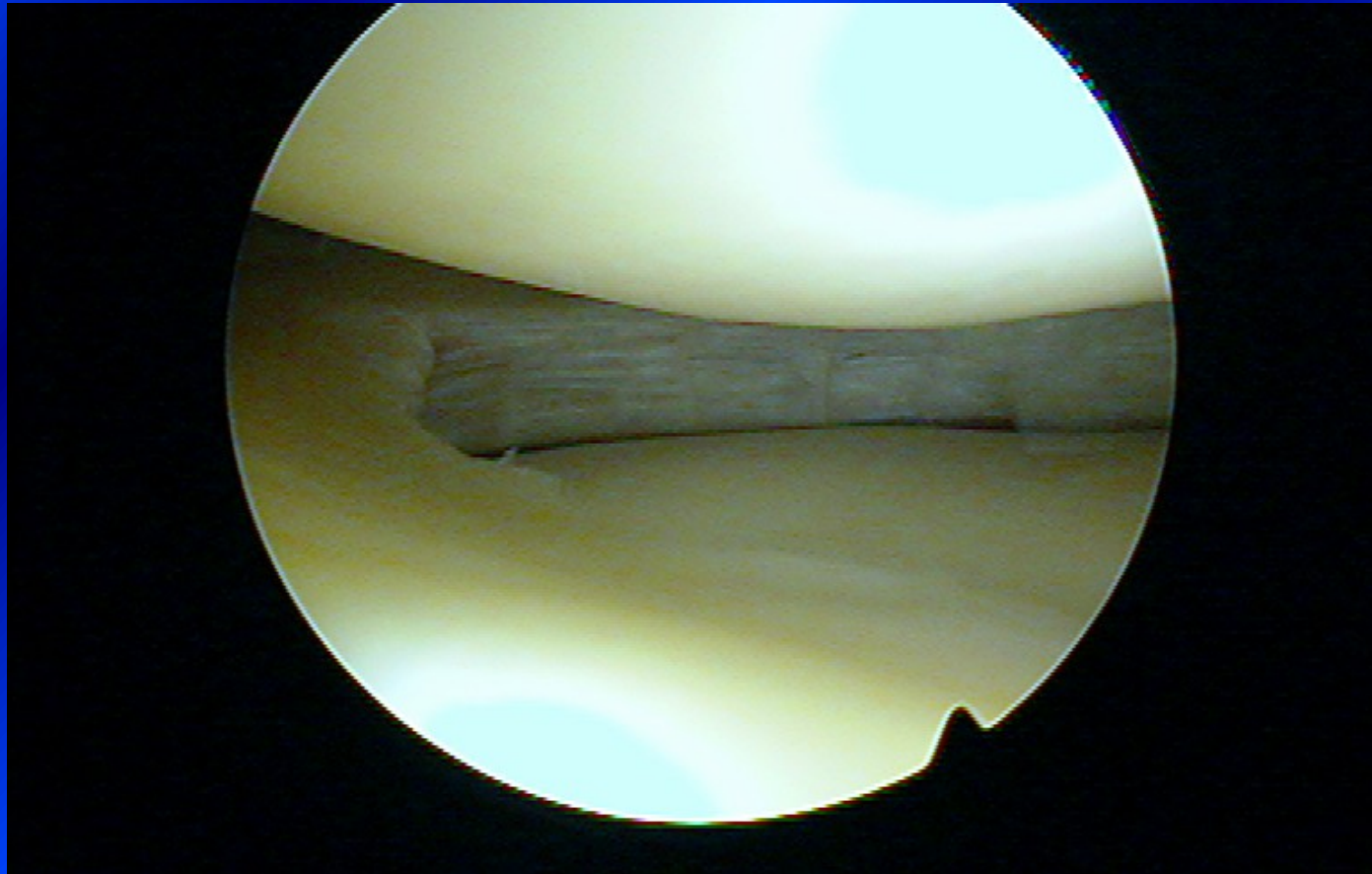
# Meniscus treatment

## Meniscectomy

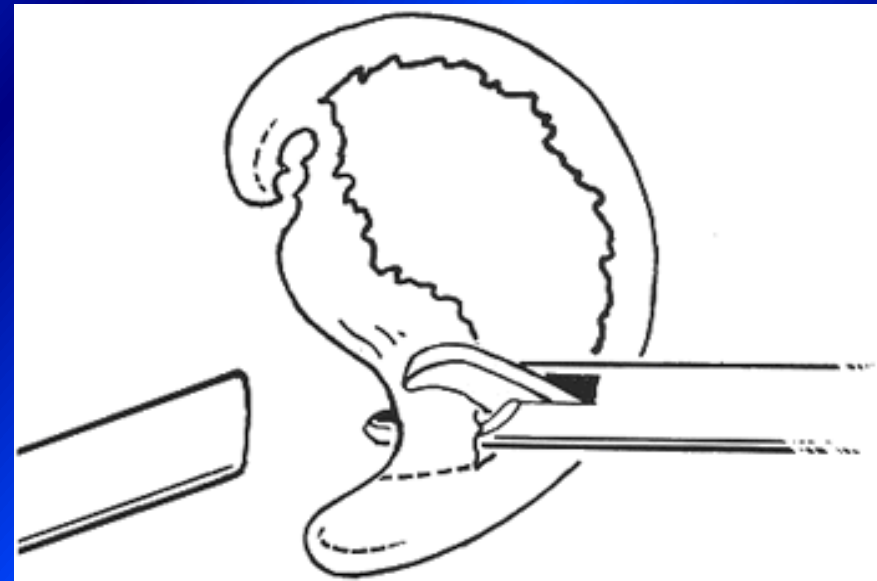
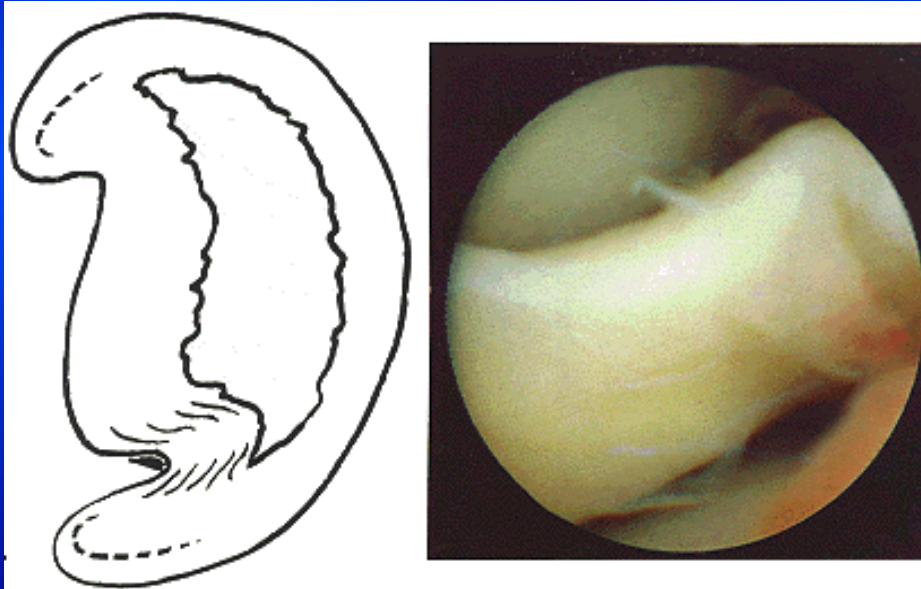
- partial
- subtotal
- complete



# Partial meniscectomy



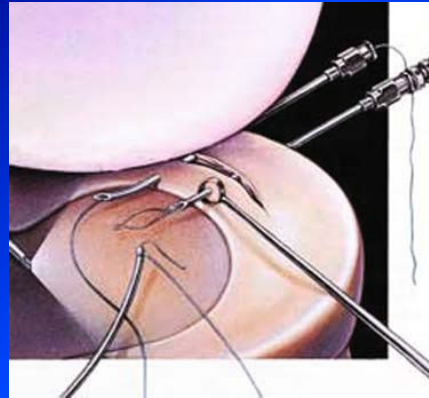
# Subtotal meniscectomy



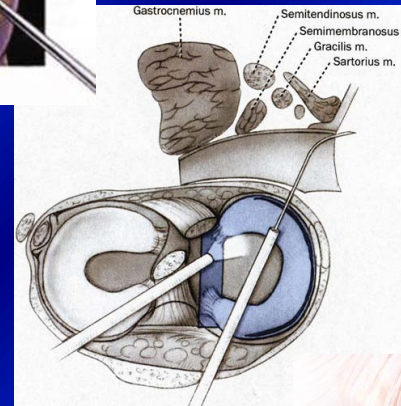


# Techniky sutury

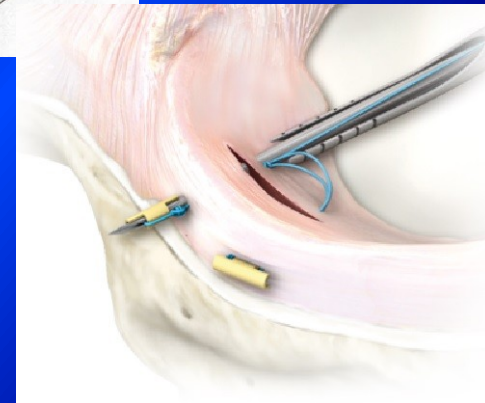
Outside – in



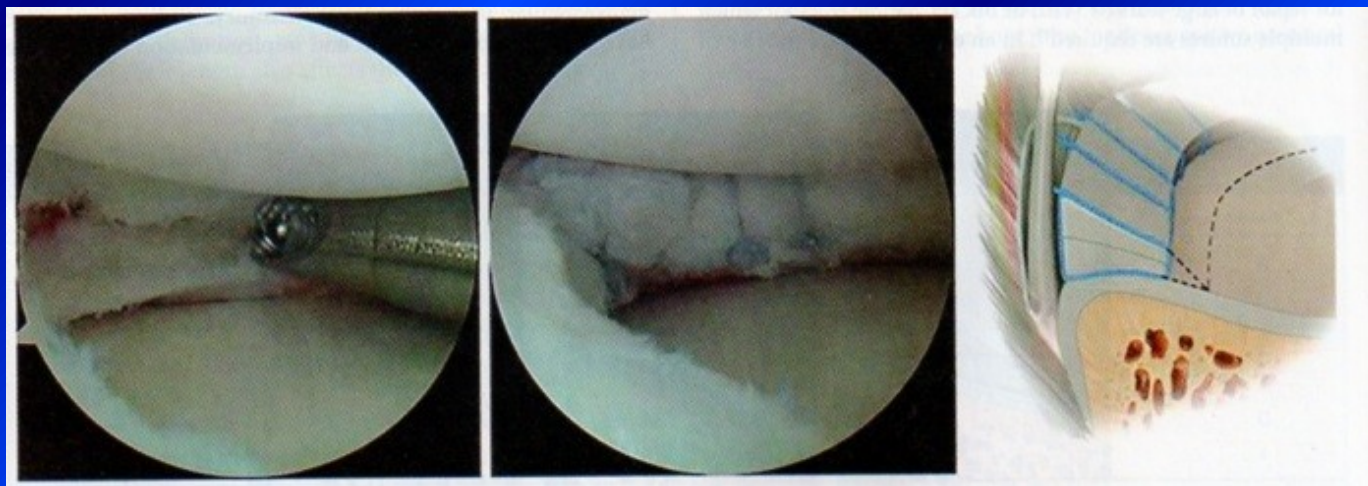
Inside – out



All – inside



- Excelentní výsl. zhojení u mladých pac.
- All – inside – kompresní cirkumferentní steh po obvodu léze



# Radiální ruptura

- Rpt. 60 % centrální zóny nemá vliv na  $\uparrow$  tlaku / kandidát parc. menisektomie /
- Rpt 90 % signifikantně  $\uparrow$  tlak – sutura
- Inside-out, All-inside, transtibiální technika / TT /
- Chronická léze – retrakce okrajů – gapping /  $\downarrow$  TT /



- A: Inside-out -horizontální matracový steh
- B: All-inside knot tying
- C: Transtibiální technika

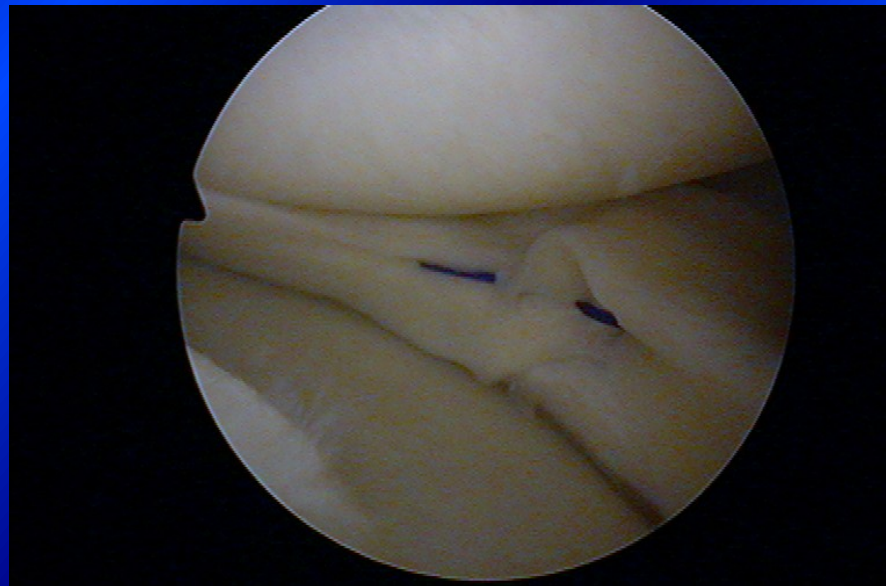
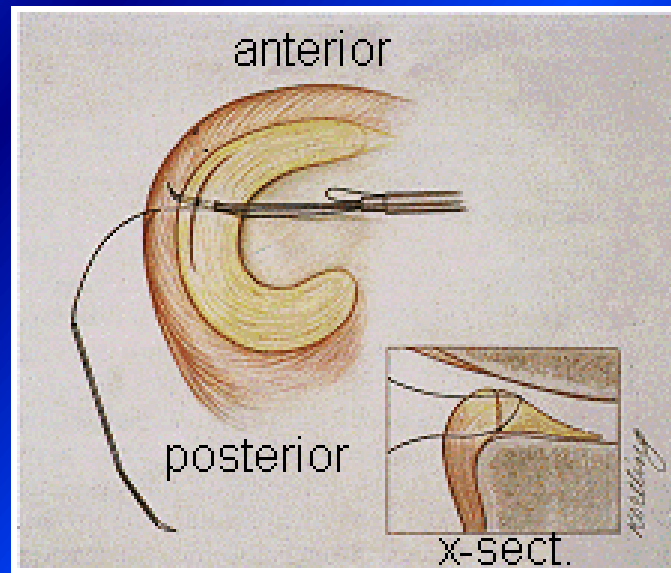


