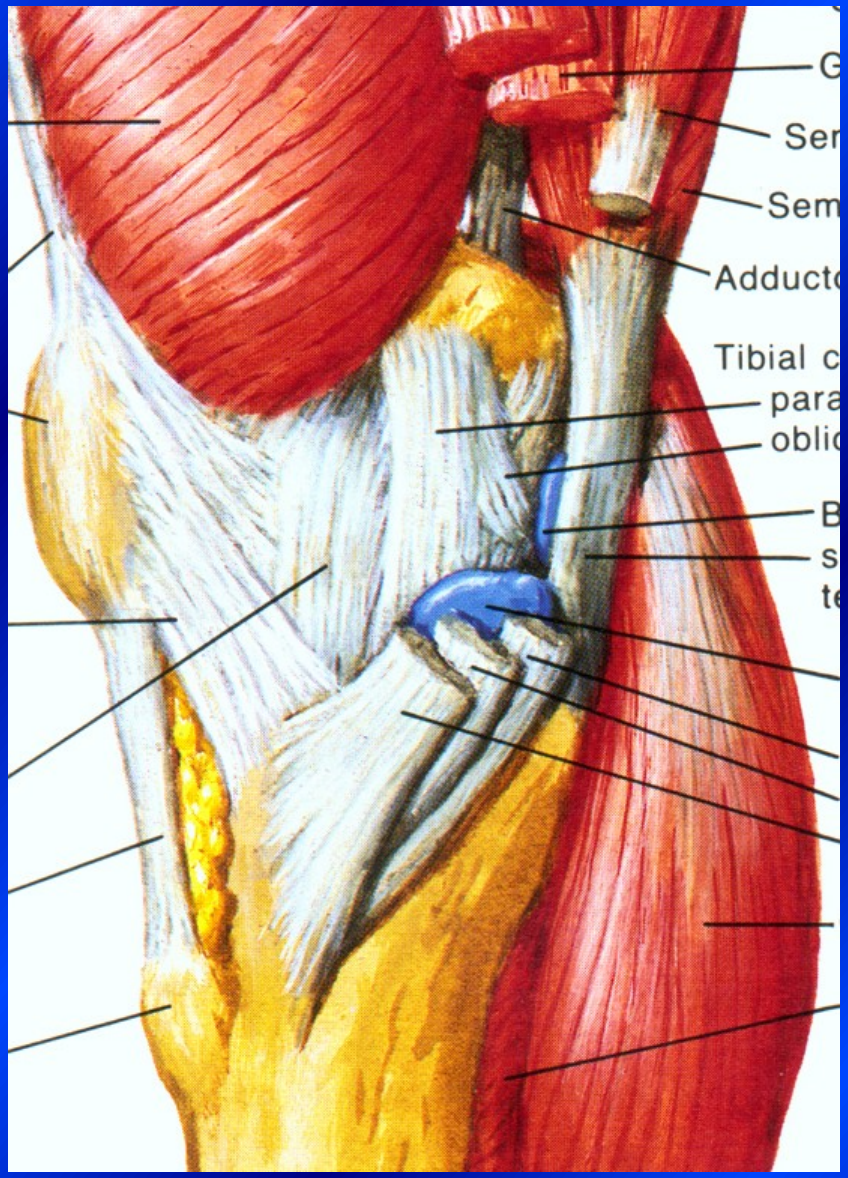
Knee joint

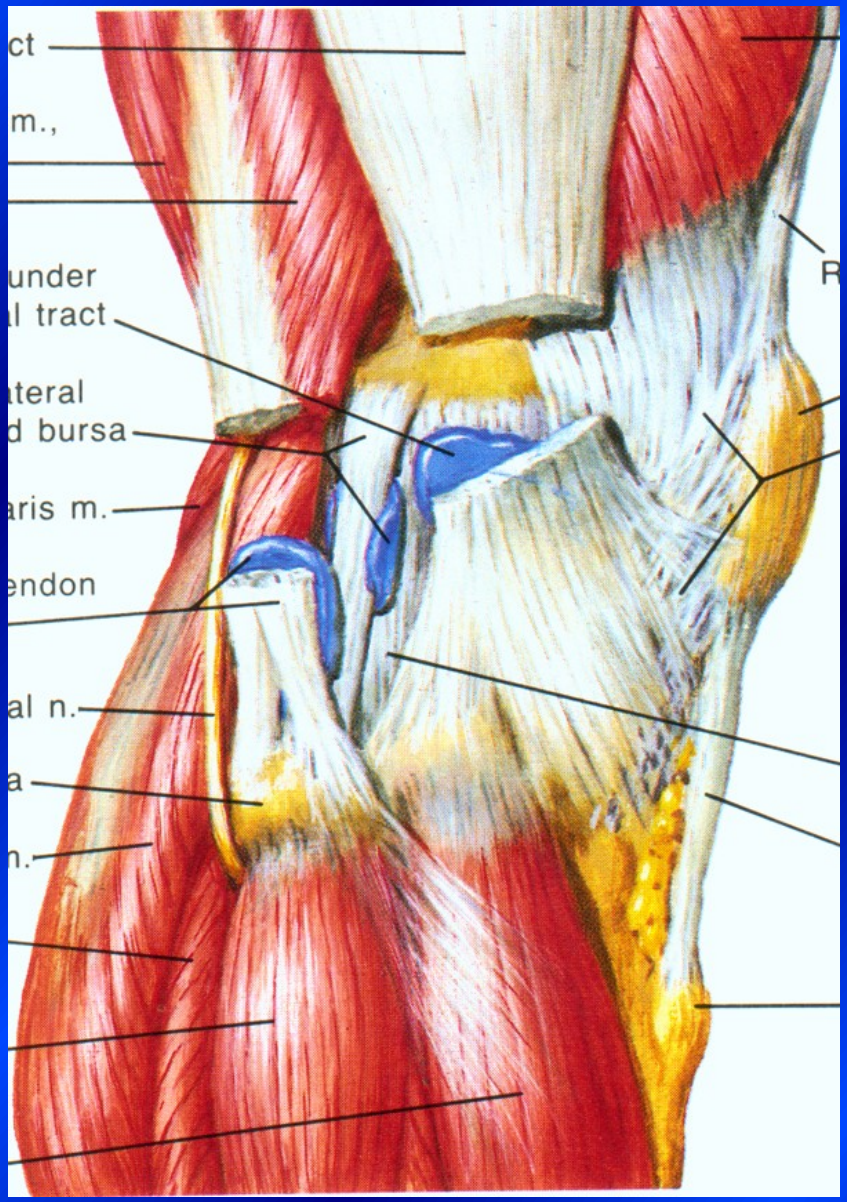
Anatomy, clinical examination, imaging, pathology

Anatomy- skeleton

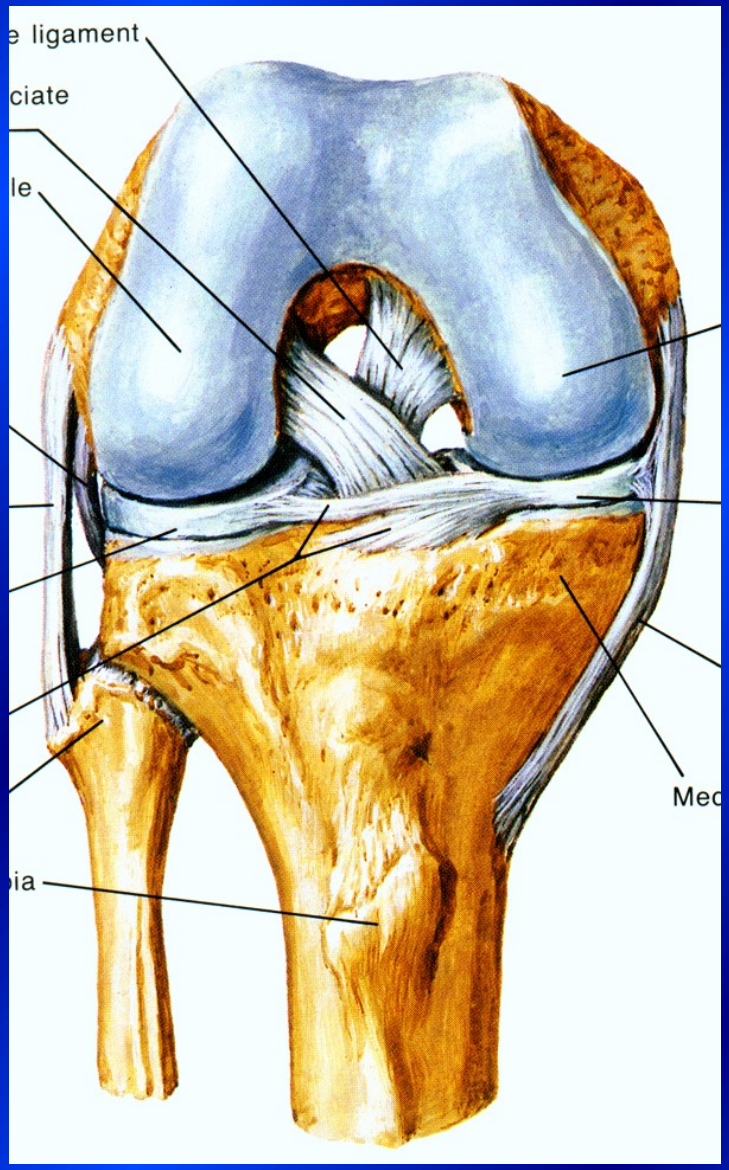
Complicated osseous sctructure- soft tissue for stability is needed

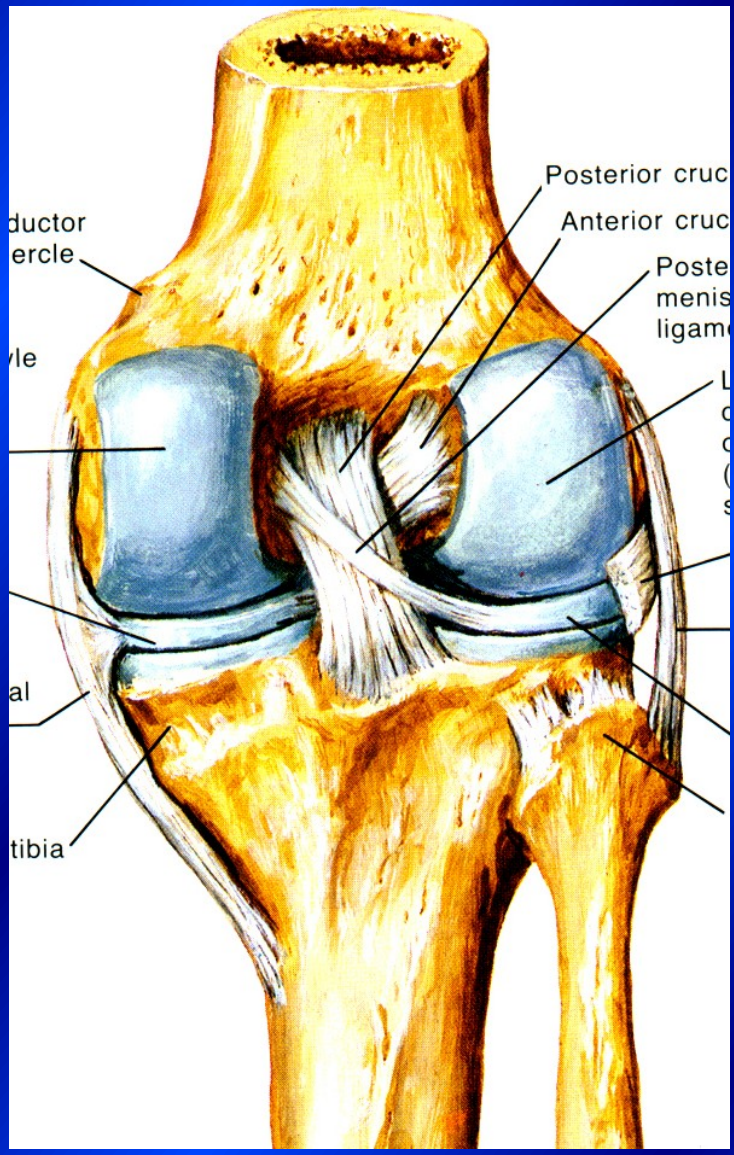


Medial side

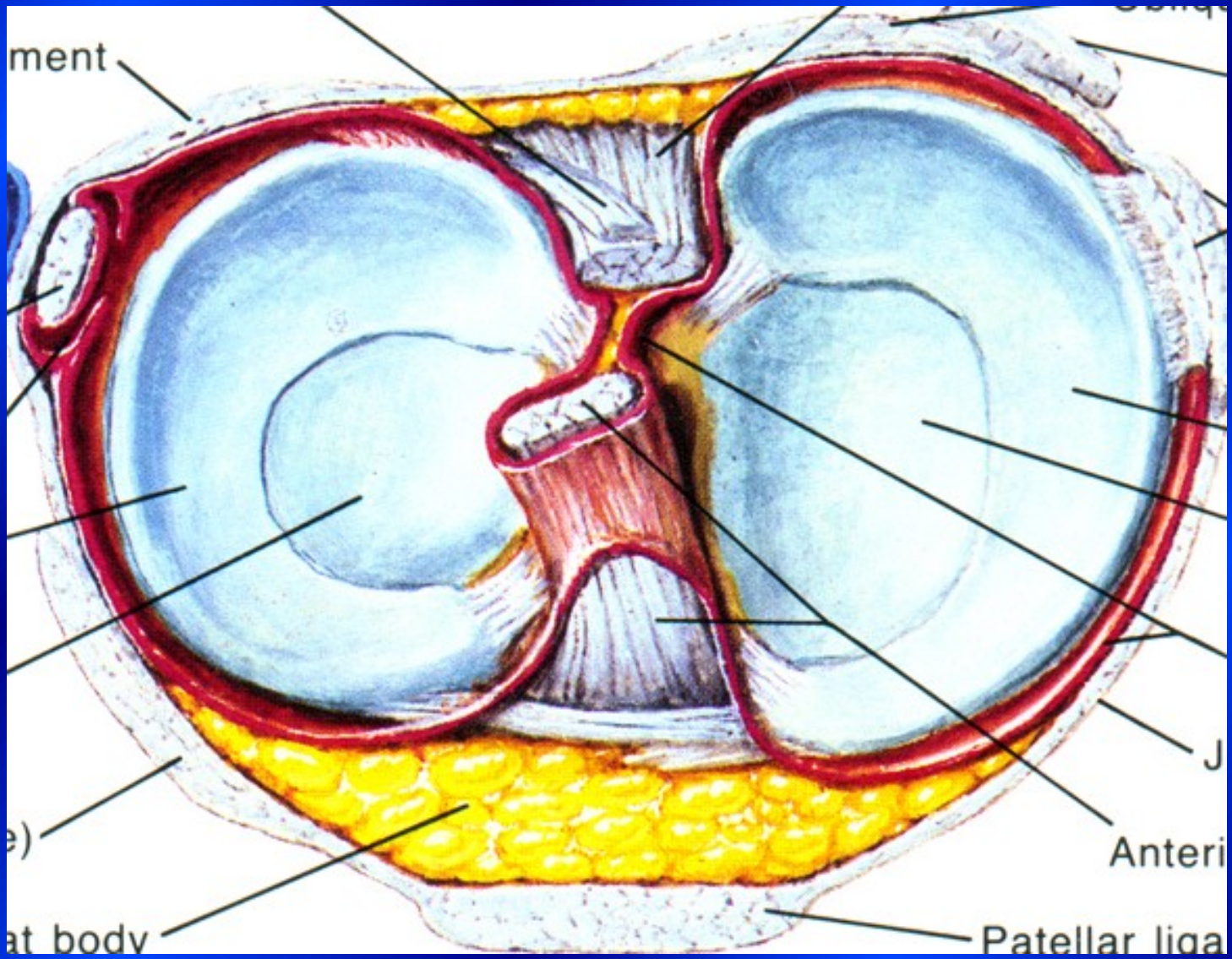


Lateral side

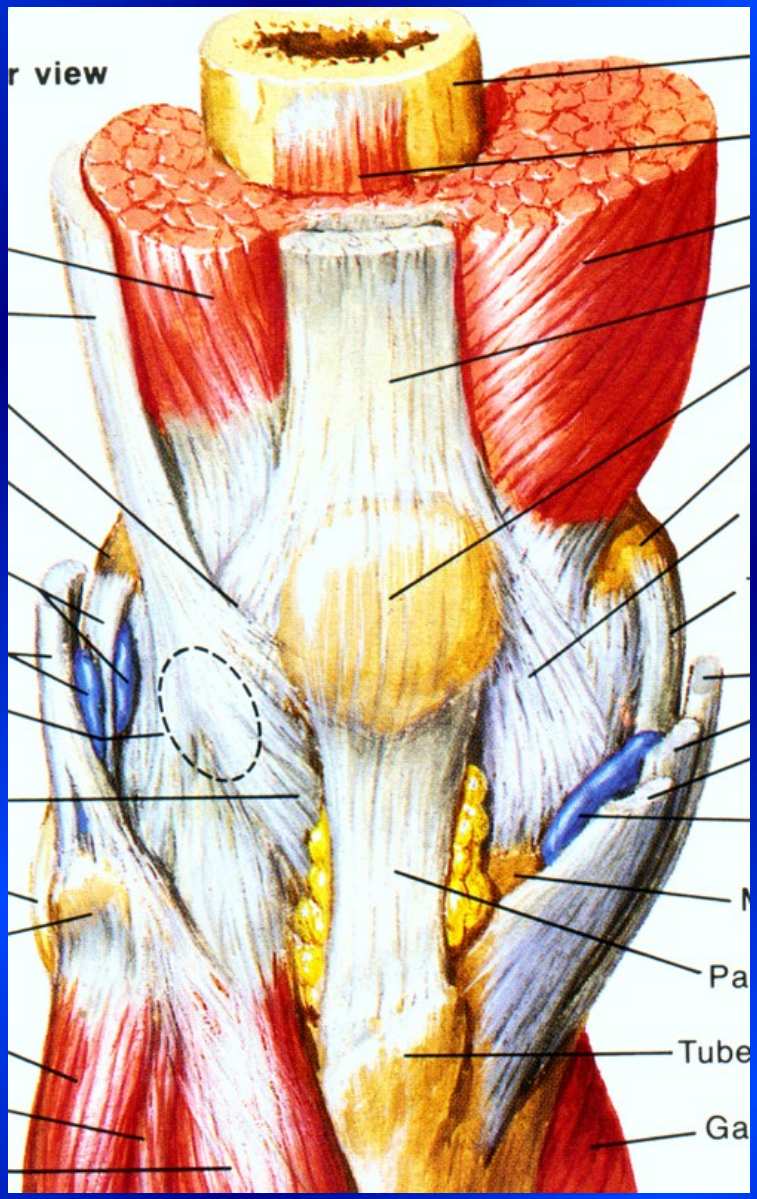




Cruciate ligaments

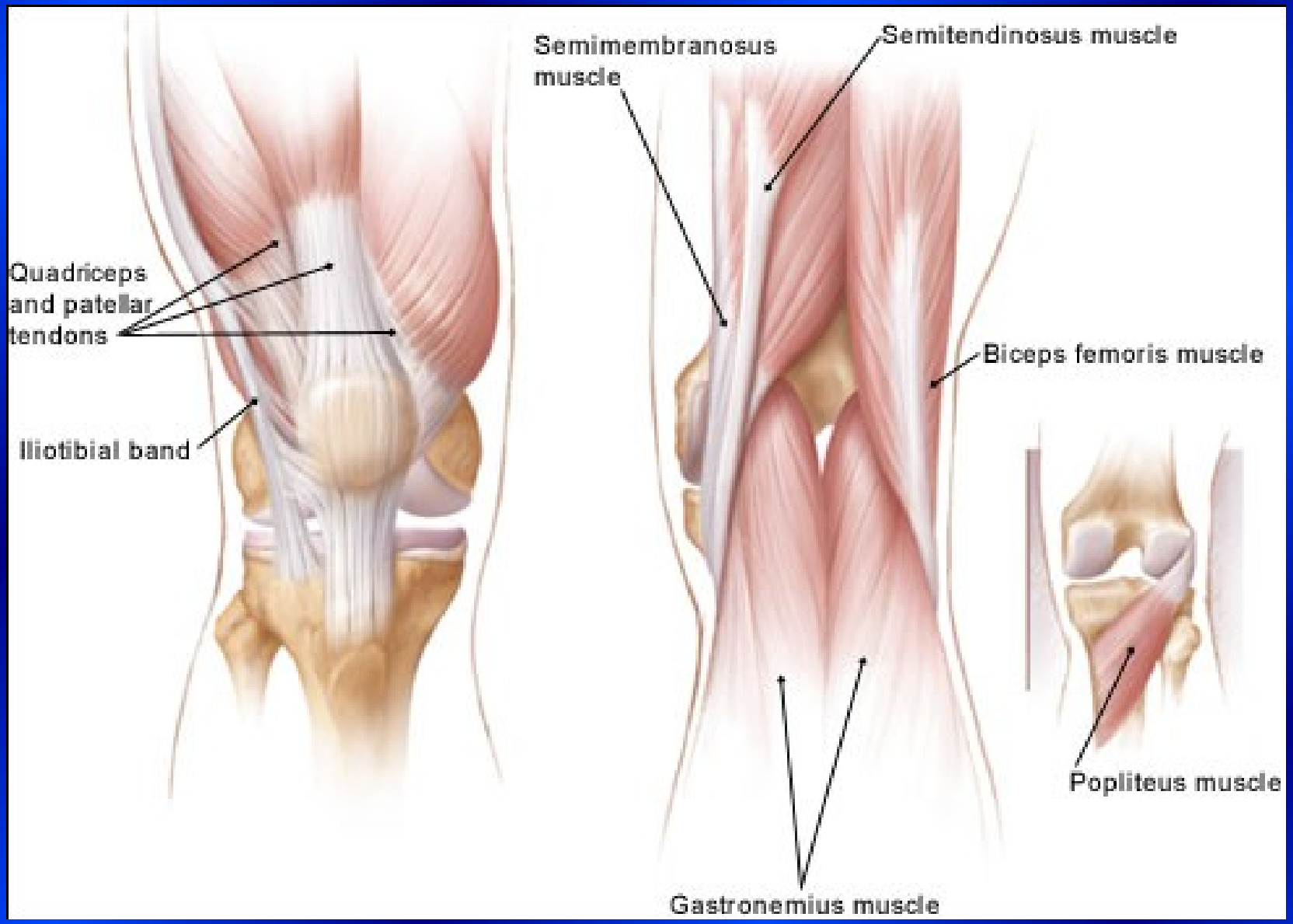


Menisci

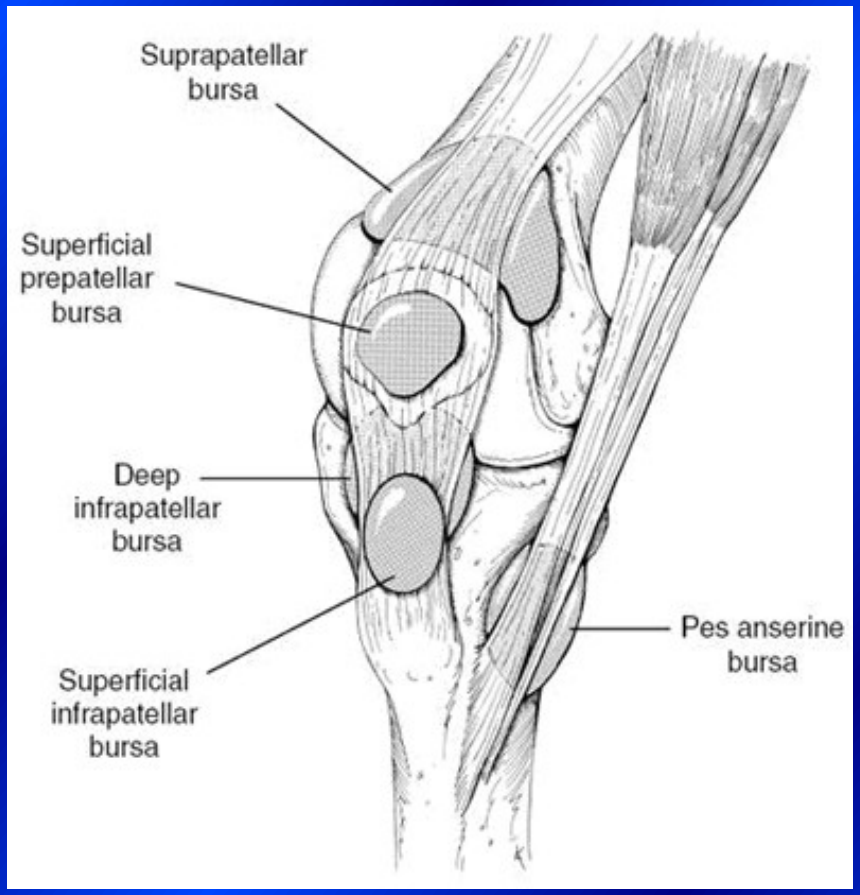


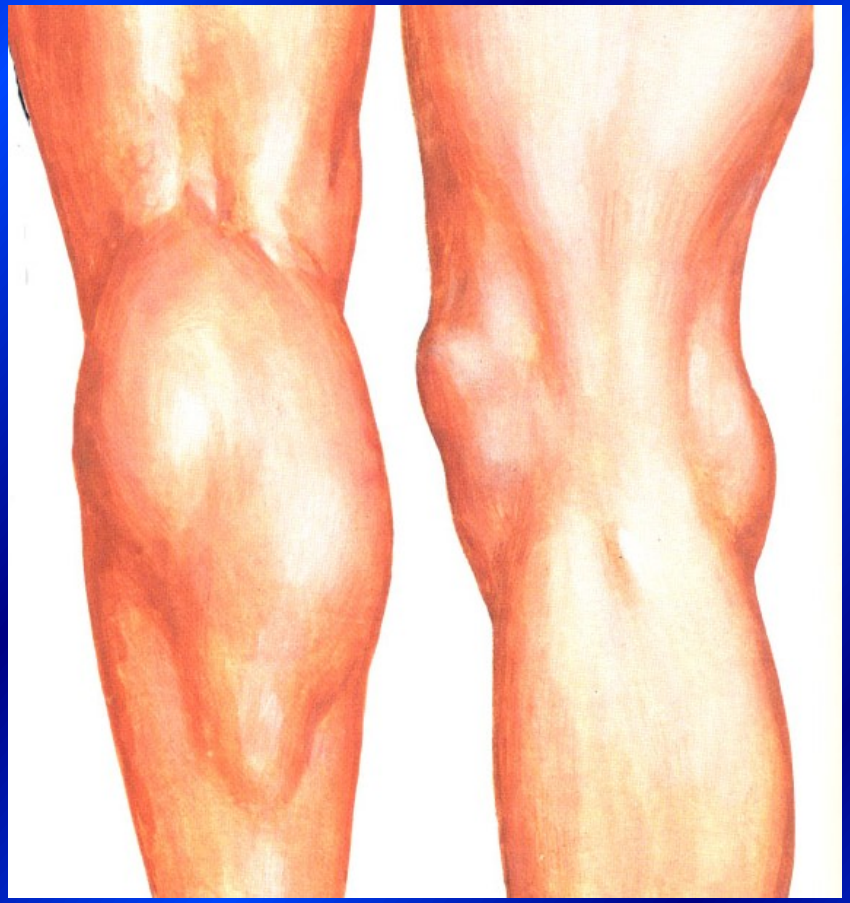
Muscles

Stability of the knee- muscles

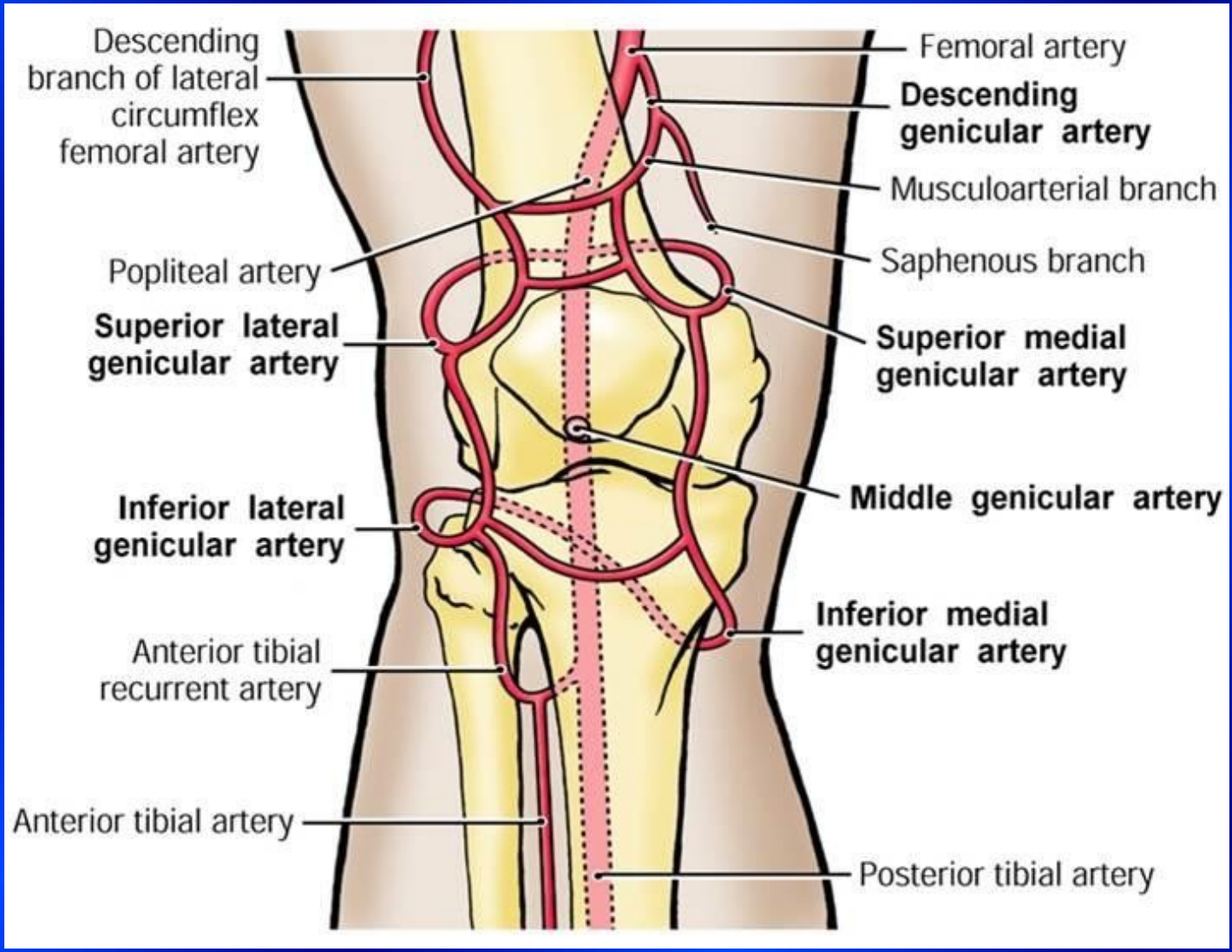


Anatomy- bursae

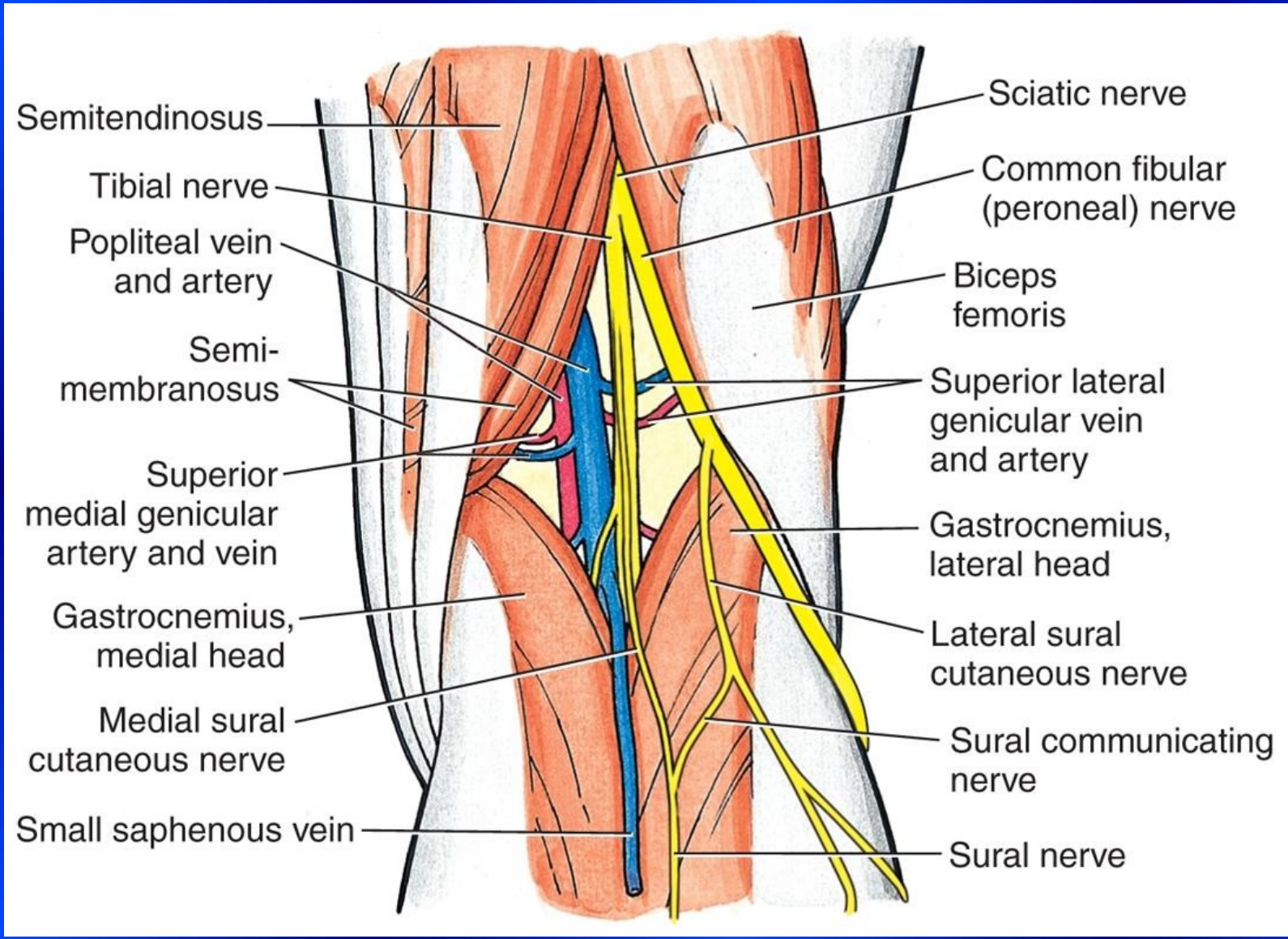