# Suture of meniscus- meniscopexis

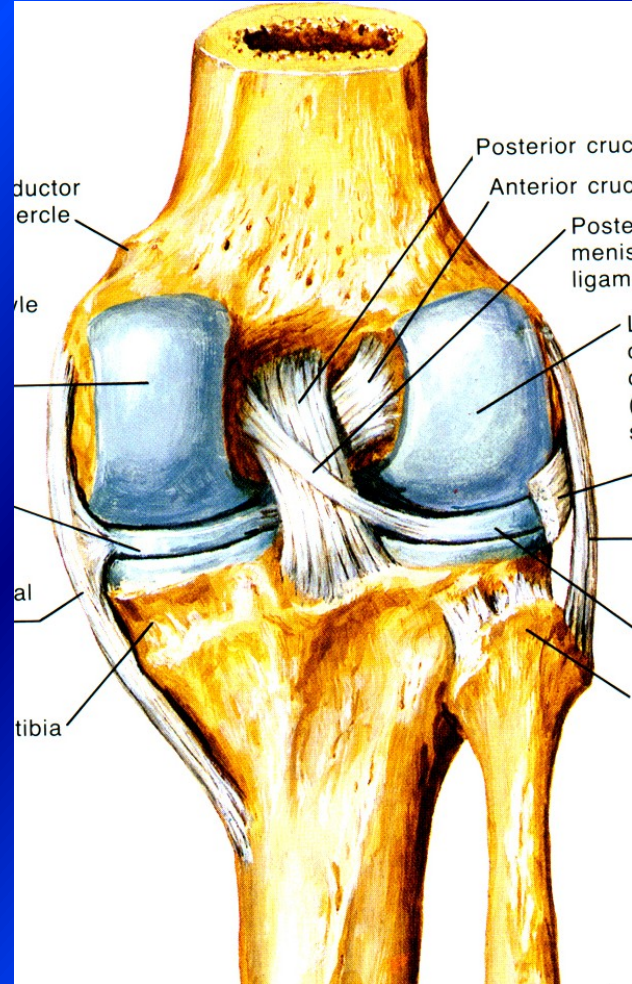
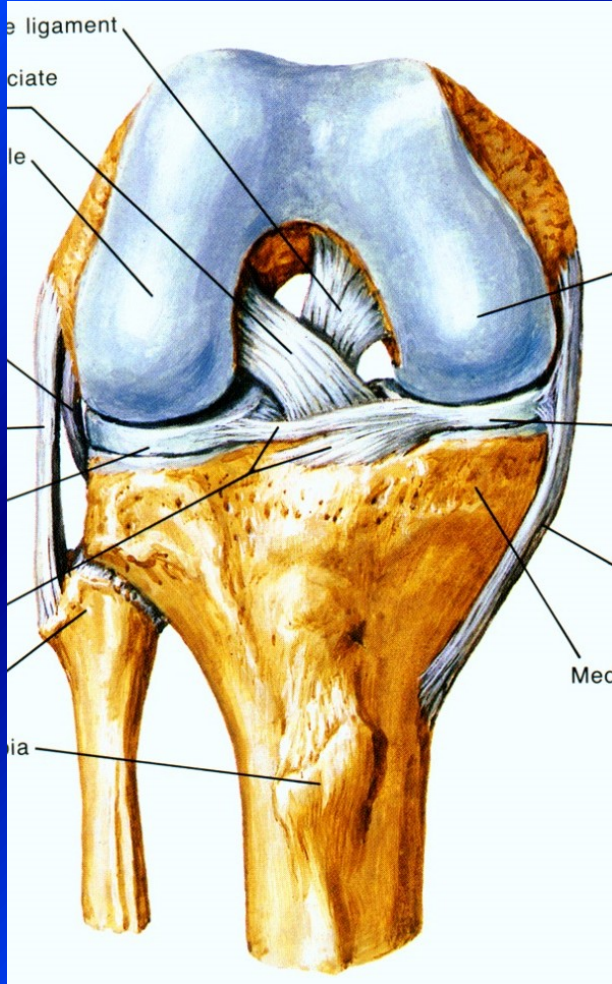
outside-in

inside-out

all-inside



# Ligaments- ACL, PCL



# Rupture of ligaments

- **Sprain**
- **partial rupture**
- **total rupture**
- Mechanism of injury
- Tests of stability

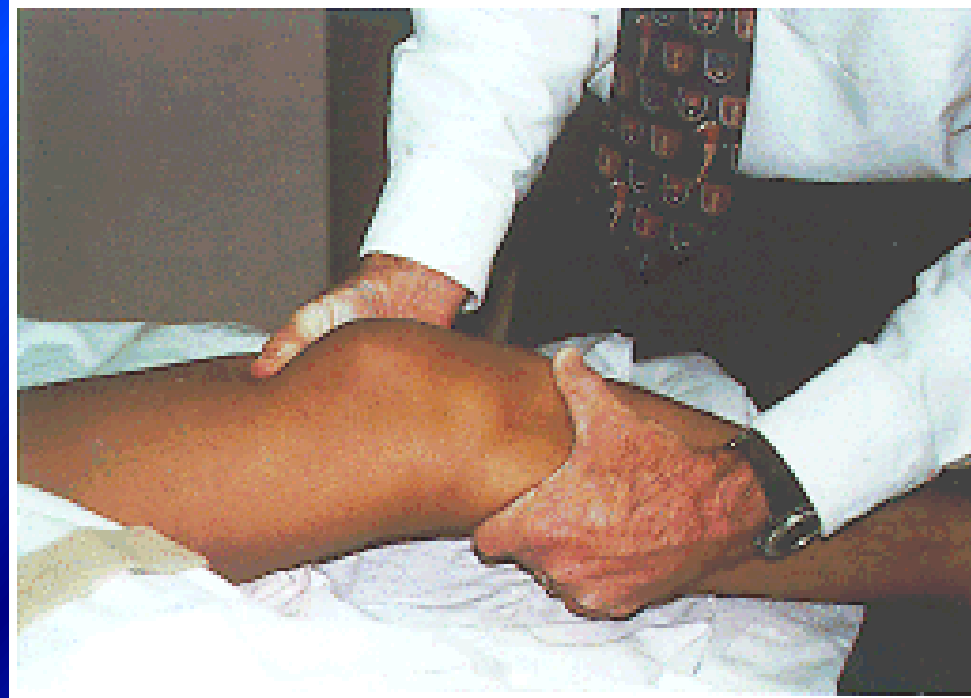


Unhappy trias



# Rupture of ACL

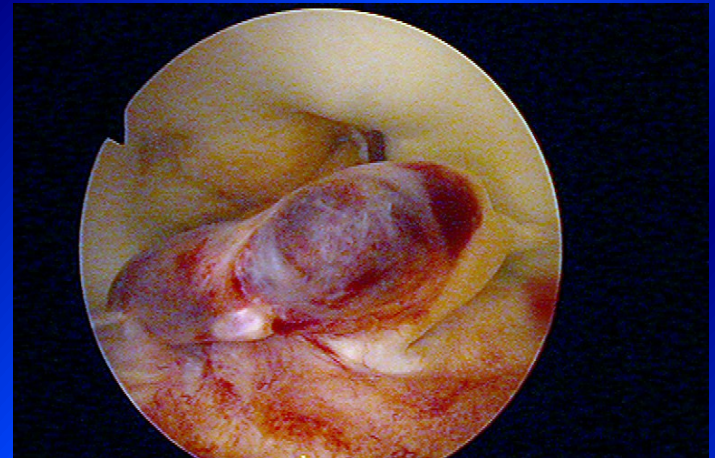
- Tests of stability
- Lachman test
- Anterior drawer sign
- Pivot-shift test



Lachmann test

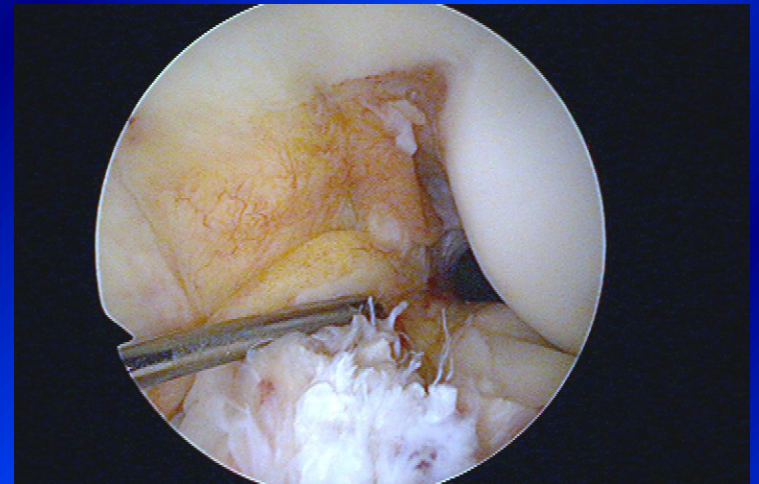
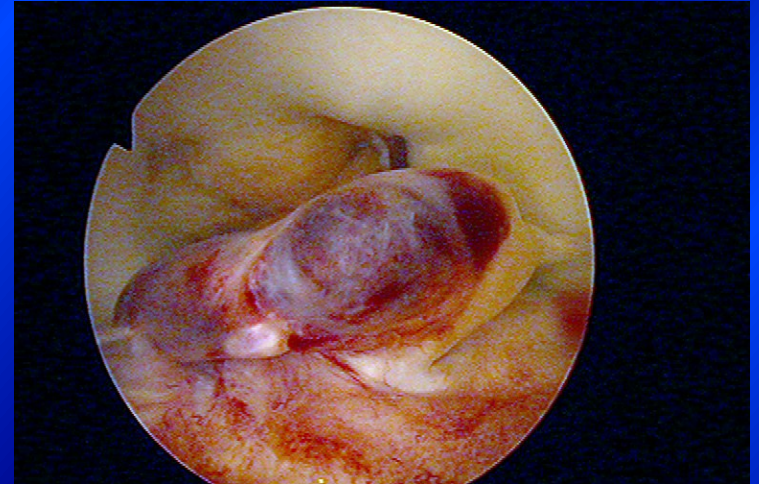
# Rupture of ACL

- Frequent injury



# Rupture of ACL

- Debridement
- Physiotherapy
- Limited activity
- Orthosis







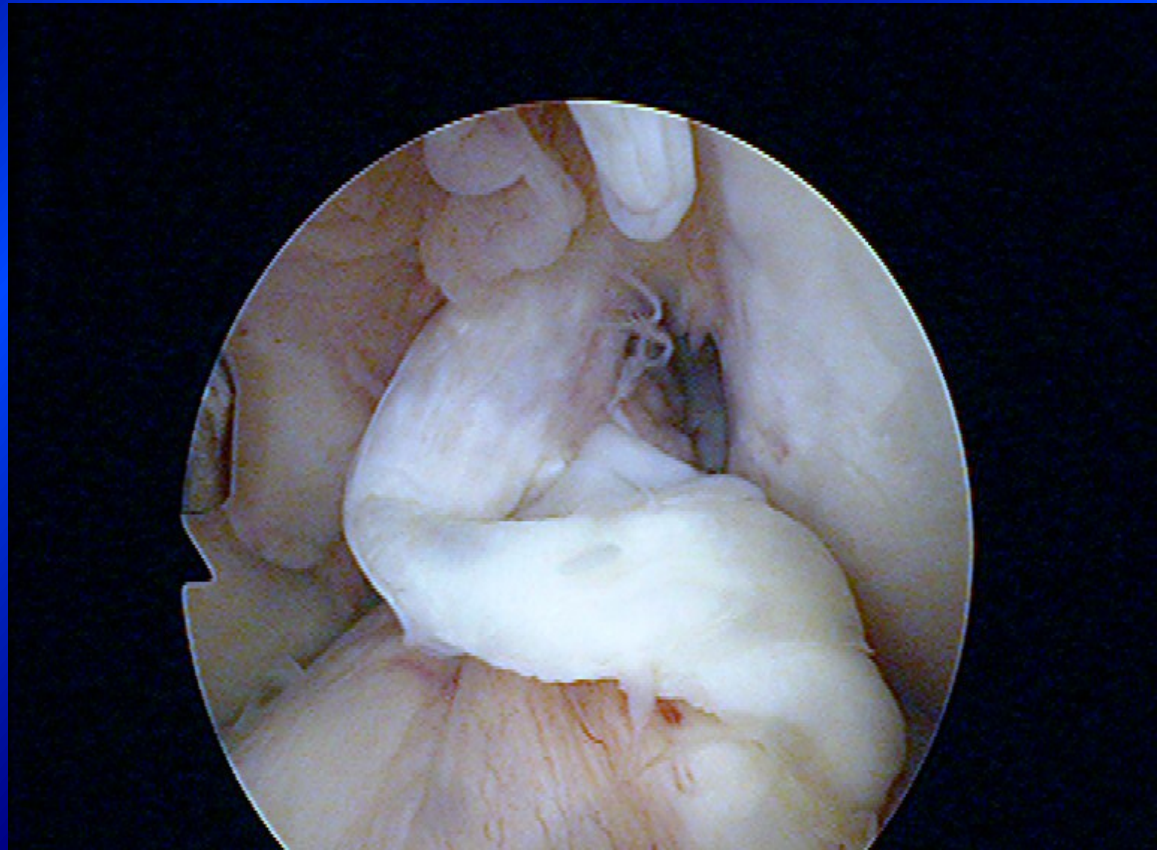
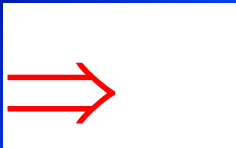
Physiotherapy



Orthosis

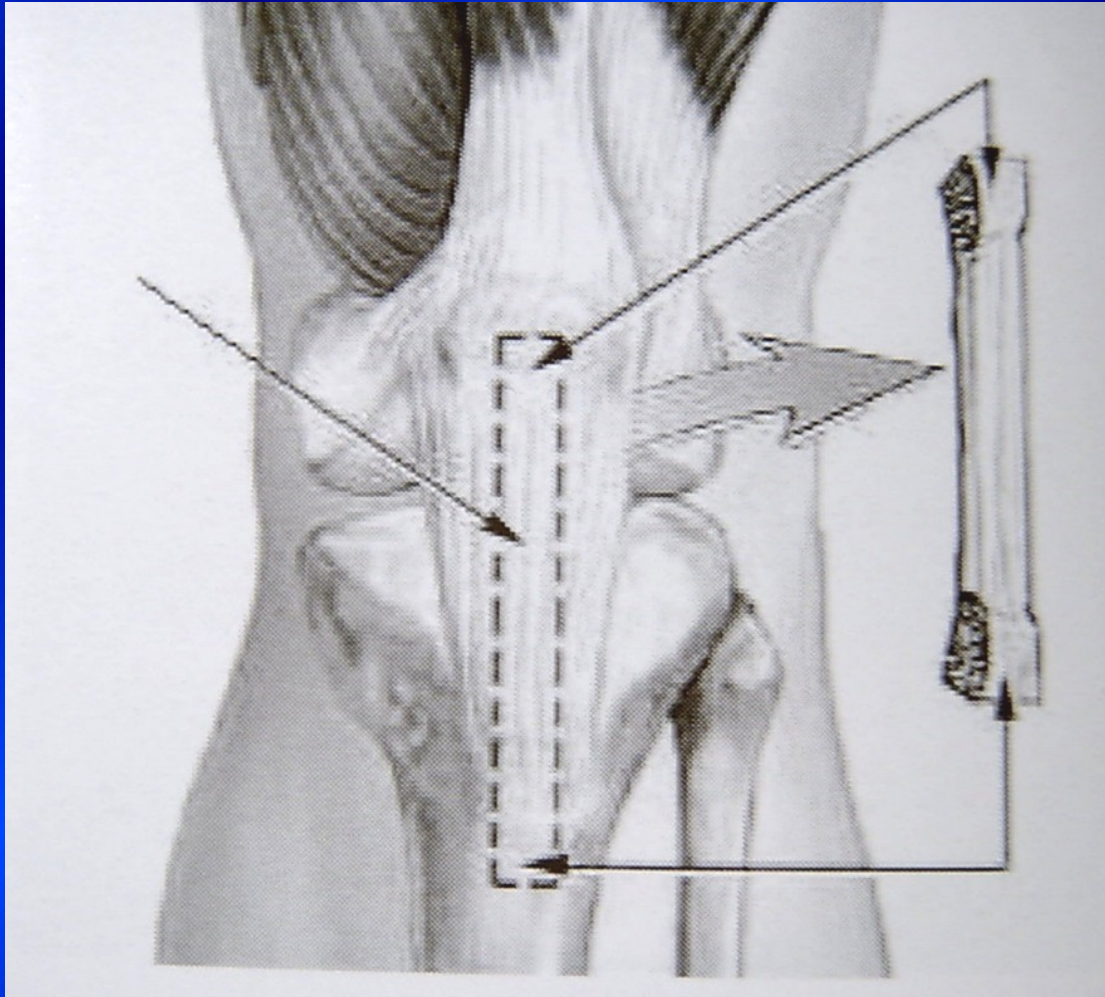
# Indication for reconstruction

- 1/3 of cases



# BTB graft

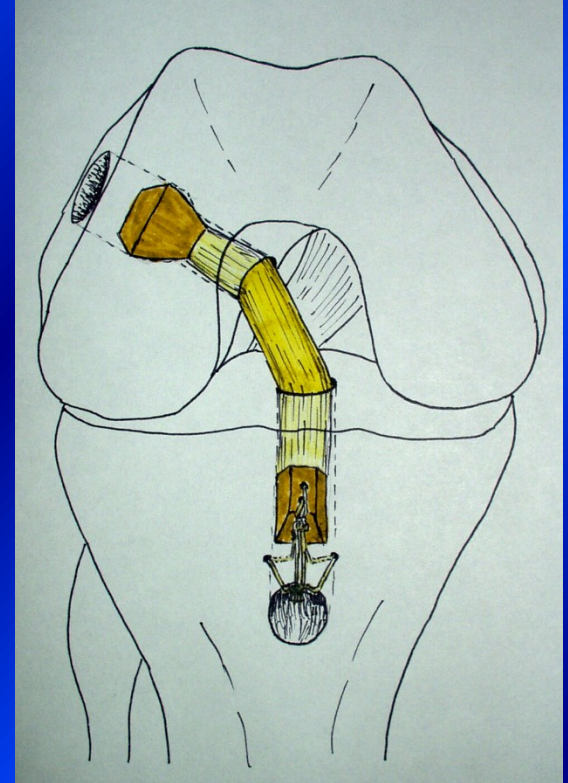
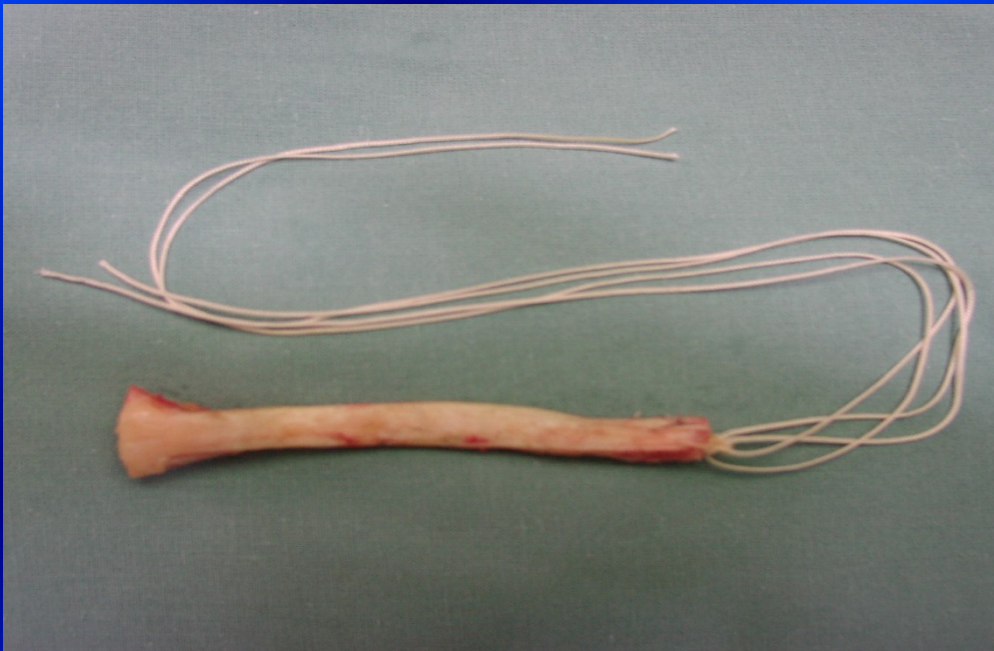
- Bone-Tendon-Bone





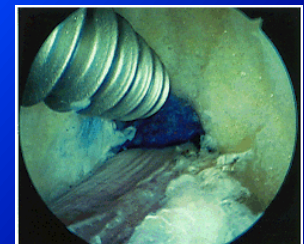
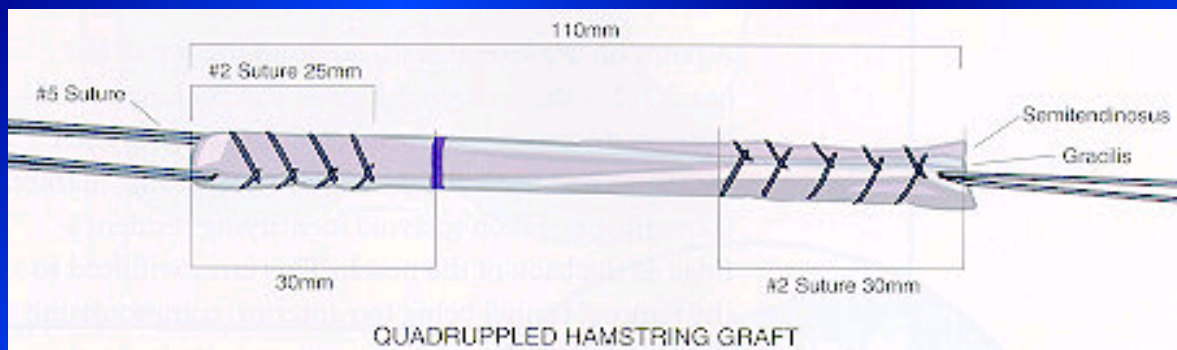
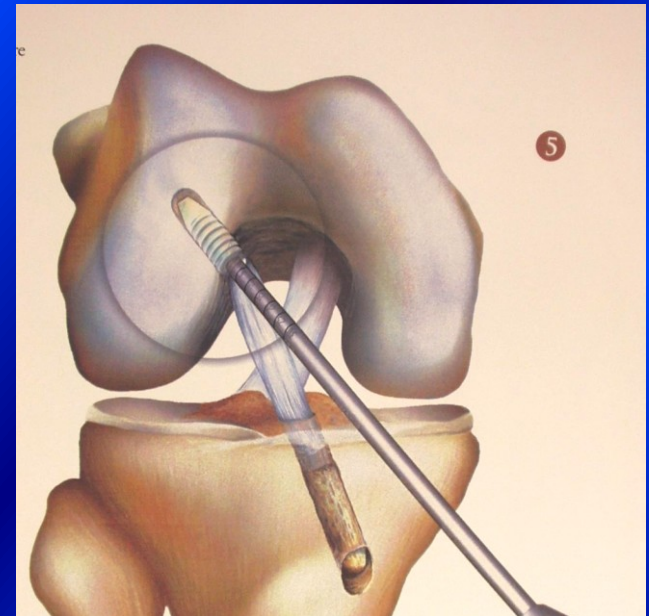
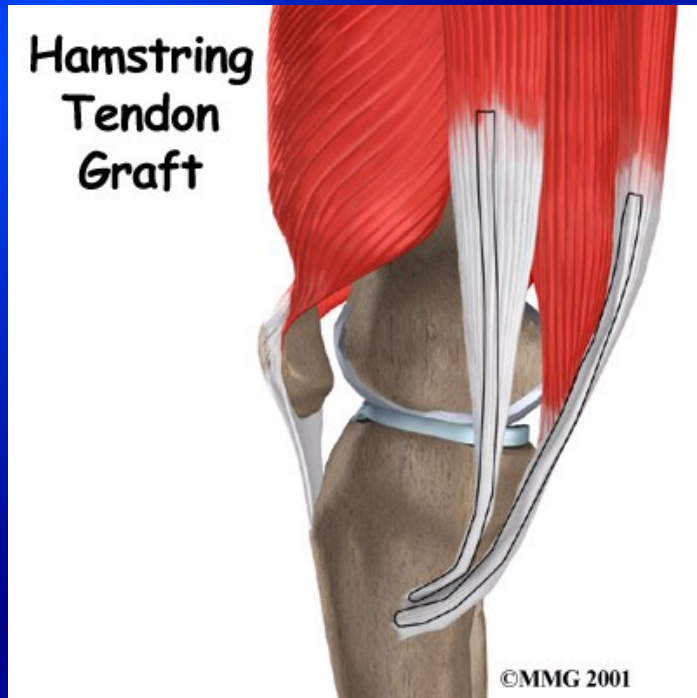
# BTB graft

- Bone-Tendon-Bone



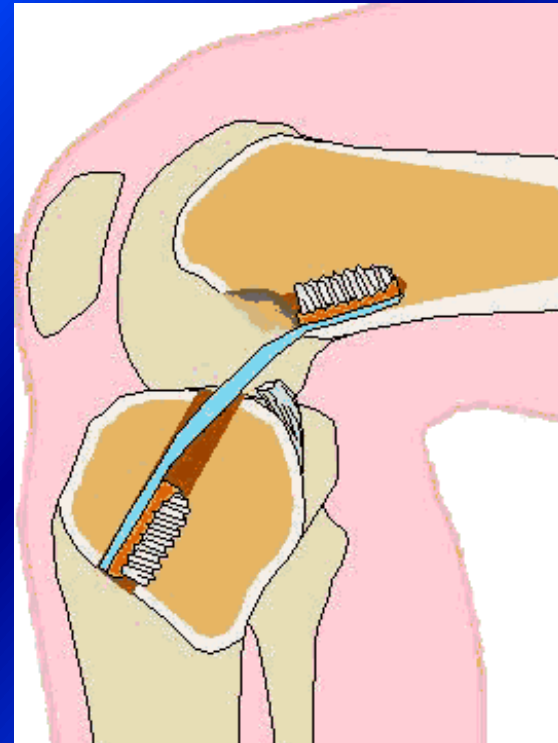
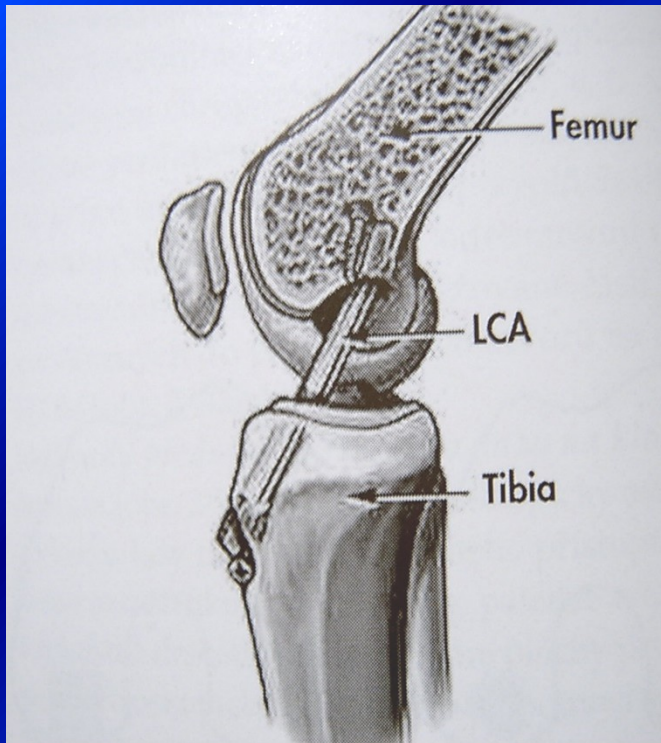
Press fit technique

# Hamstrings (m. semitendinosus + m. gracilis)



Fixation by screws

# Technique

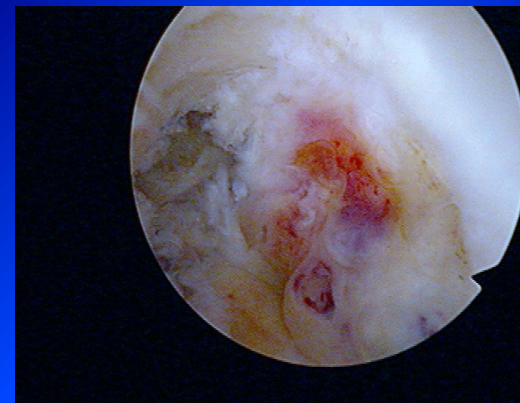
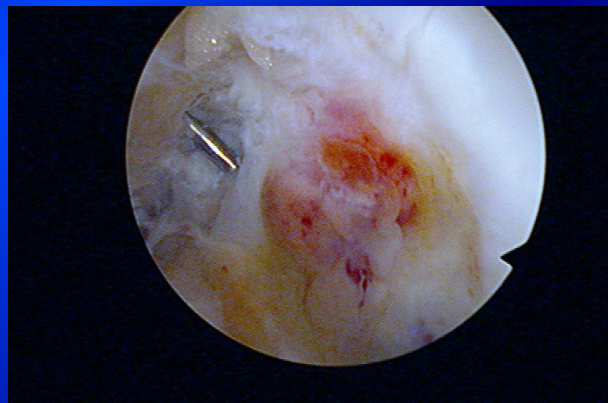
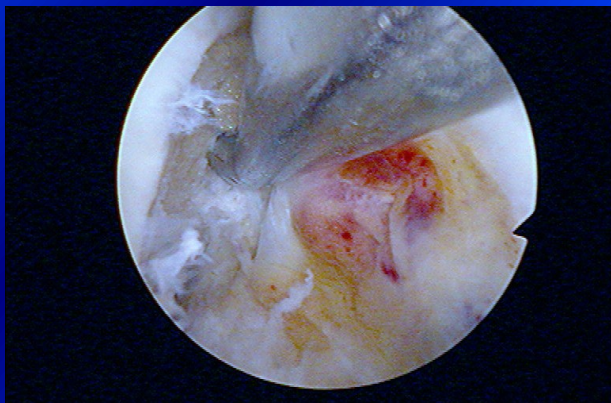




# ACL plasty- press fit technique

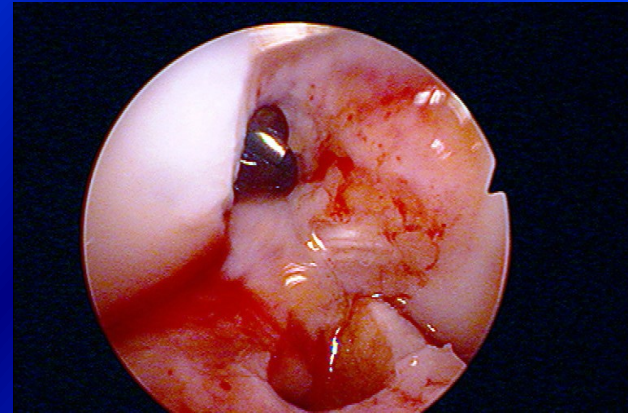
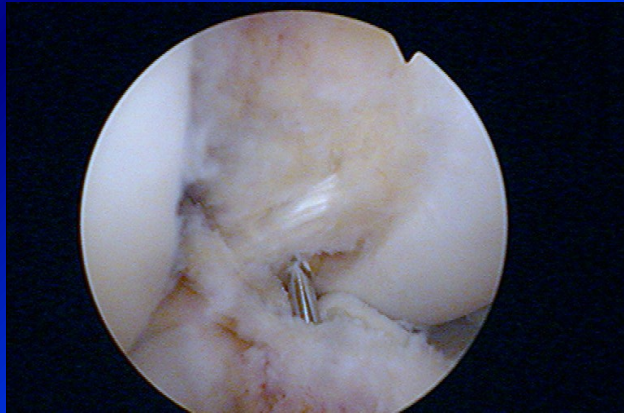