Anatomy- vessels

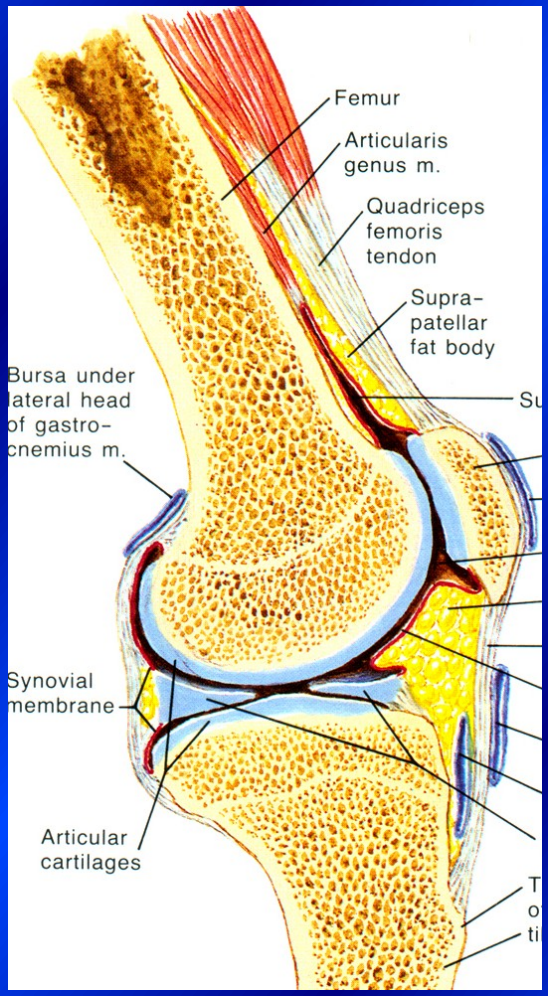


Anatomy- nerves



Biomechanics

Level	Movement
Sagital	flexion/extension - rolling - gliding
Transversal	ext/ int roration
Frontal	adduction/abduction



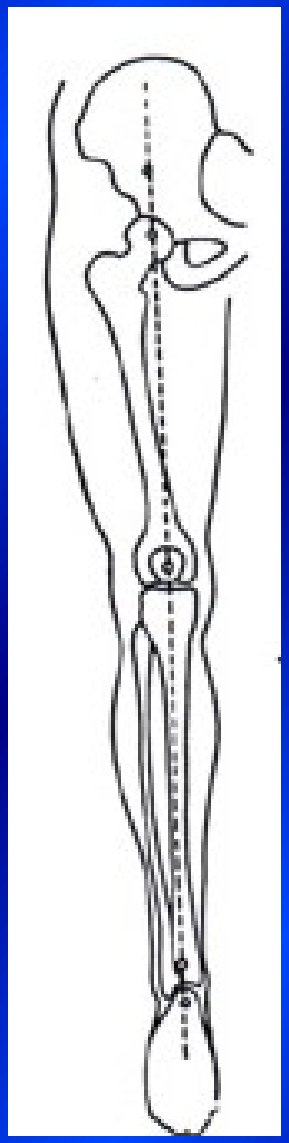
Clinical examination

- skin
- swelling
- alignment
- deformity
- contracture
- active and passive movement
- stability
- meniscus manevuers
- femoropatelar joint

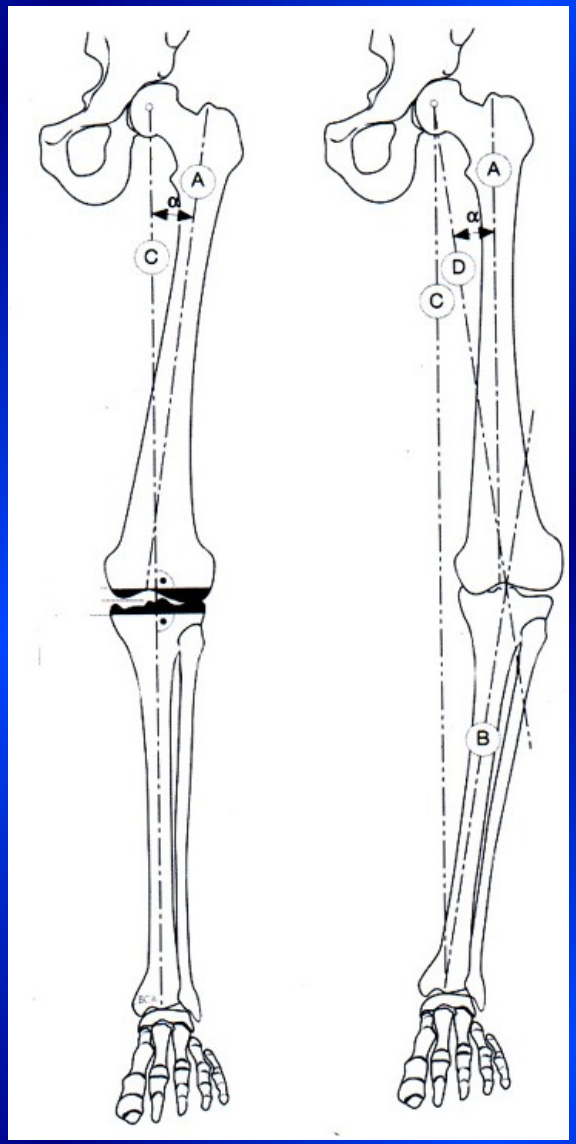
Swelling in the knee region

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

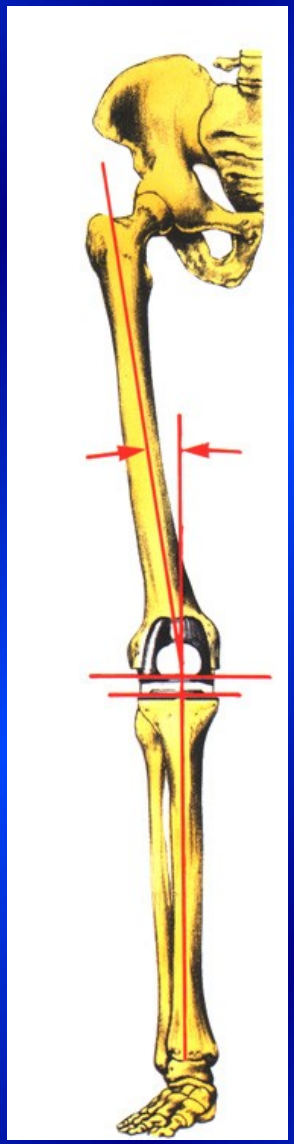
Alignment of lower extremity



Mikulicz line

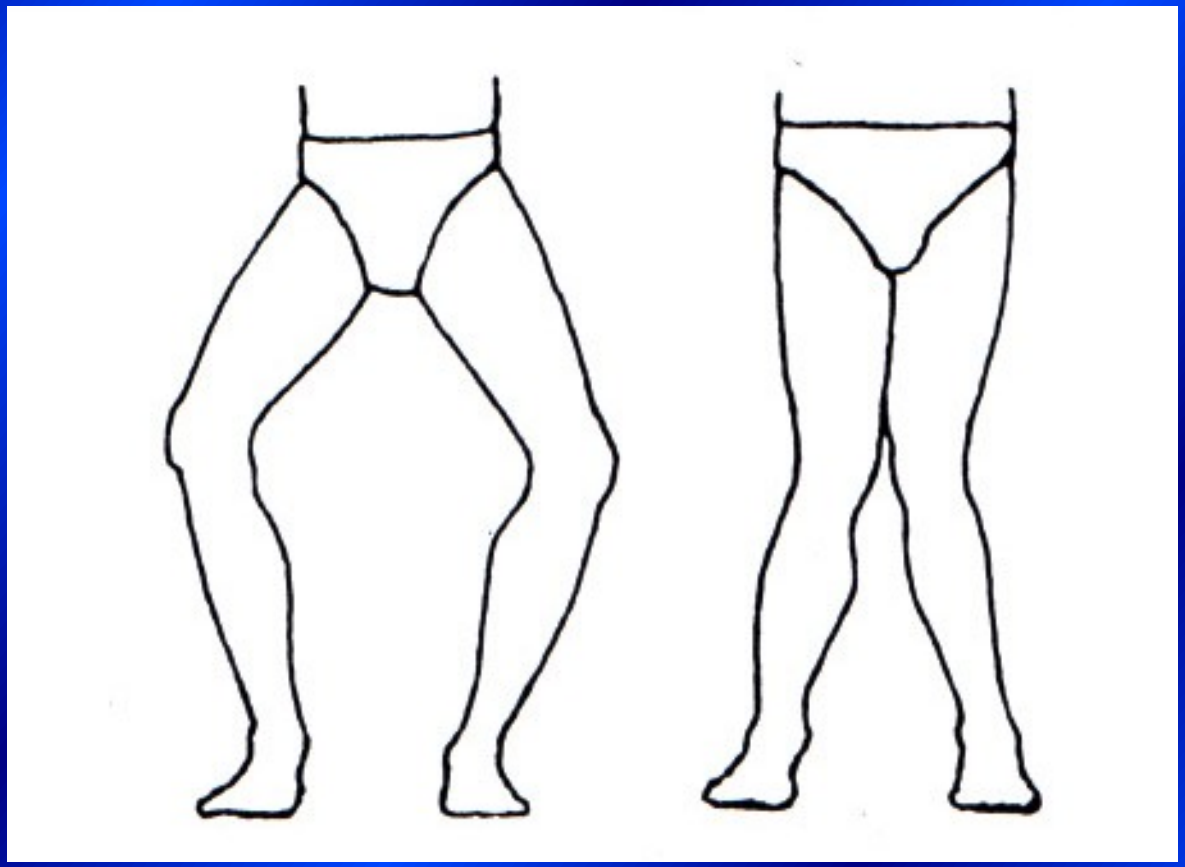


Mechanical



Anatomical

Deformity of the knee joint



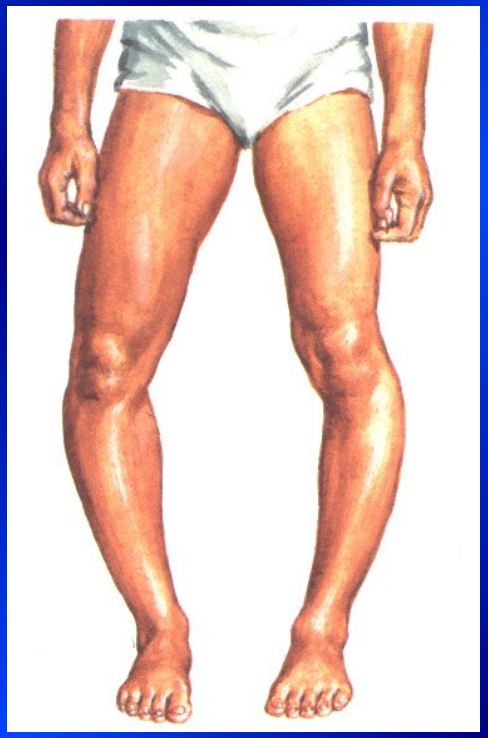
Genu varum

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

Genu valgum

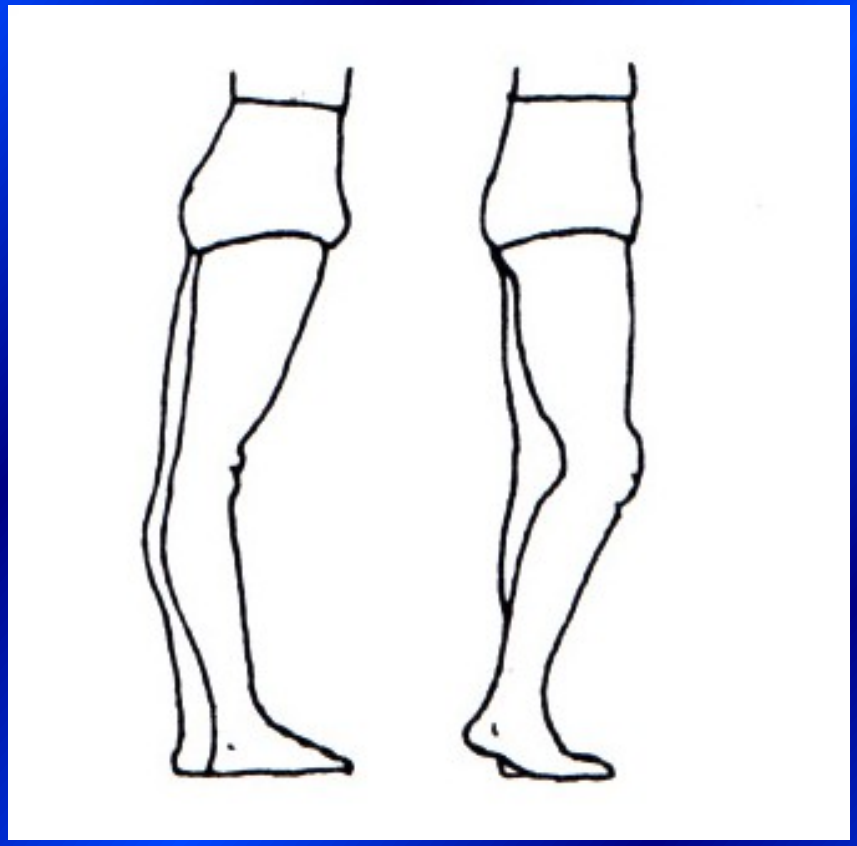
- rachitis
- posttraumatic
- R.A.
- O.A.

M. Blount

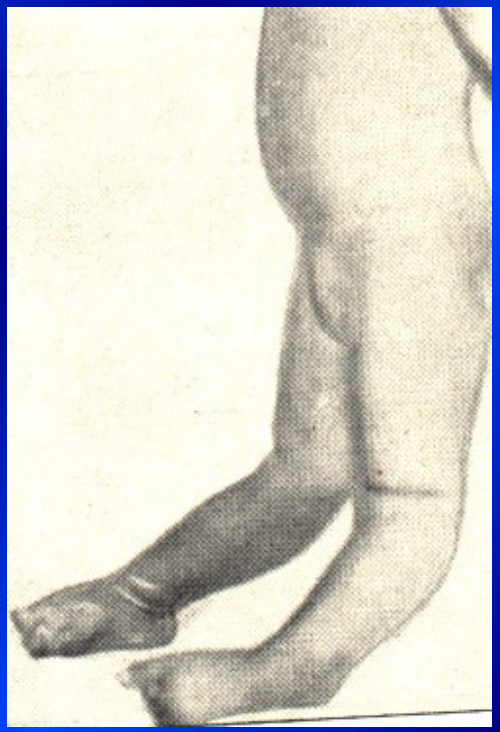


Disorder of the growth plate of proximal tibia

Deformity of the knee joint



Genu recurvatum congenitum



Genu recurvatum

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

Genu flectum

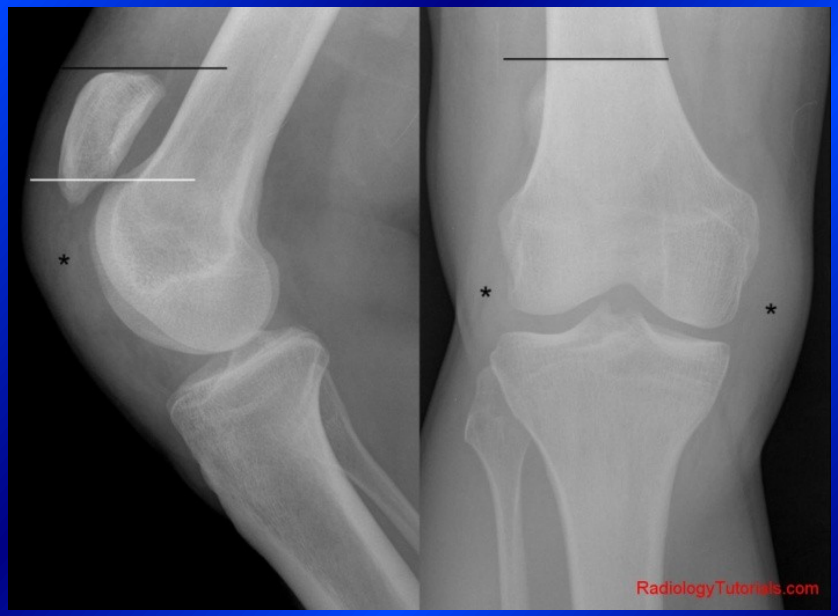
- cerebral palsy
- other neurological disorders
- O.A., R.A, post infection