# Femoral canal



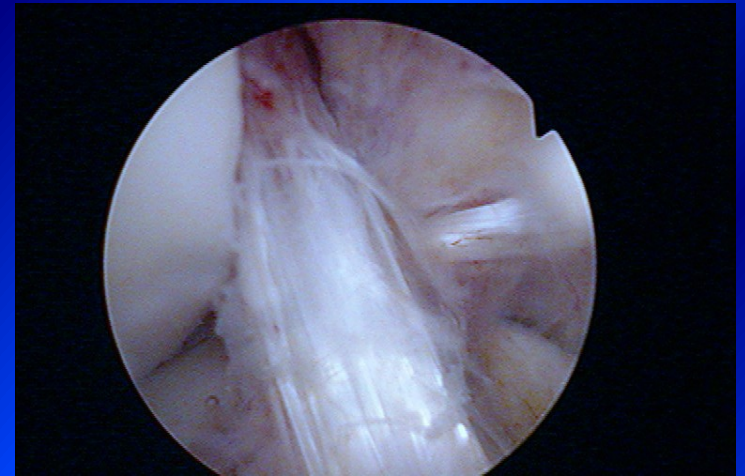
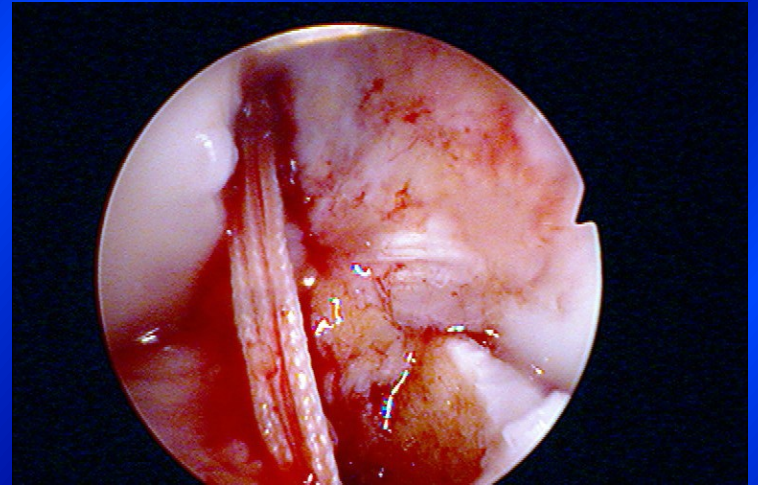


# Tibial canal





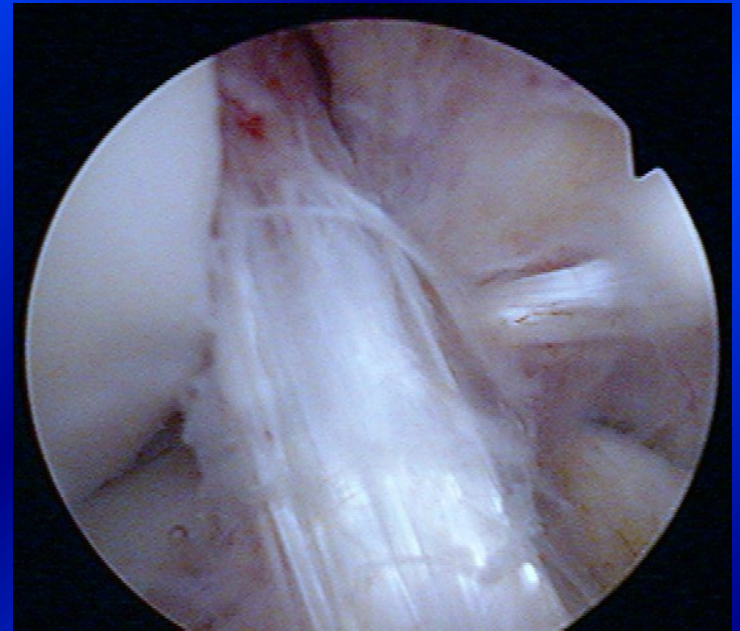
# Tightening of the graft



Graft in situ

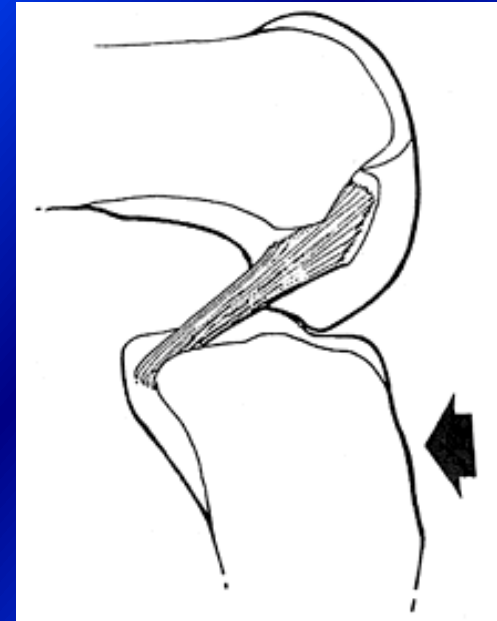
# Aftertreatment

- 6 weeks orthosis
- Weight bearing after 6 weeks
- Sports activity after 9 months



# Rupture of PCL

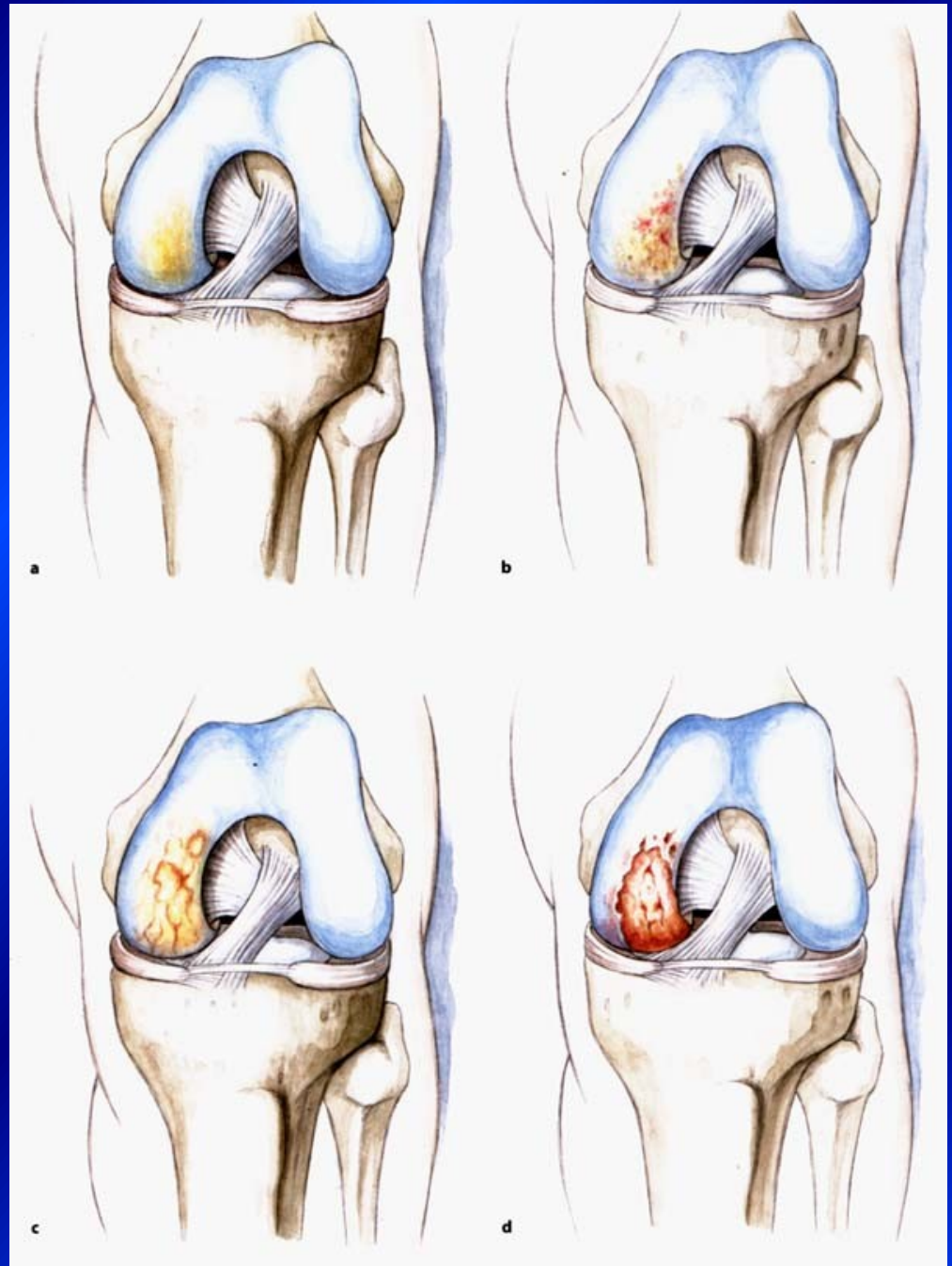
- In **dashboard injury**
- **Posterior drawer sign**



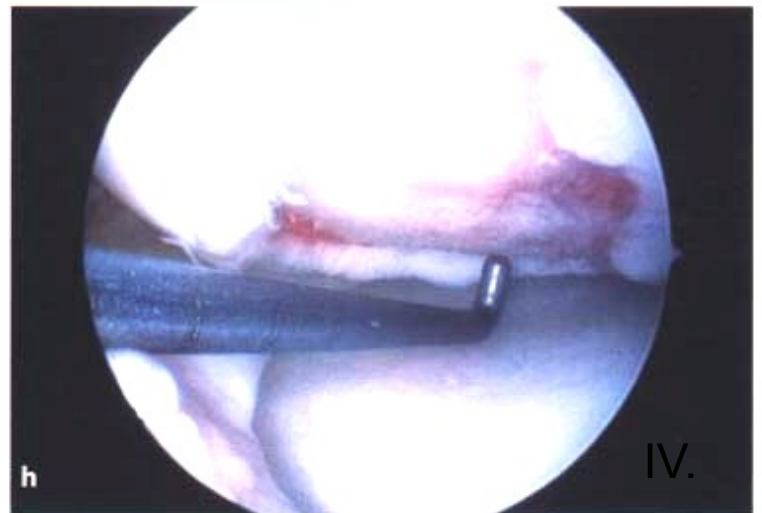
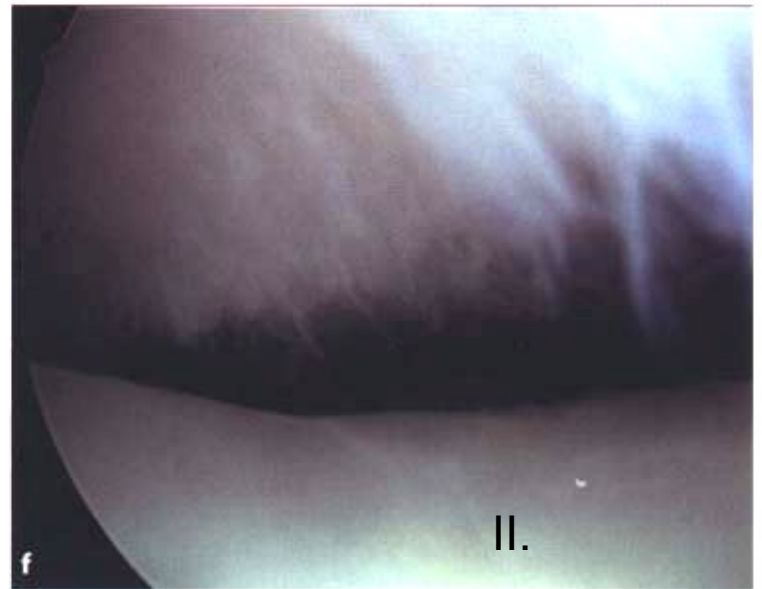
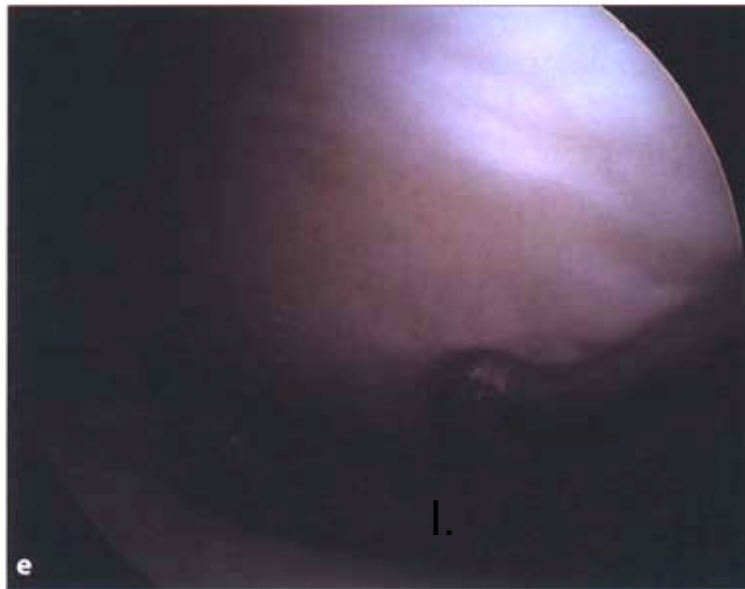


# Chondropathy

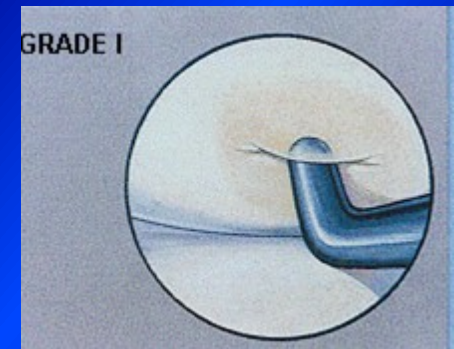
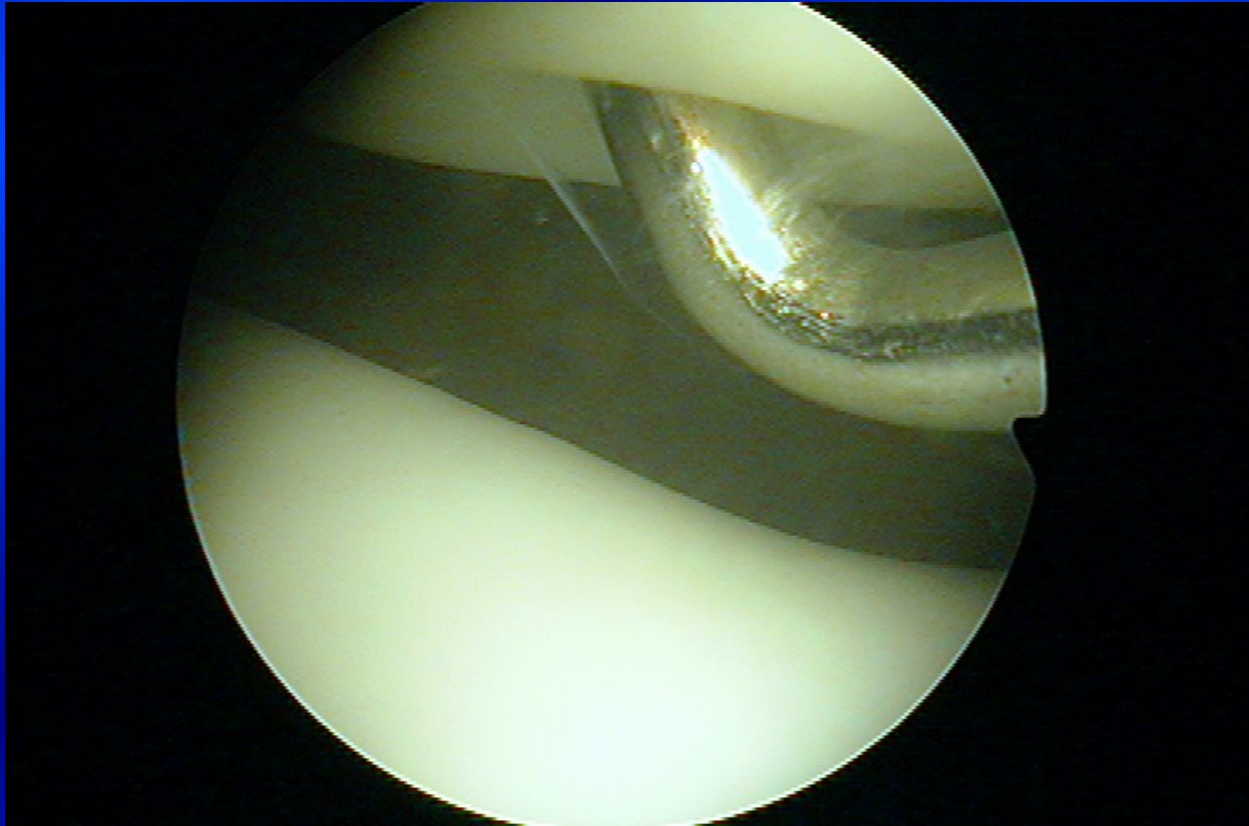
Outerbridge. H.K.