Position of the knee joint

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

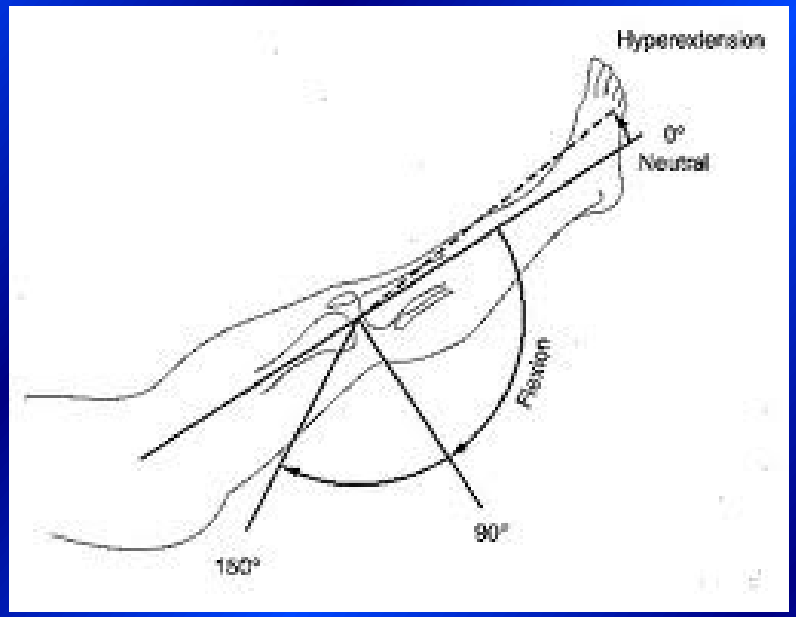
Flexion contracture in cerebral plasy

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



Movement in the knee joint

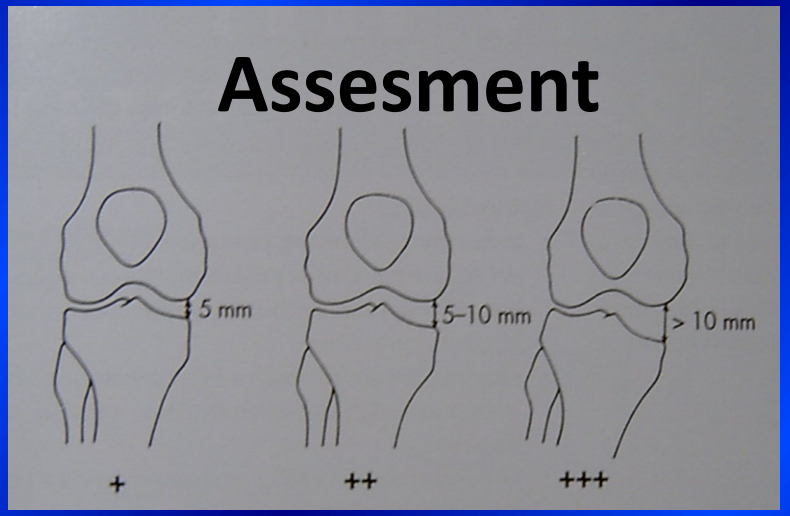
- active, pasive



S extension - 0 - flexion

S 0 - 0 - 140

Test for stability

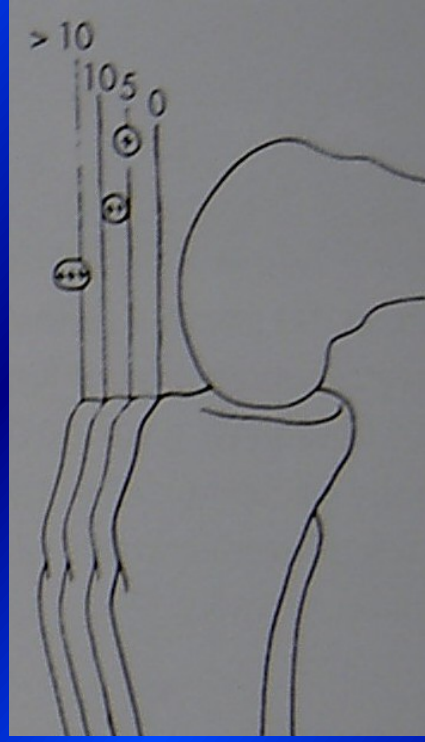


Valgus stress test (LCM)

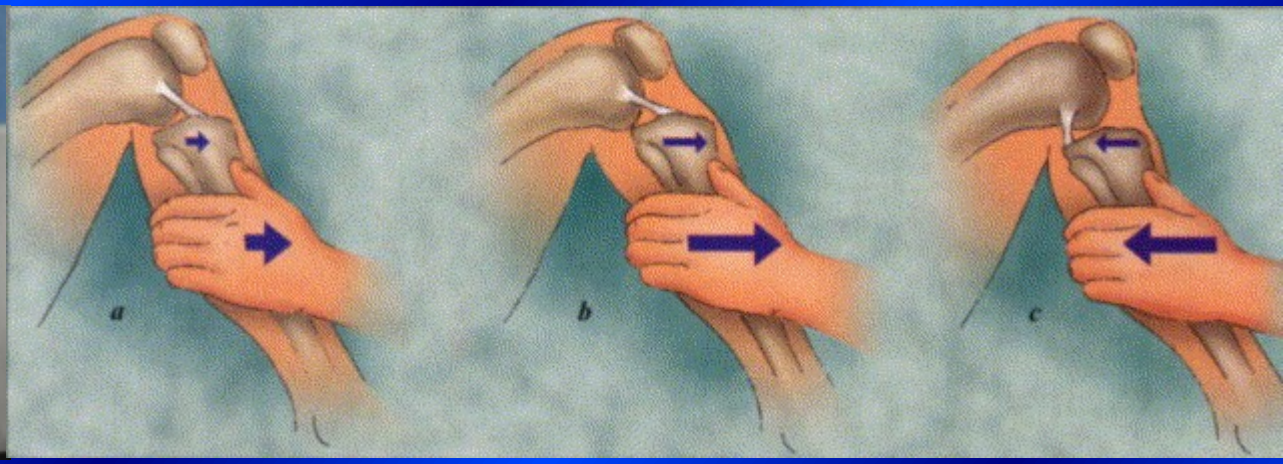
Varus stress test (LCL)

Cruciate ligaments

Lachmann test



Ant. drawer sign , post. drawer sign

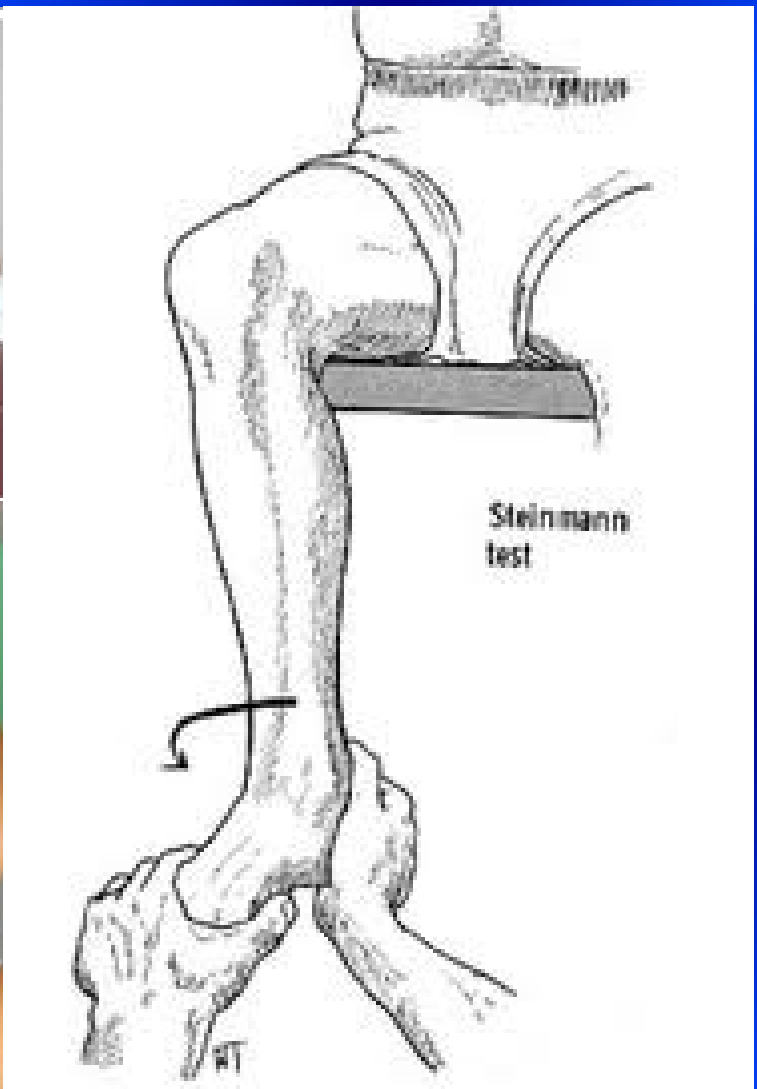


normal ant post

Meniscus manoeuvres

McMurray test

Steinmann test

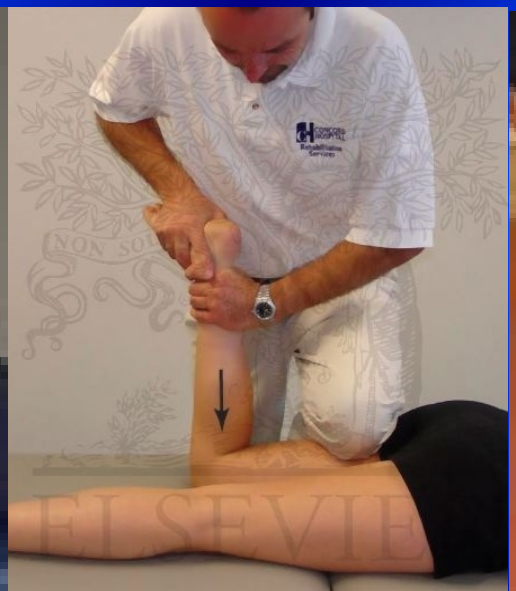


Meniscus manouevres

Payer test

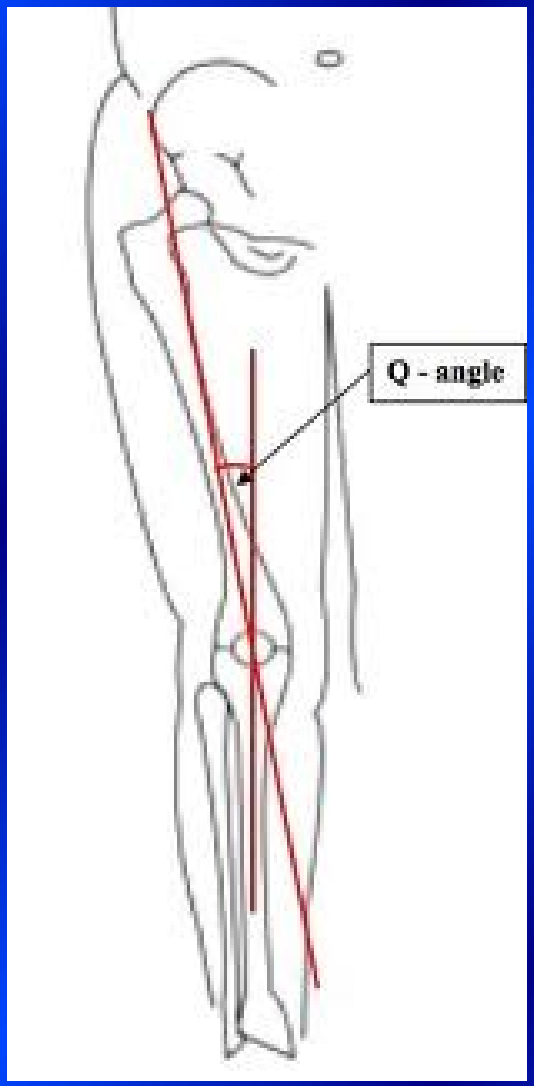
Appley test

Childress test



Patella

- history- retropatelar 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 manoeuvers (Zohlen, grinding)
- Q- angle



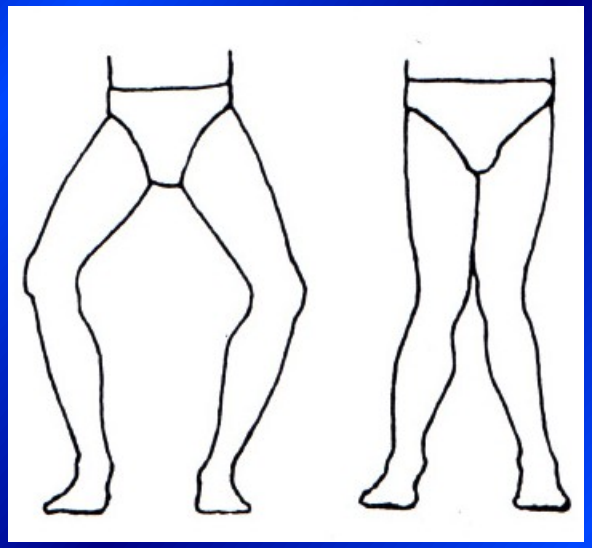
M 8-10
F 15 ± 5

Imaging methods

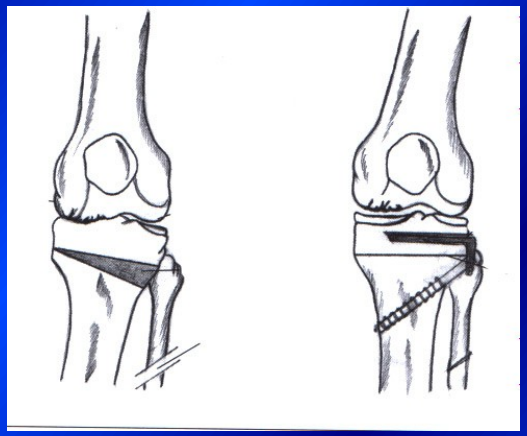
- X ray, AP, lateral, axial
- USG
- CT , MRI
- Scintigraphy
- Artroscopy

Deformity of the knee joinnt

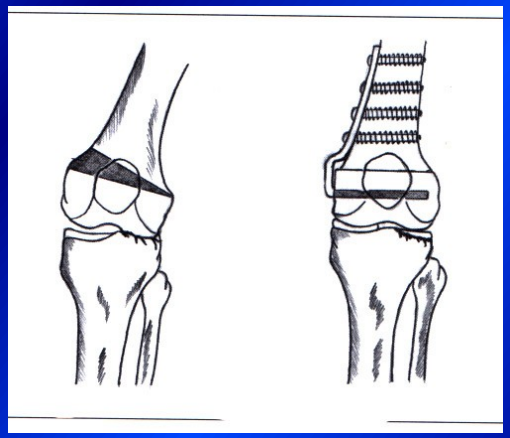
- in children- hemiepiphyseodesis
- in adults osteotomy



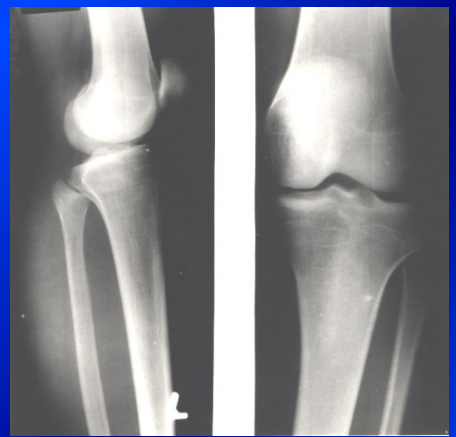
genu varum /genu valgum



Valgus OT



varus OT



Meniscus

Mechanism of injury

Tests: Mc Murray

Steinmann I

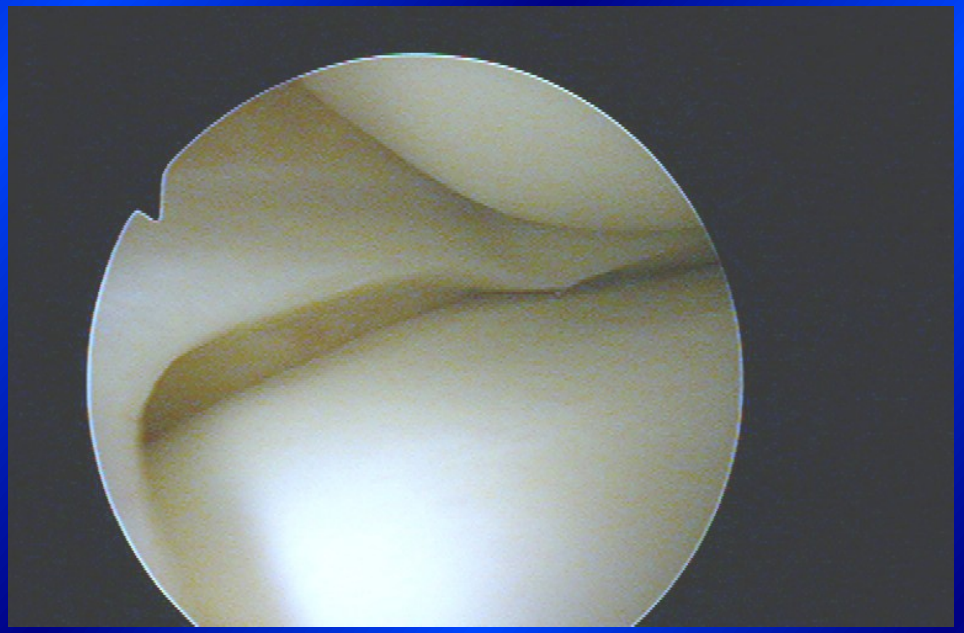
Steinmann II

Appley

Turner

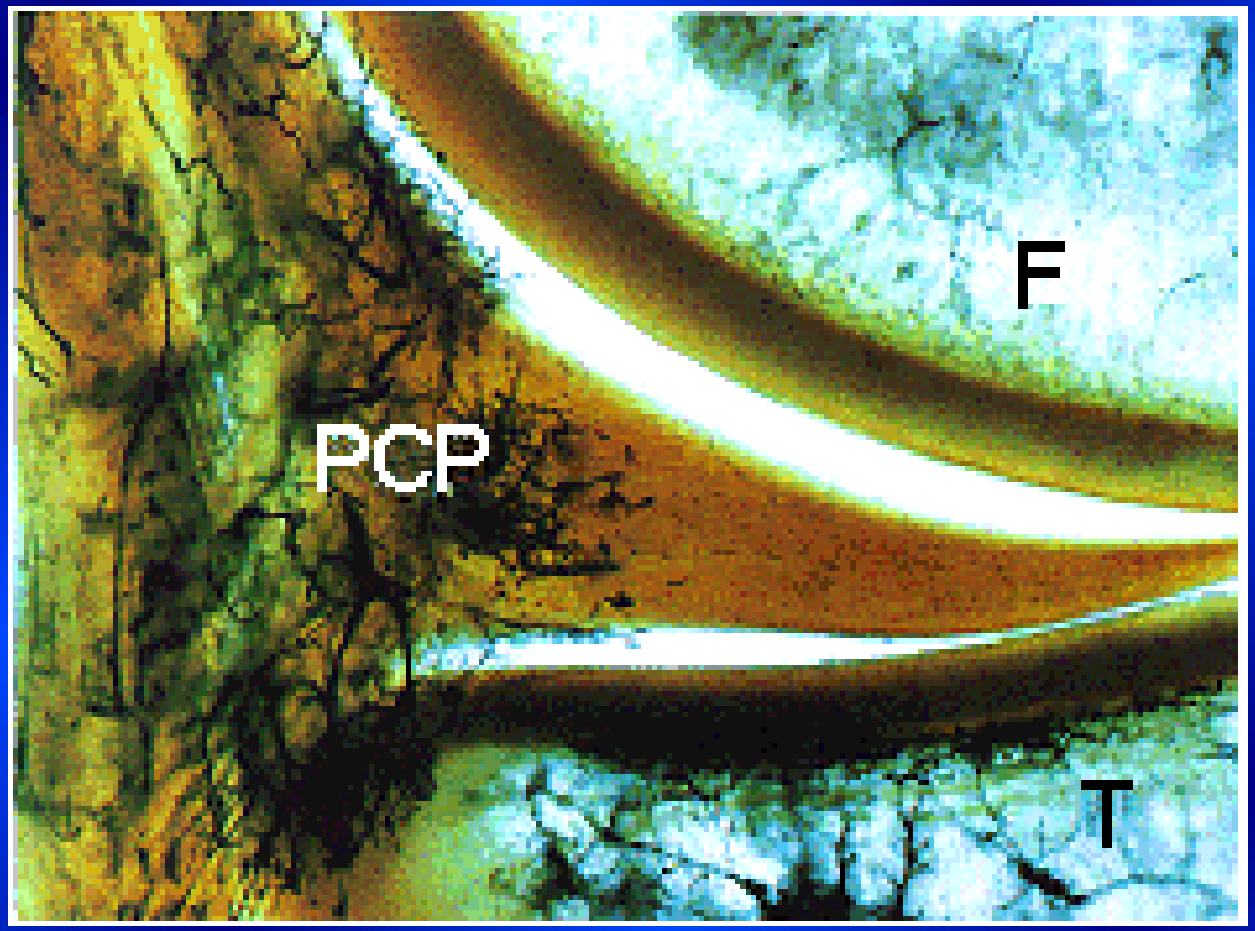
Payer

Childress- squat test



Meniscus

- Fibrocartilago
- High elasticity
- Paracapsular zone
  - vessels

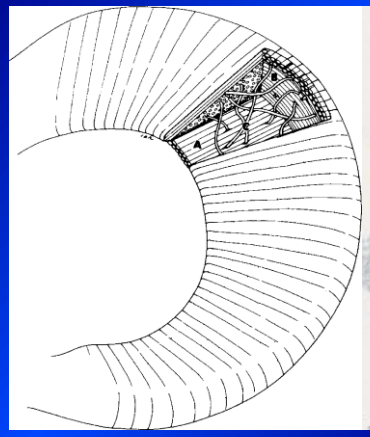


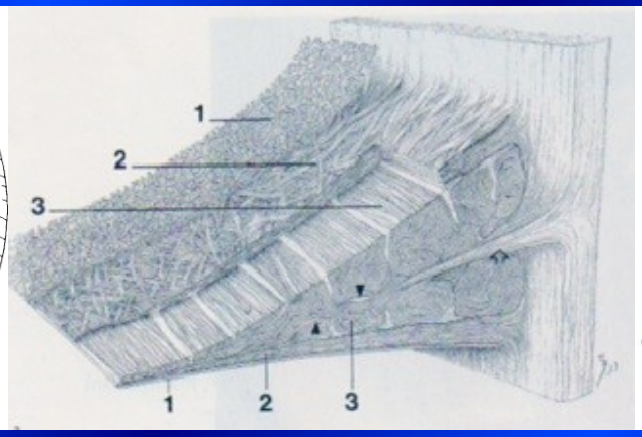
Red zone red- white zone white zone

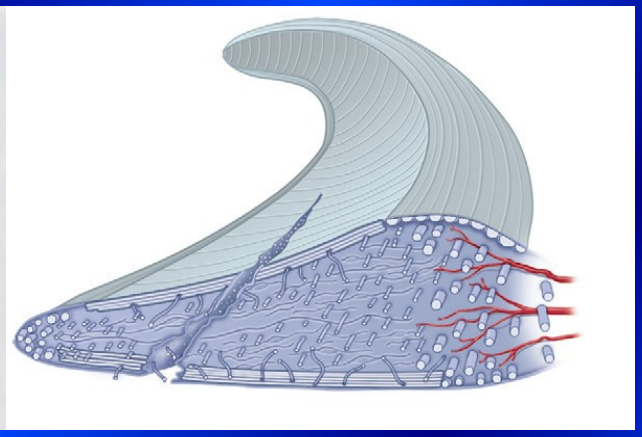
Struktura menisku

- Kartilaginózní struktura
- Relativně acelulární
  - vaskulární zóna – fibroblast-like cells
  - avaskulární zóna – chondrocytes-like cells
- Kolagen. vlákna v matrix -