# Chondropathy



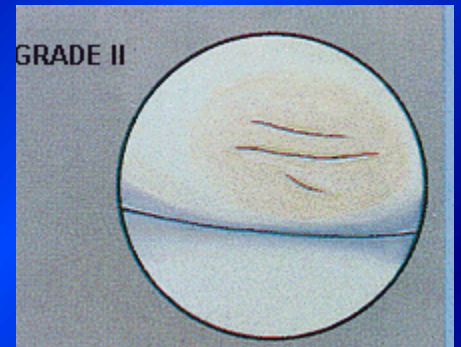
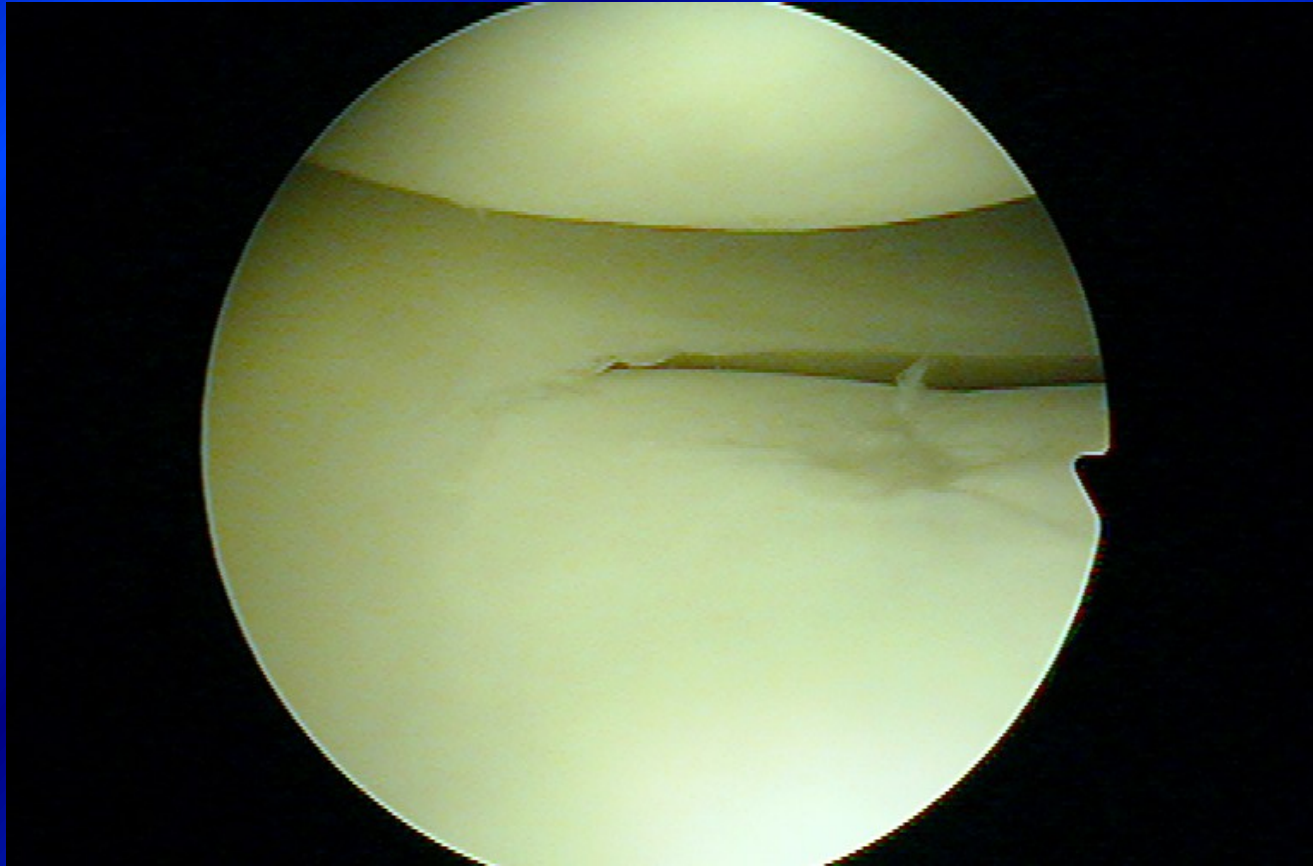
# Chondropathy I. st.



**Soft cartilage, chondromalacia**

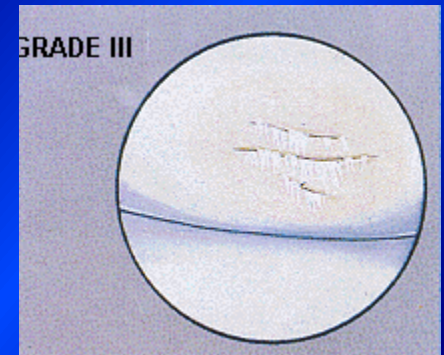
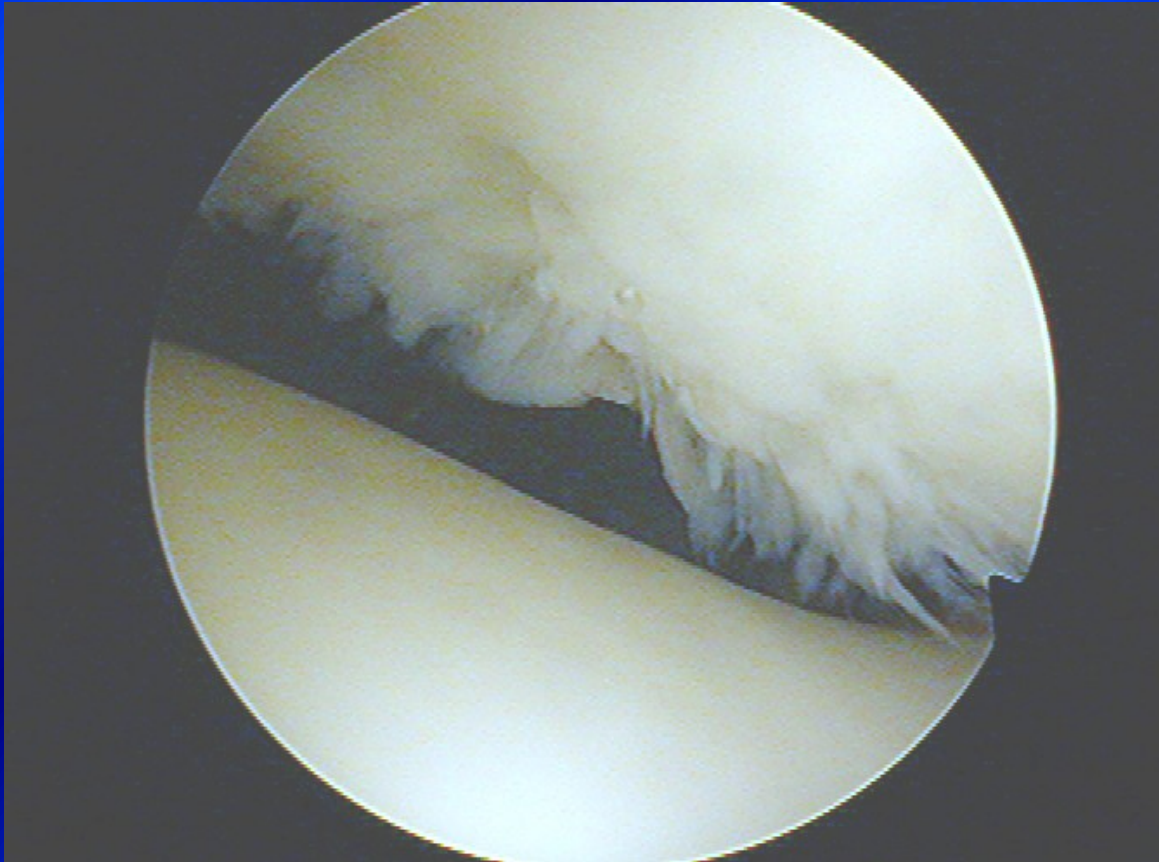


# Chondropathy II. st.



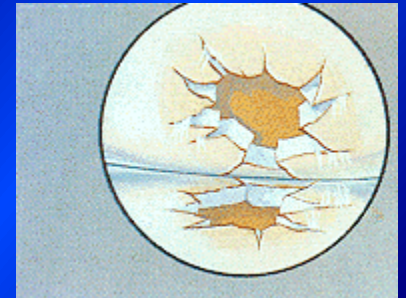
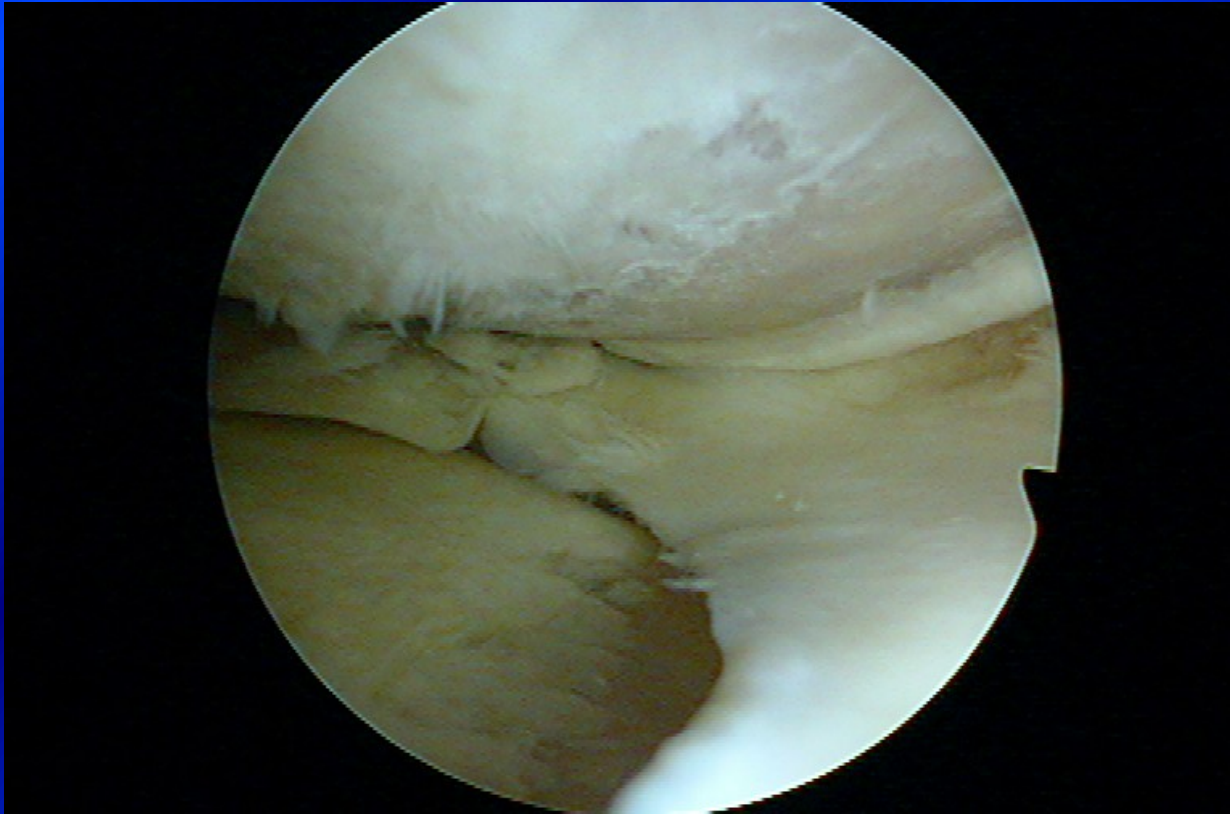
**Fissures in the cartilage**

# Chondropathy III. st.



Fibrillation- „ crab meet“

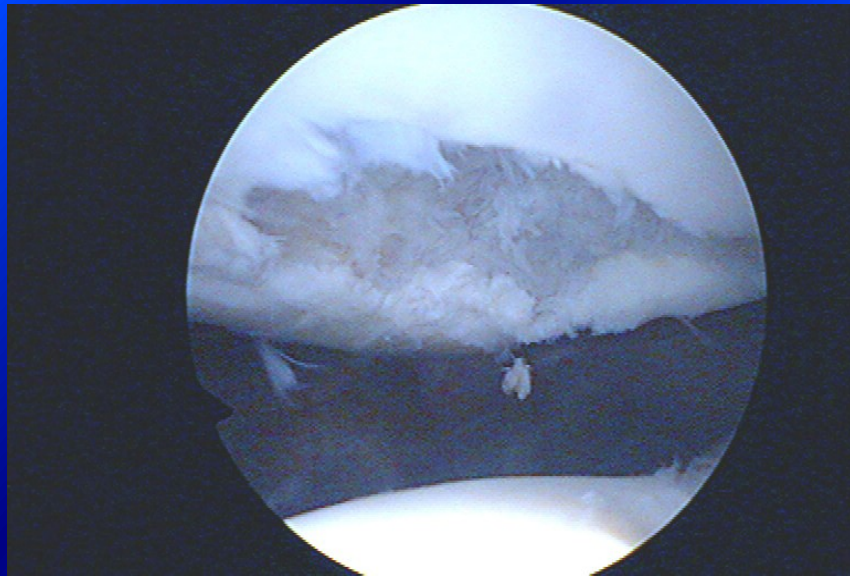
# Chondropathy IV. st.