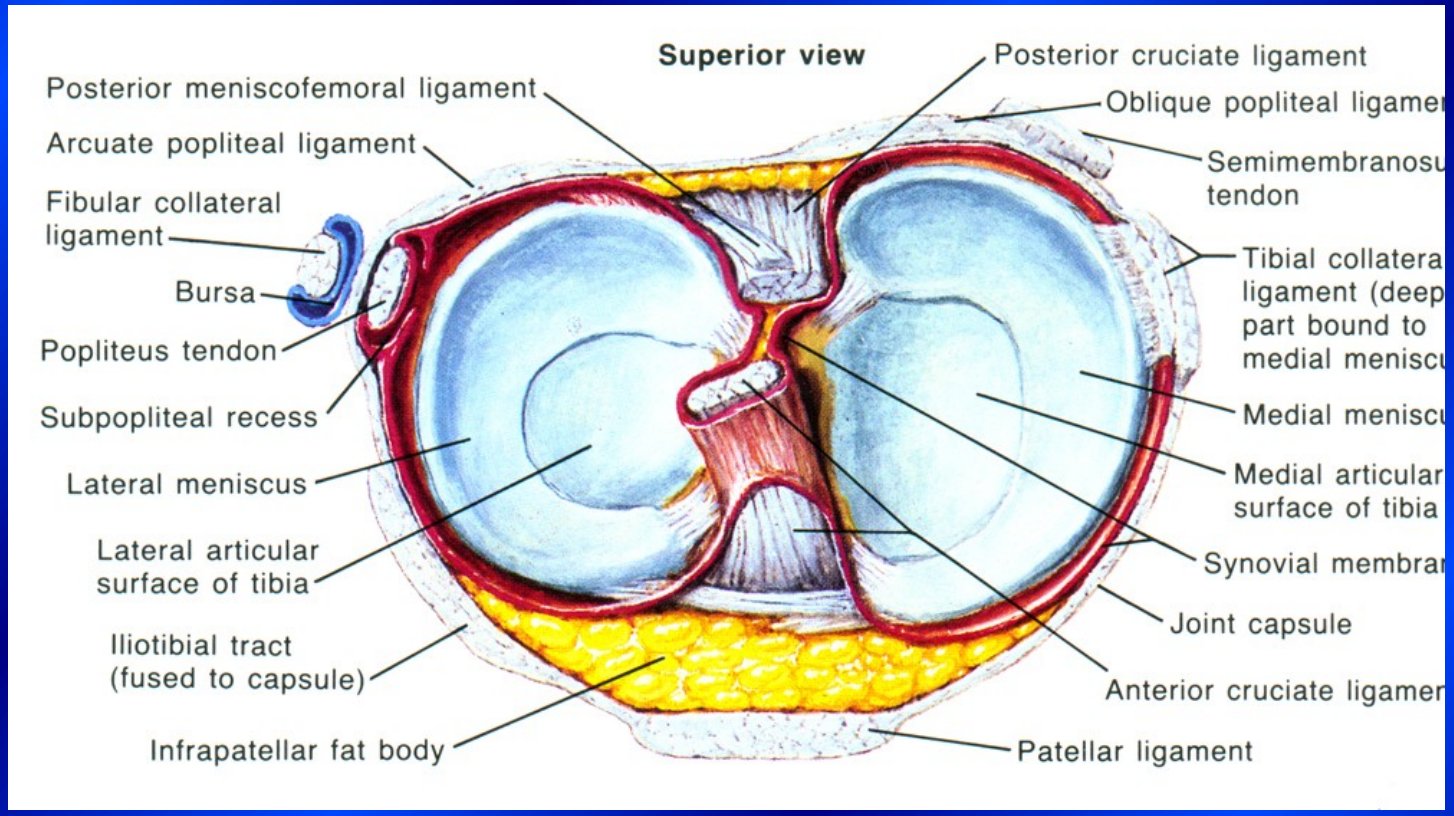
  -rozložení k přenosu kompresního tlaku + hoop stresu







Functions

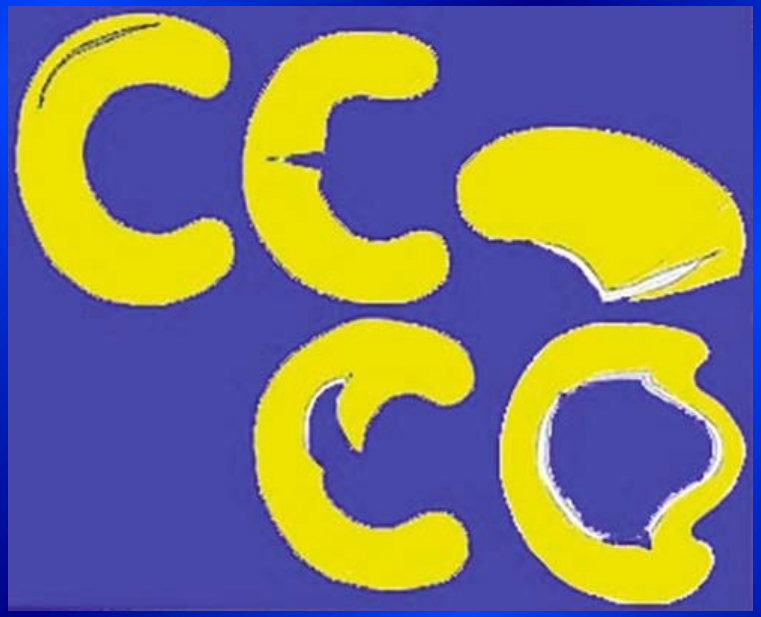


- Bumper
- Stabilisator
- More congruency

- Distribution of synovial fluid
- LM – more mobile
- MM – prone for injury

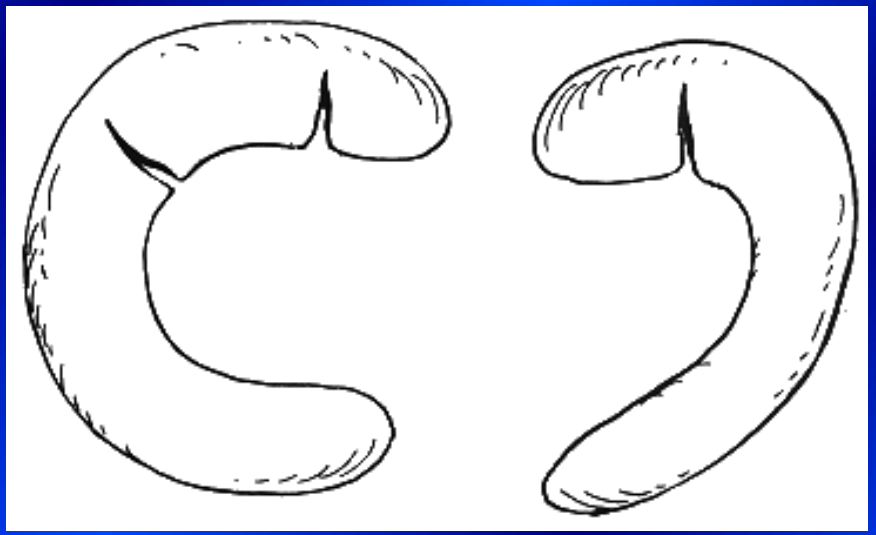
Typy ruptur menisku

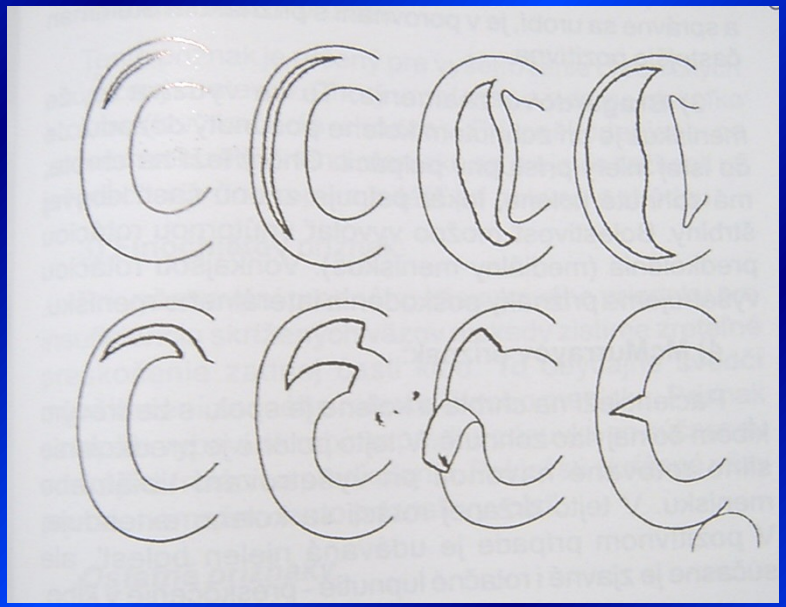
- Longitudinální
- Radiální
- Horizontální
- Šikmá
- Bucket handle
- Komplexní



Ruptures of menisci

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





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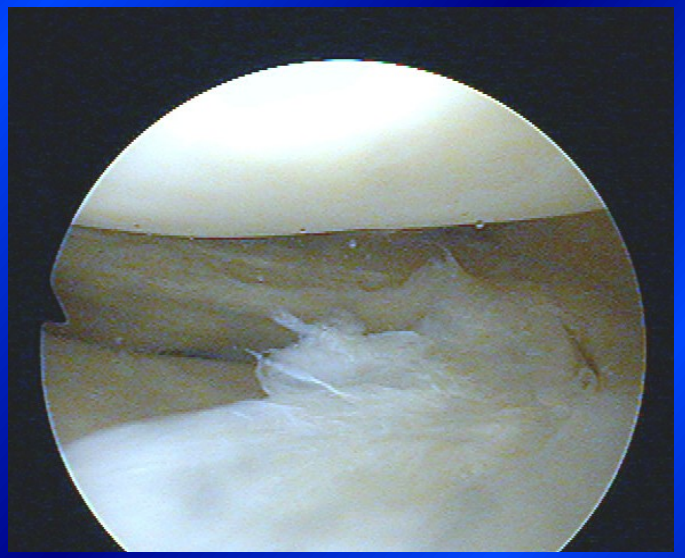
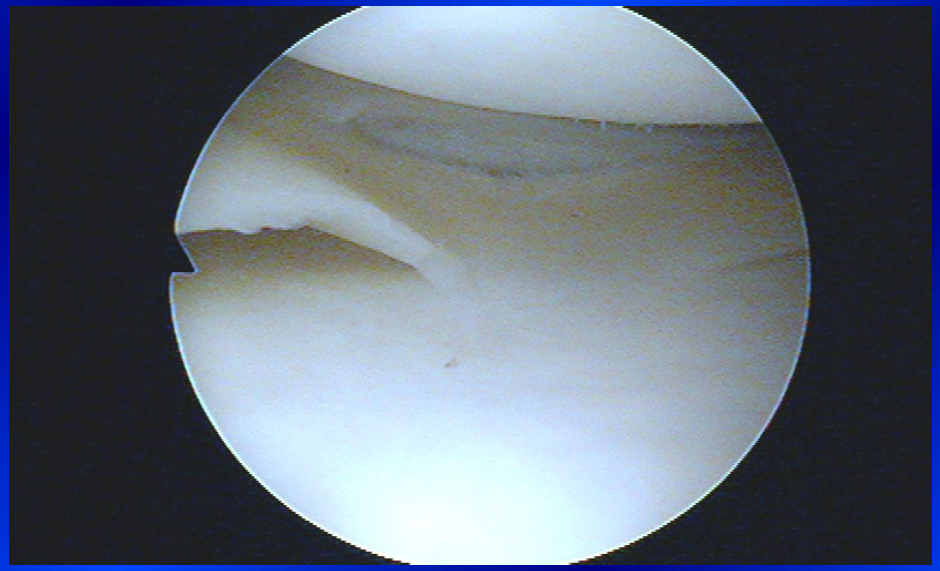
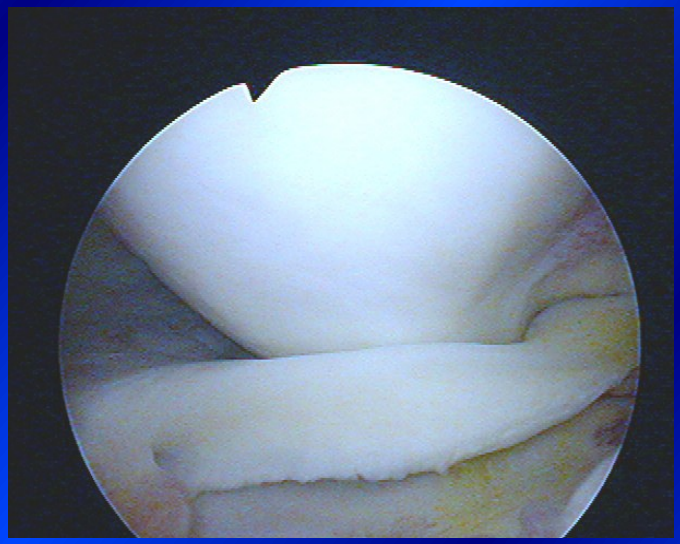