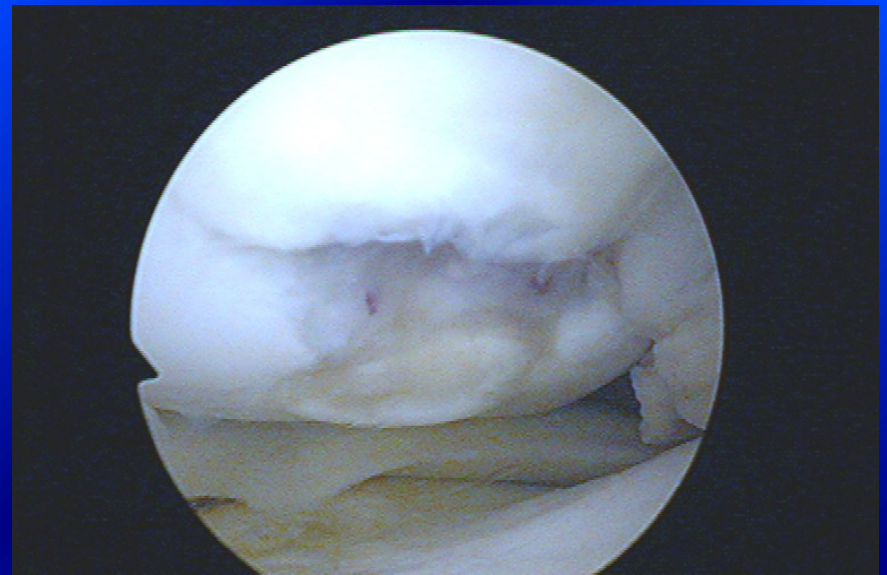
**Defects to subchondral bone**



# Defects of cartilage

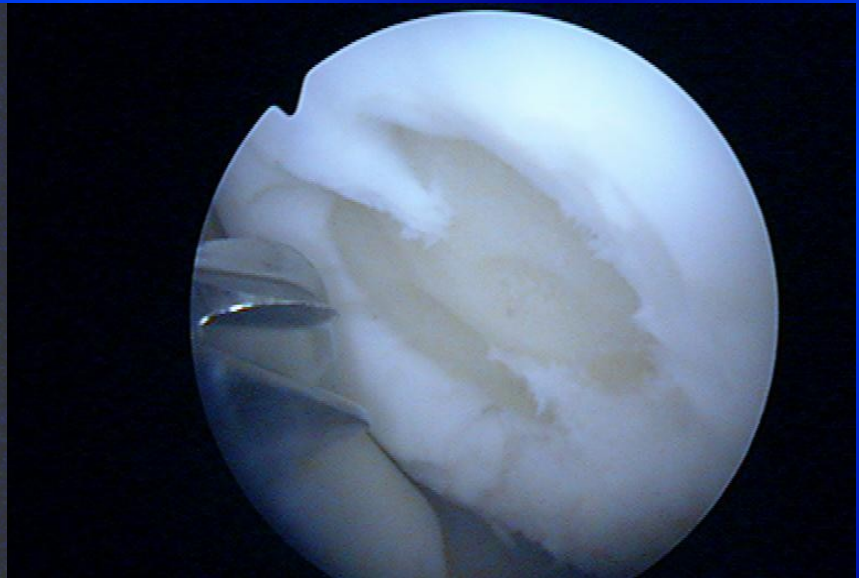
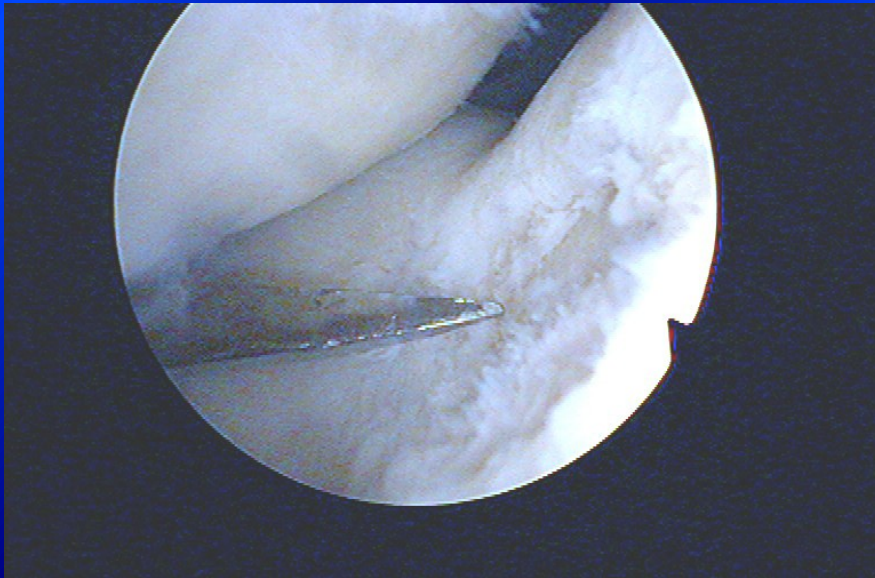


**Patella**



**Medial condyle**

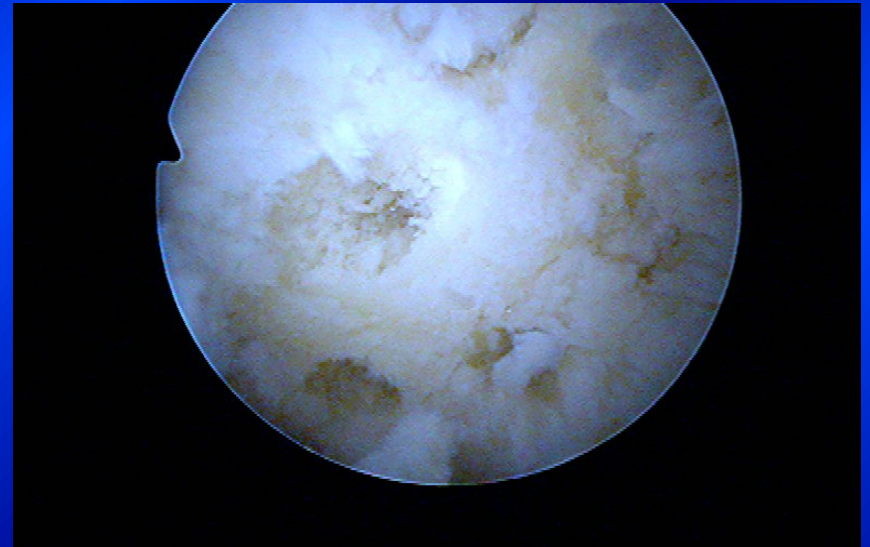
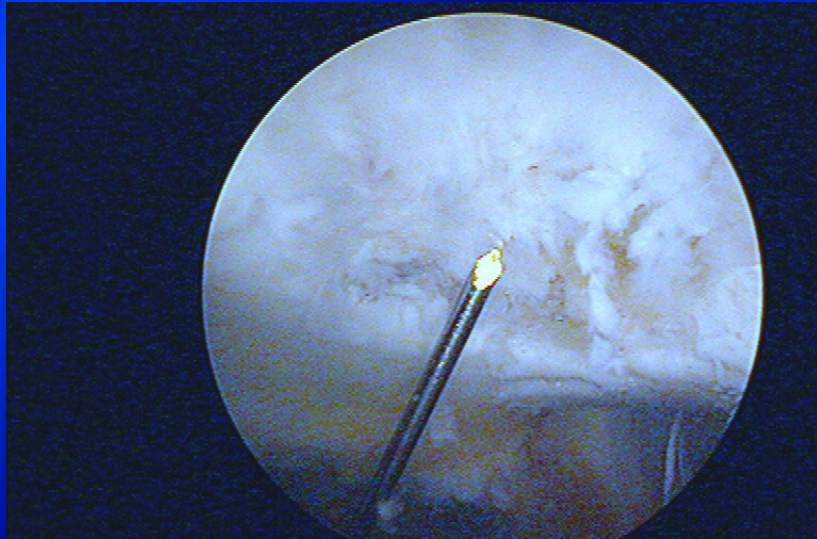
# Shaving and drilling



-

-

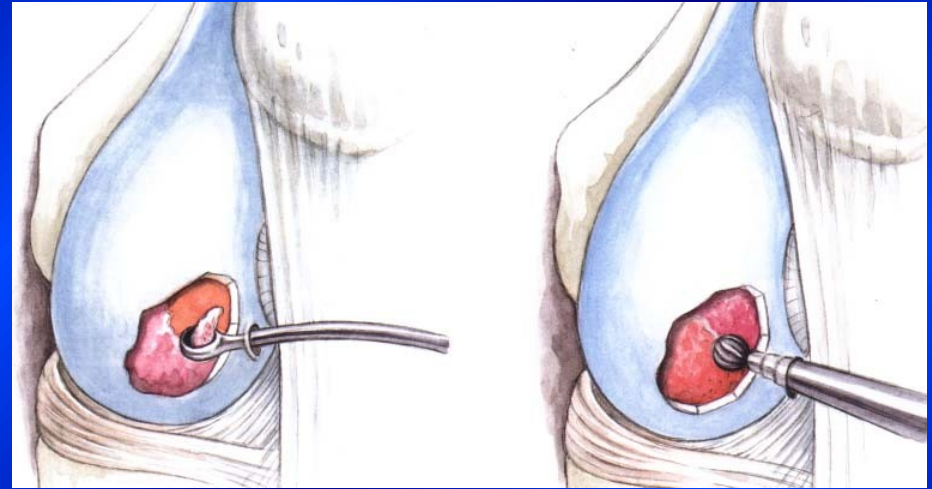
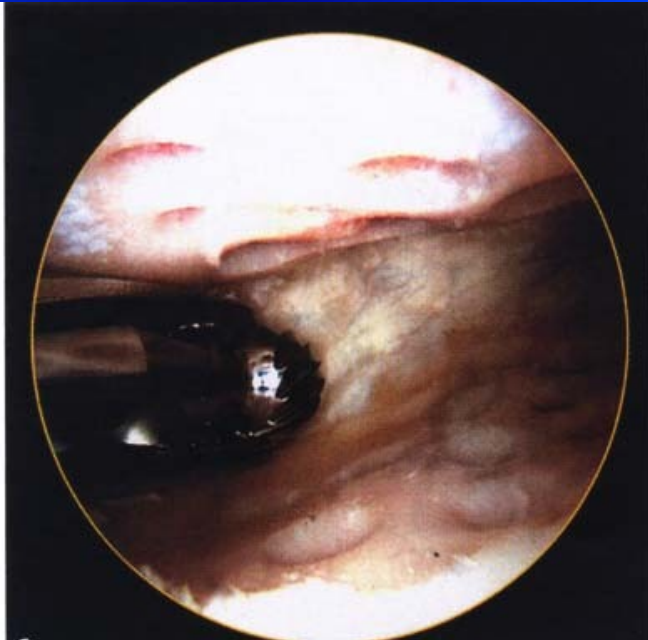
# Drilling





# Abrasion chondroplasty

Curretage  
Shaver



# Microfractures

Perforation of subchondral bone  
- slight bleeding

Steadman, J.R., 1999

Multipotent stem cells into  
the defects

The aim- to create fibrocartilago



# Microfractures

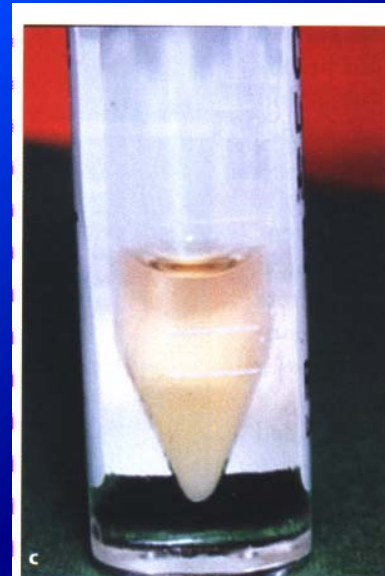
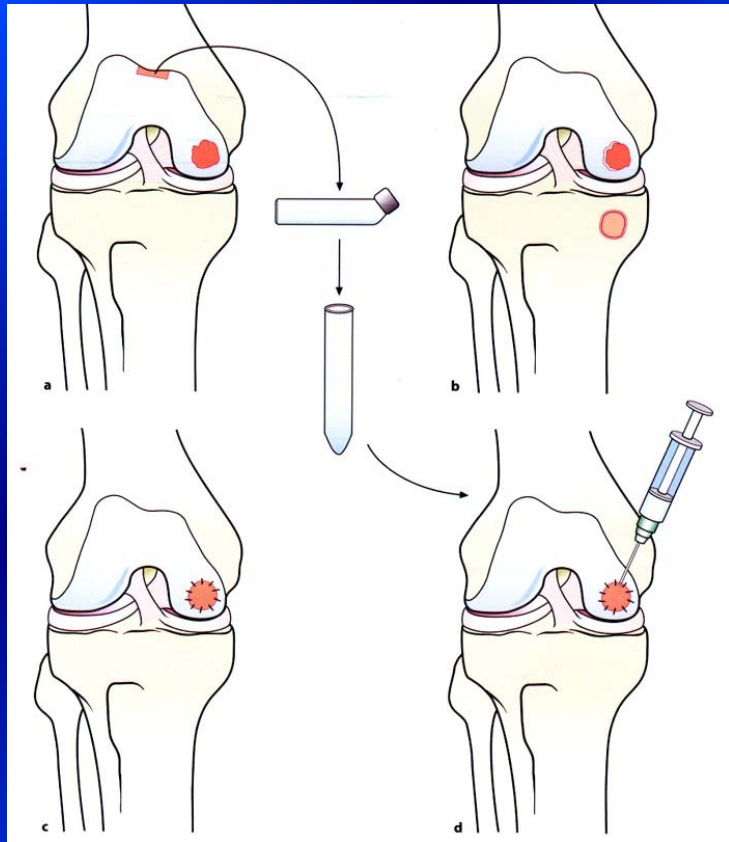




# ACI – autologous chondrocyte implantation

Transplantation of autologous chondrocytes  
into defects of cartilage

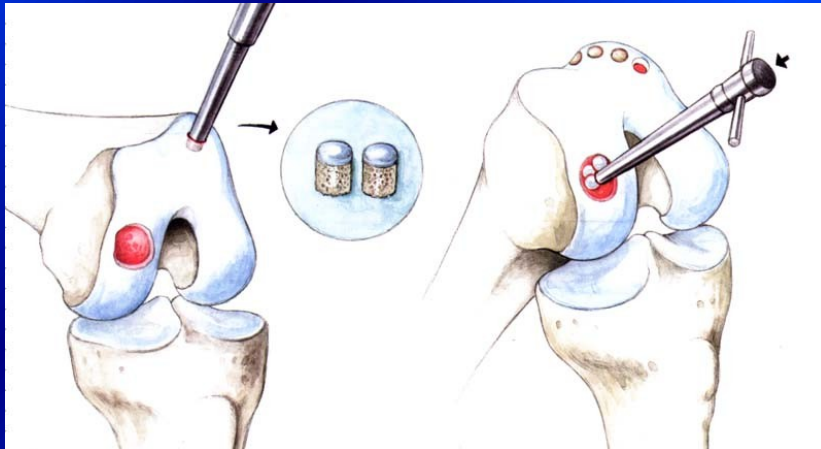
Chondrocytes in suspension under periosteal layer



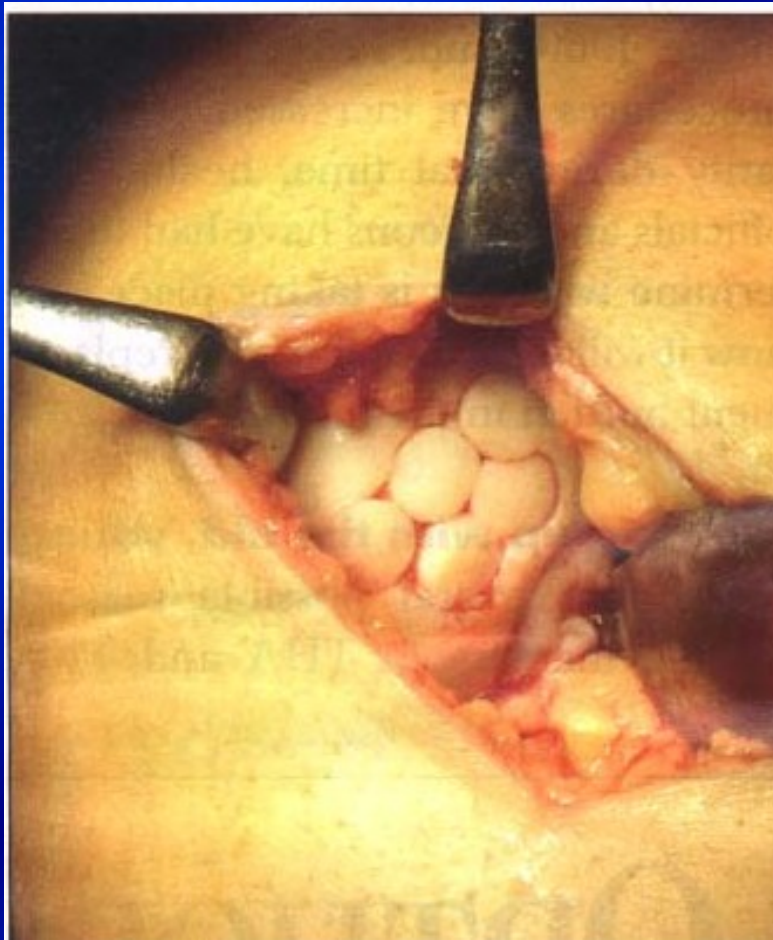
# Osteochondral autograft transfer- OAT

## Mosaic plasty

Hangody, L., 1992  
Defects up to 2 - 4 cm<sup>2</sup>



OAT



4 years after surgery

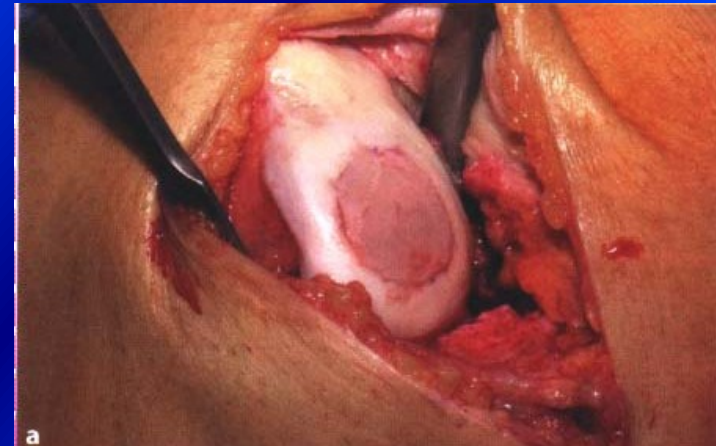


# Hyalografts and chondrografts

Scaffolds- HyaloFast, Chondrotissue...

Biodegradable

Matrix for stem cells from bone marrow  
after drilling or from serum



Collagen scaffolds

# Hyalofast- scaffold

Polymer of HA

No special fixation

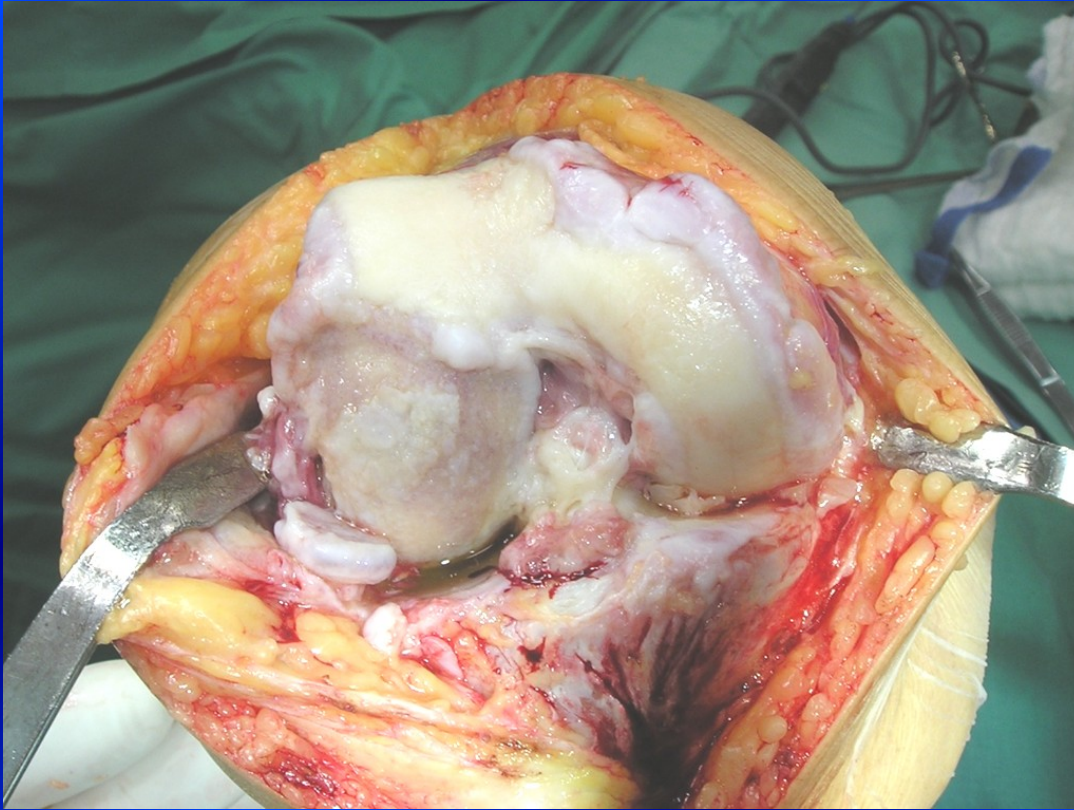
Scaffold serves for maintaining of stem cells from bone marrow

Supports viable cells

Fills the defects of hyaline cartilage

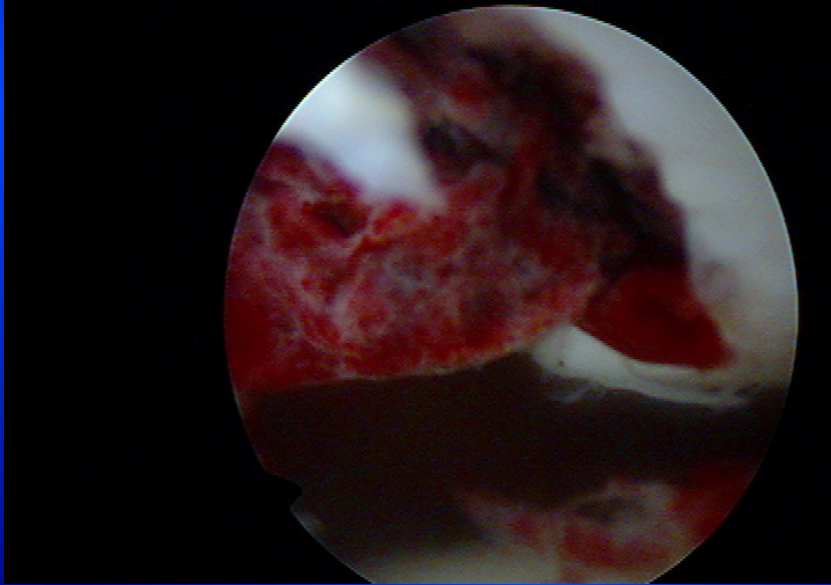


# Osteoarthritis

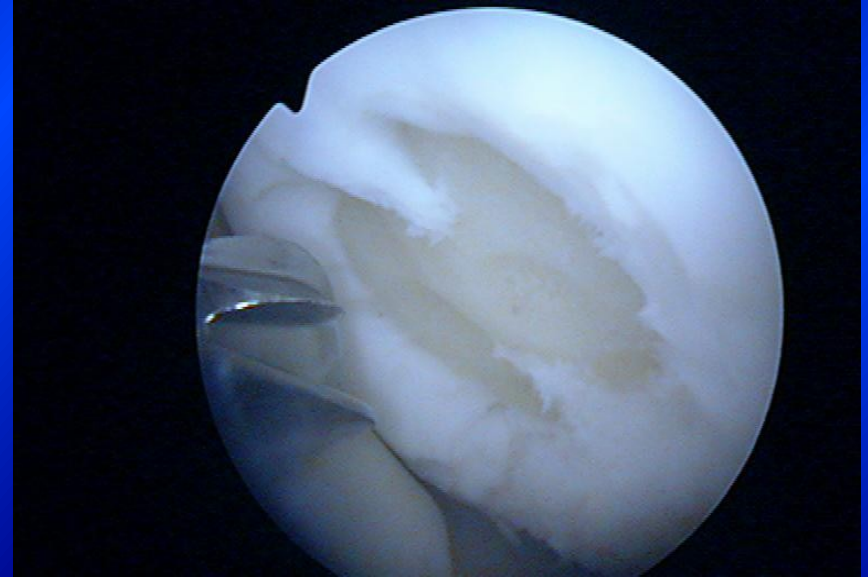




# Transchondral fractures



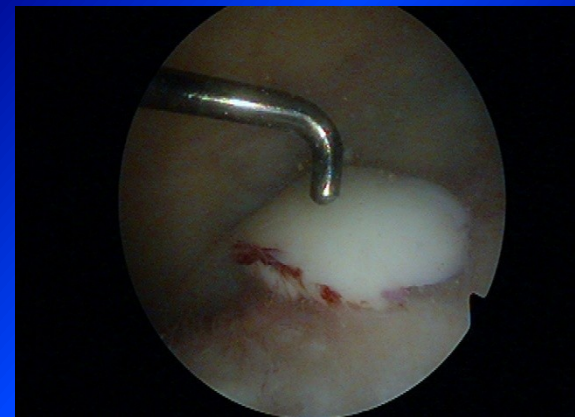
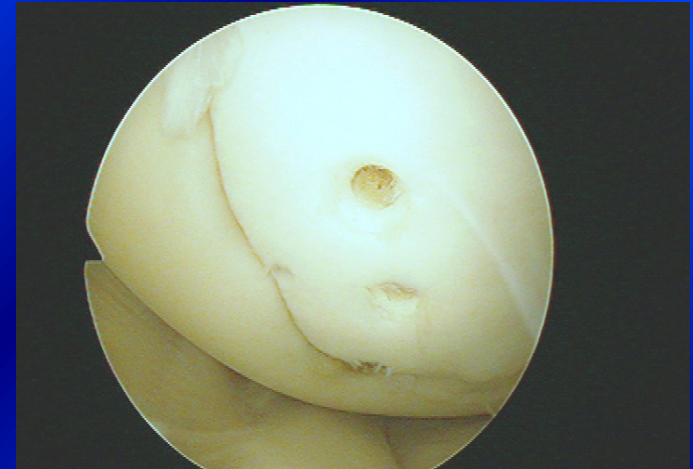
**Removal**



- **Subchondral abrasion**
- **Drilling**

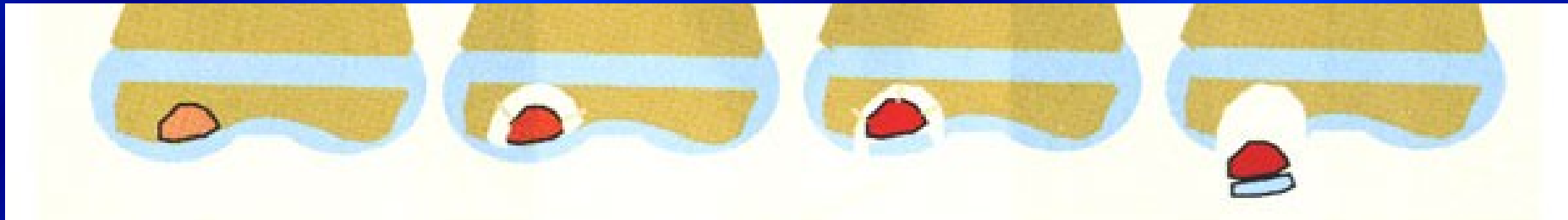
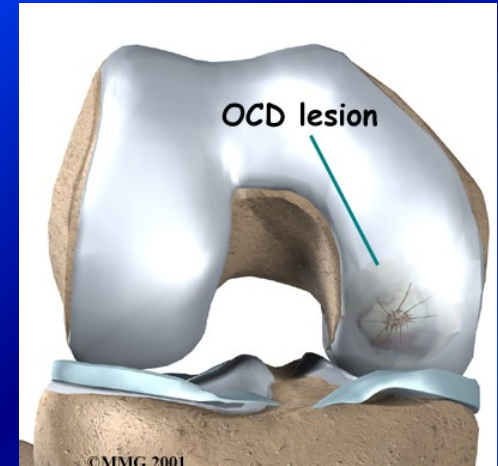
# Osteochondral fractures

- Removal
- Fixation
- Loose body



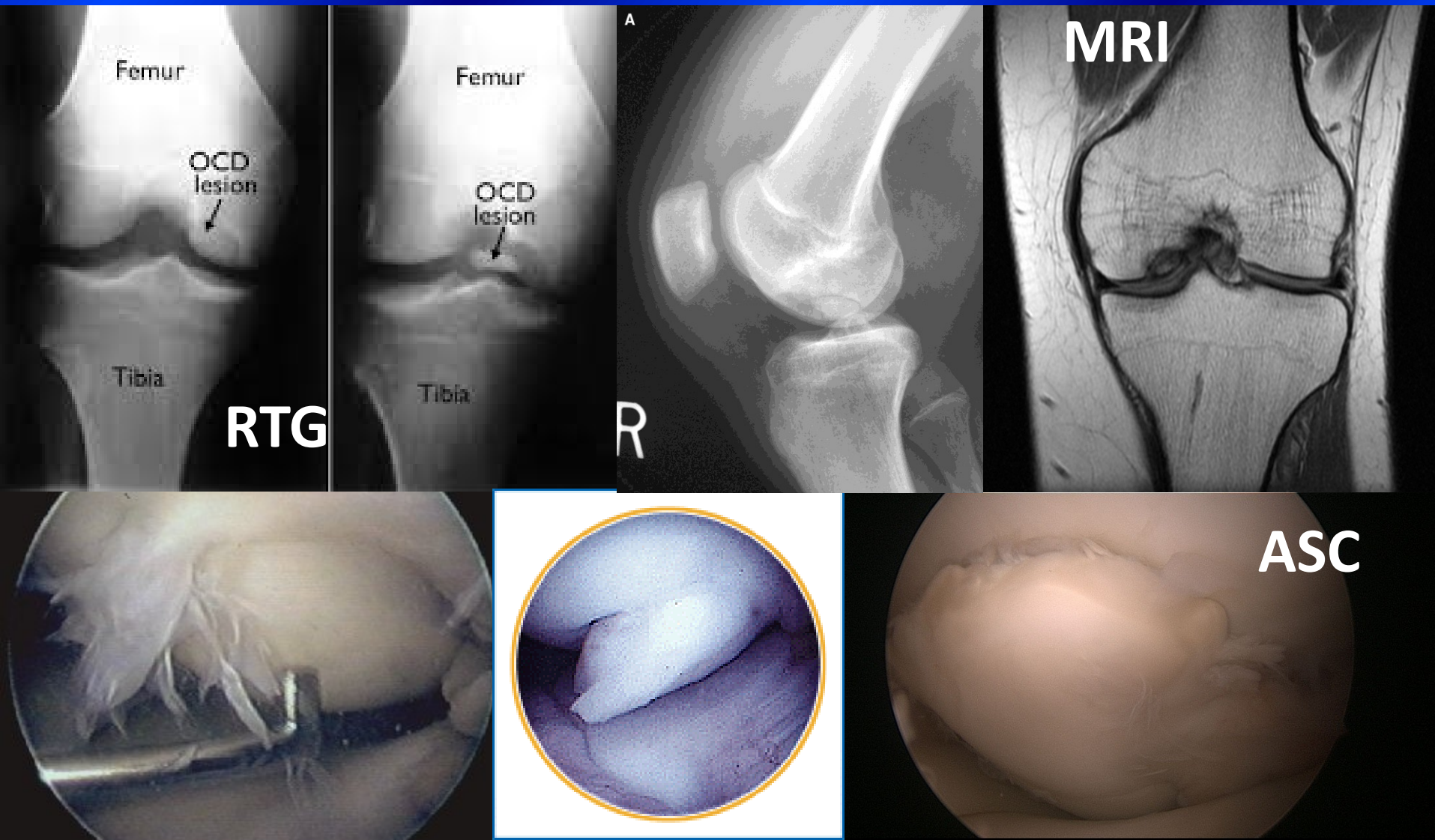
# Osteochondritis dissecans

- Local necrosis in subchondral bone
- Mostly on medial femoral condyle
- Etiology- trauma, microtraumatisation
- vascular

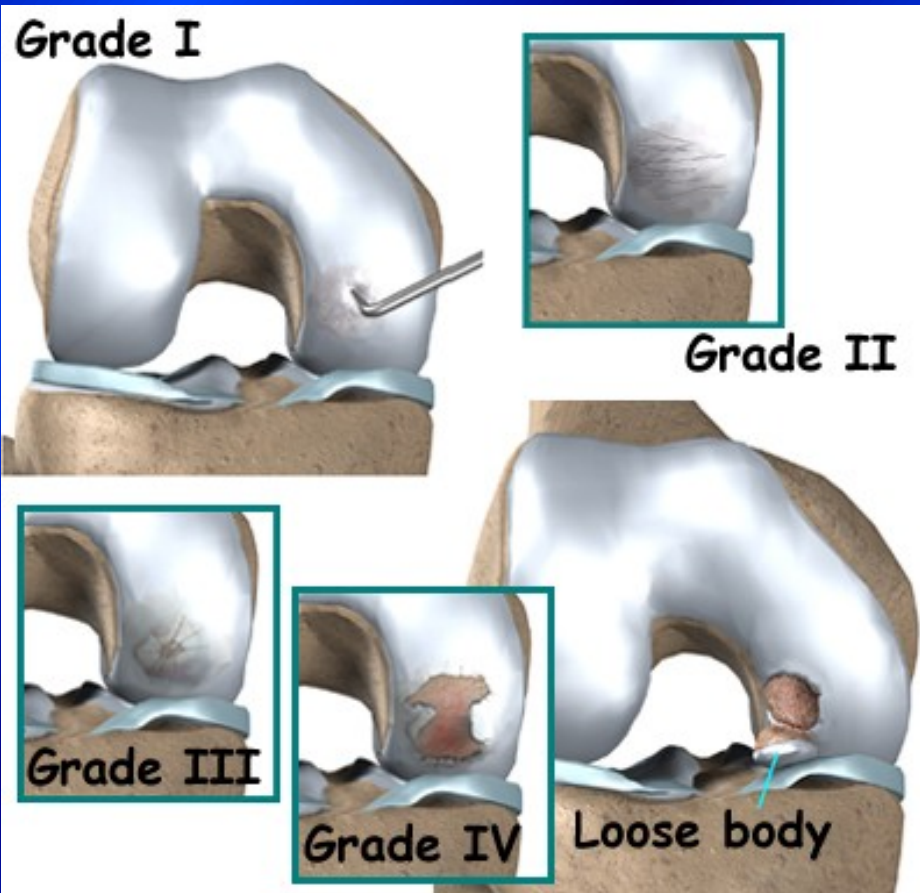




- Diagnostics:  
X ray, MRI, CT, arthroscopy



# ASC classification



## X ray classification

1. Negative
2. radiolucency
3. Sclerosis
4. Loose fragment

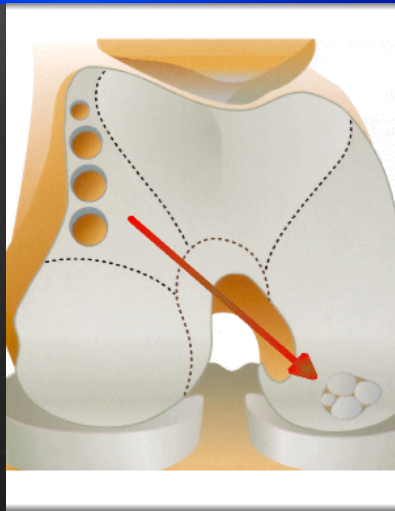
# Therapy

## Juvenile form

- conservative
- ASC drilling

## Adult form

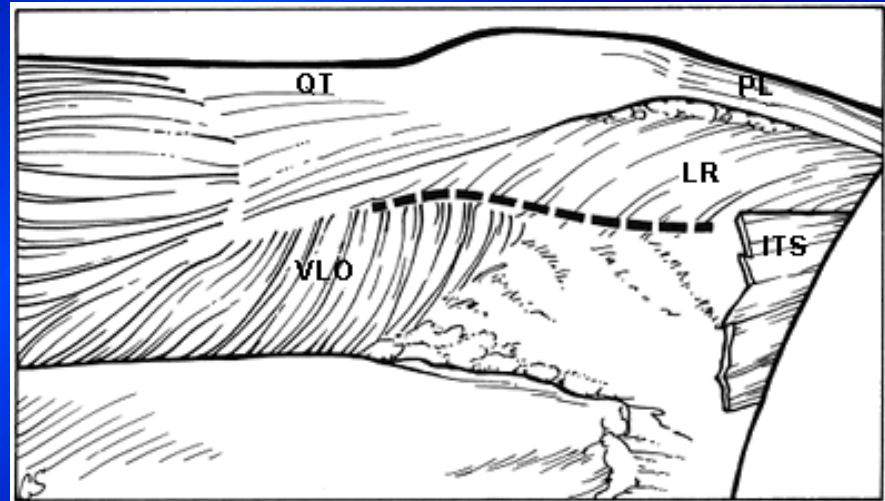
- Drilling
- Fixation of the fragment
- debridement, drilling
- Bone grafting
- Mosaic plasty
- Chondrografts





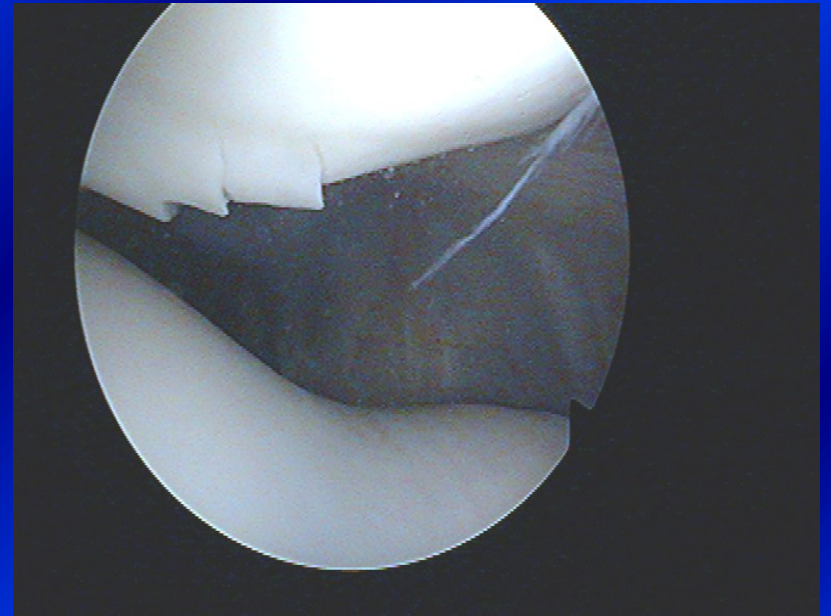
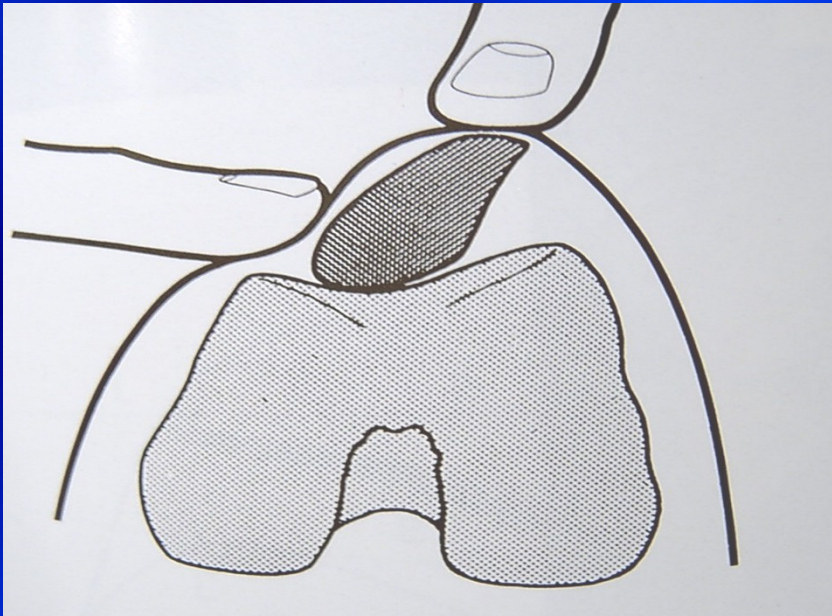
# Patella

- Chondropathy
- Subluxation
- Dislocation



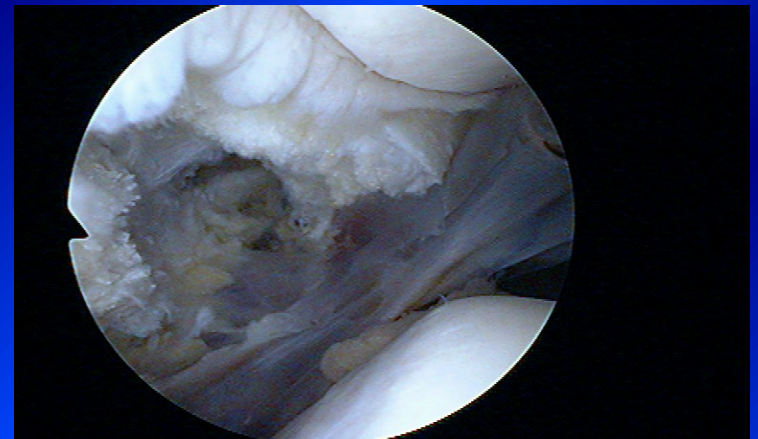
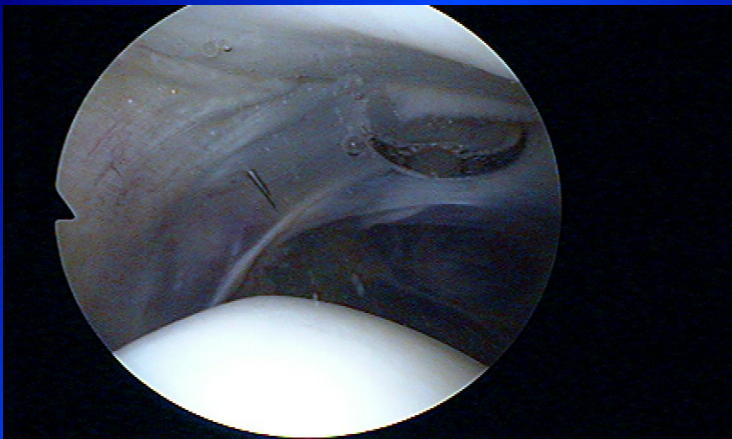
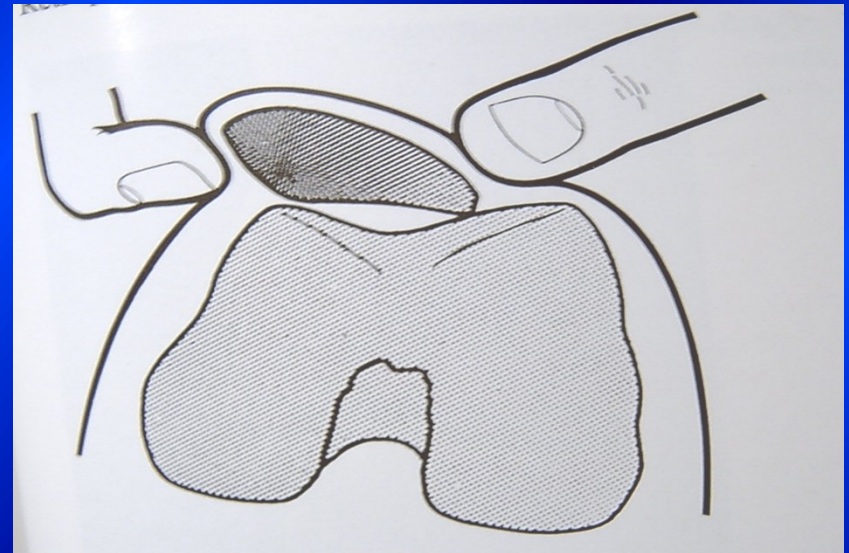
# Chondropathy of the patella

## Clinical symptoms



# Chondropathy of the patella

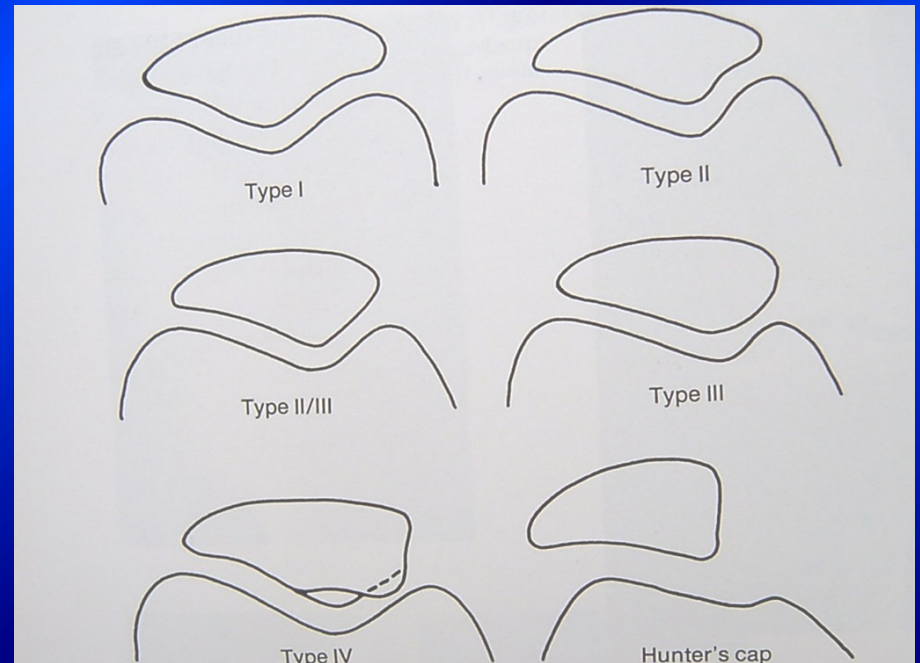
- Conservative
- In lateral hyperpression lateral release





# Traumatic dislocation of the patella

- Always laterally
- Conservative treatment
- Operative treatment



Types of patella

# Recurrent dislocation of the patella

- posttraumatic
  - congenital
  - habitual
- ASK – lateral release + medial capsuloraphy
- Open surgery

# Tumors

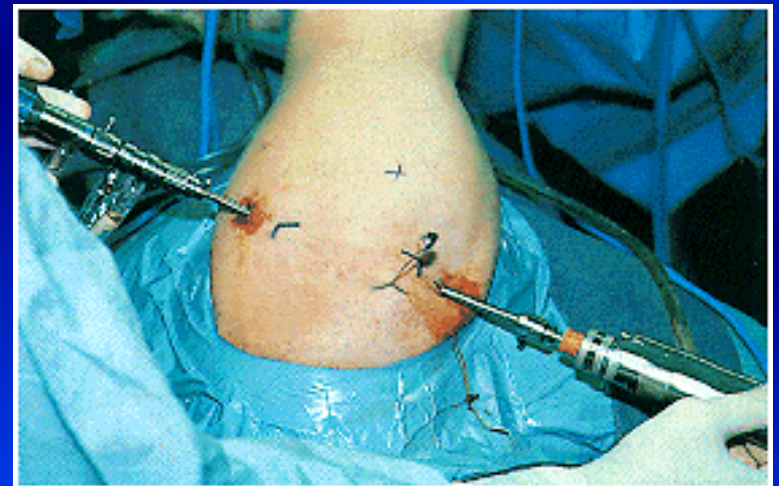
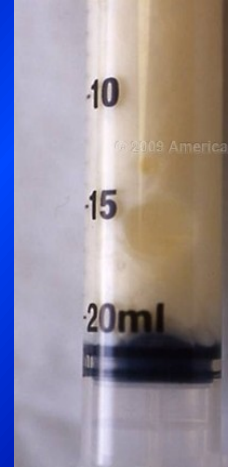
- Osteosarcoma
- Ewing sarcoma
- Osteoclastoma
- Chondrosarcoma
- Soft tissue sarcomas
- Bone metastases





# Pyogenic arthritis of the knee joint

- Aspiration- bacteriological exam.
- Laboratory tests
- X ray, ultrasonography
- **Therapy**
  - **ASC, lavage, antibiotics**
  - **orthesis**
  - **synovectomy**



# Other disorders

- M. Osgood – Schlatter
- Jumper's knee
- Baker's pseudocyst
- Bursitis
- Ganglion of meniscus