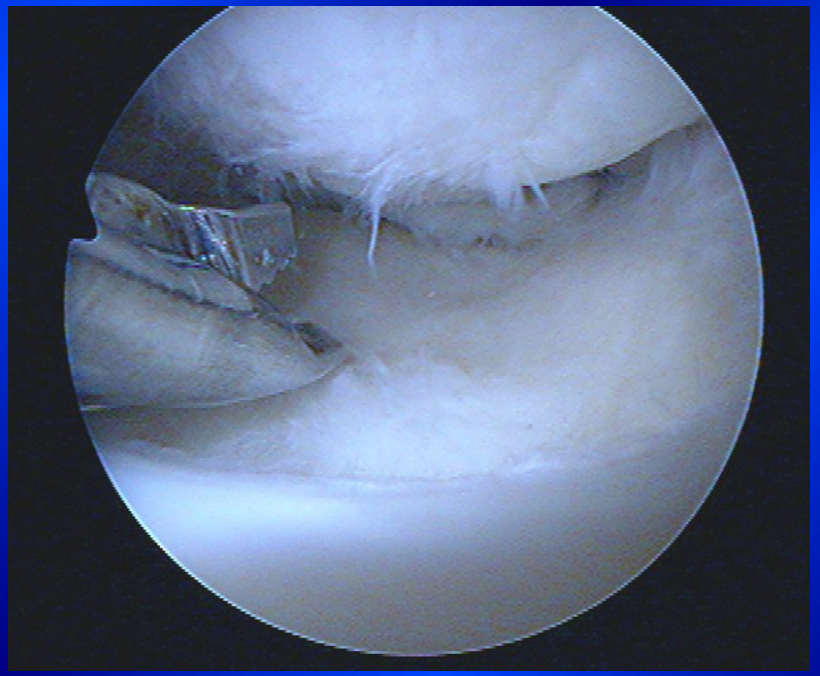




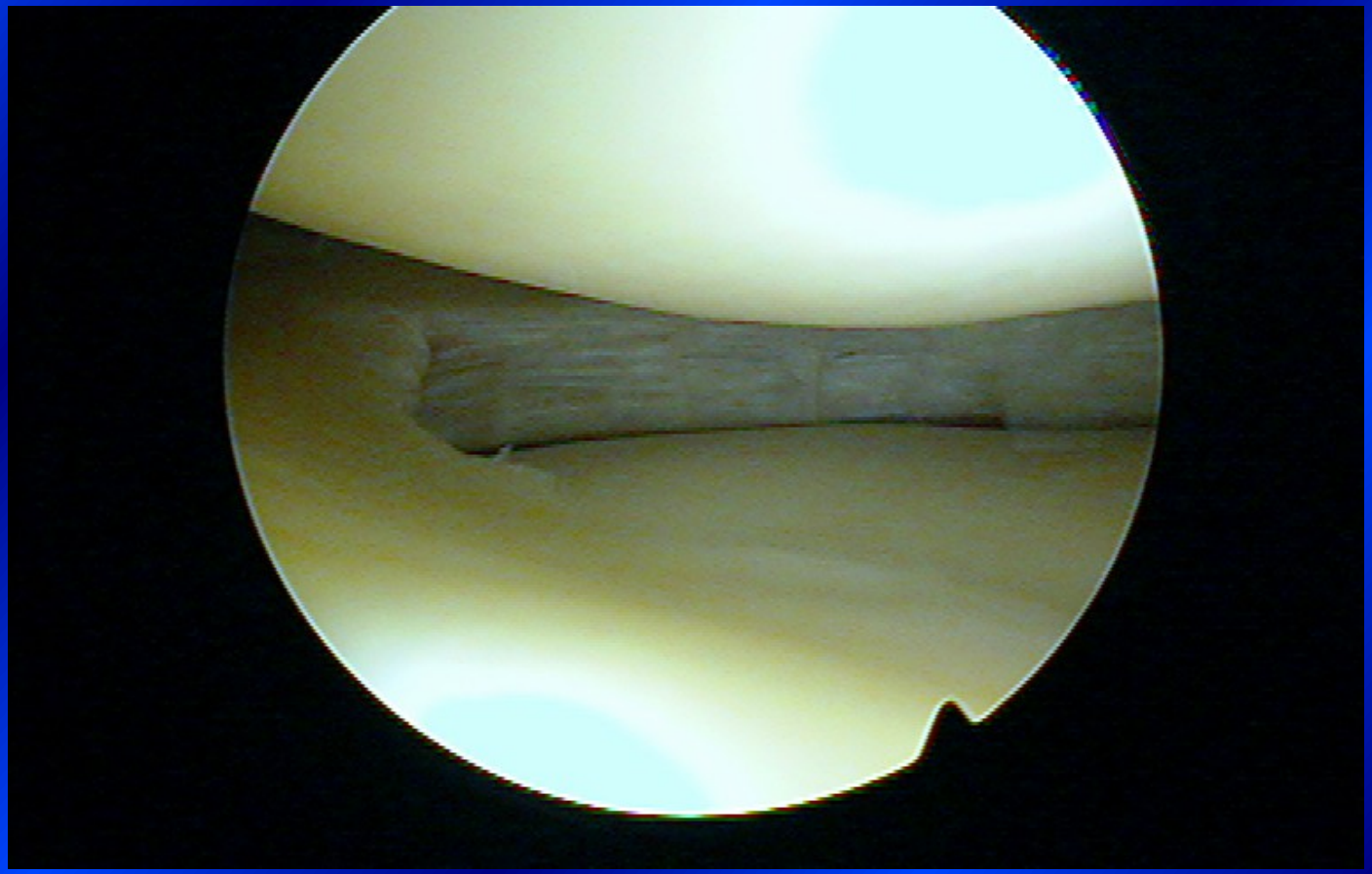
Meniscus treatment

Menisectomy

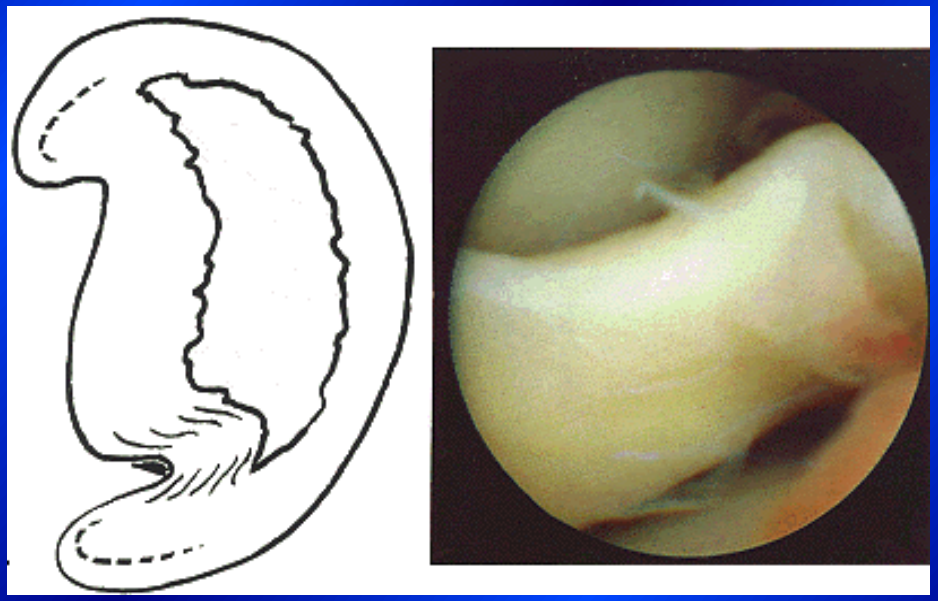
- partial
- subtotal
- complete

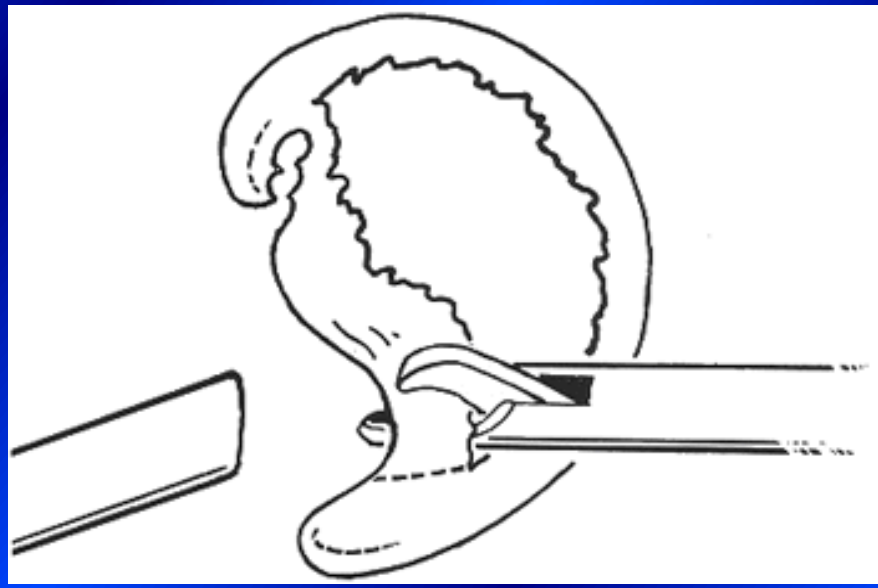


Partial meniscectomy



Subtotal menisectomy

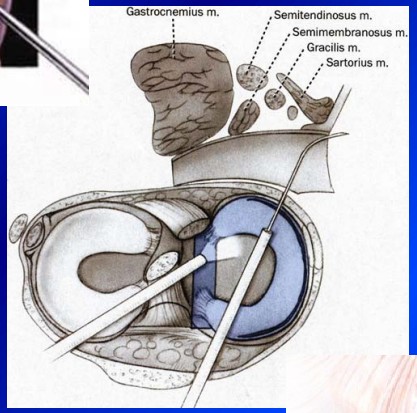




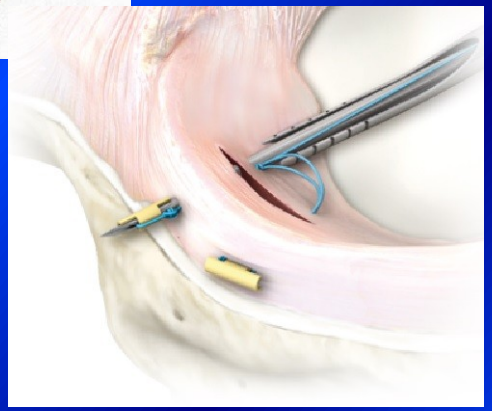
Techniky sutury

Outside – in

Inside – out



All – inside

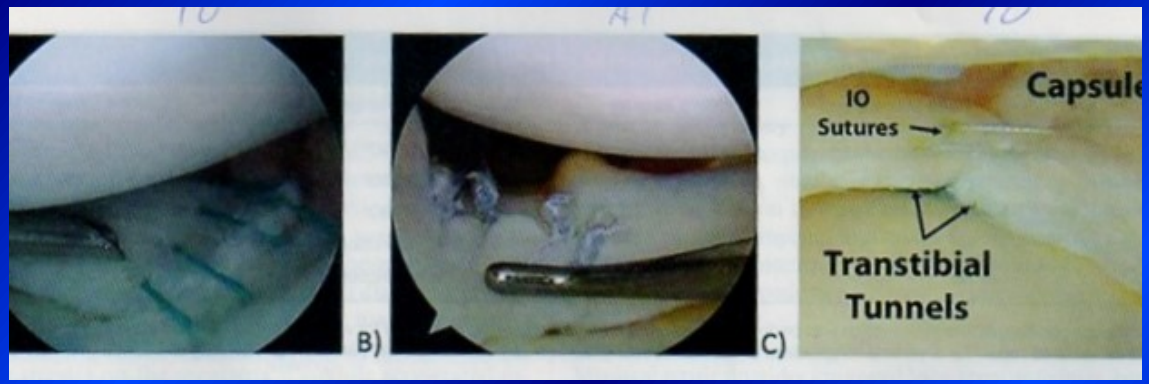


- Excelentní výsl. zhojení u mladých pac.

- All – inside – kompresní cirkumferentní steh po obvodu léze

Radiální ruptura

- Rpt. 60 % centrální zóny nemá vlyv na ↑ tlaku / kandidát parc. menisektomie /
- Rpt 90 % siginifikantně ↑ tlak – sutura
- Inside-out, All-inside, transtibiální technika / TT /
- Chronická léze – retrakce okrajů – gapping / ↓ TT /



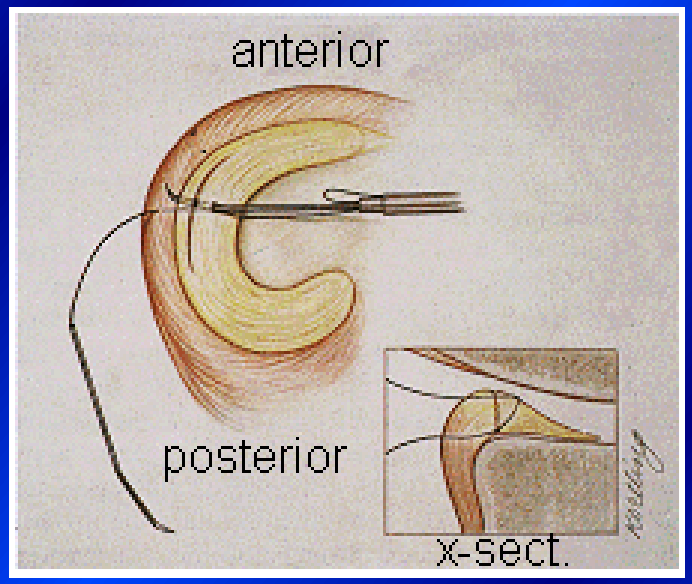
- A: Inside-out -horizontální matracový steh B: All-inside knot tying
- C: Transtibiální technika

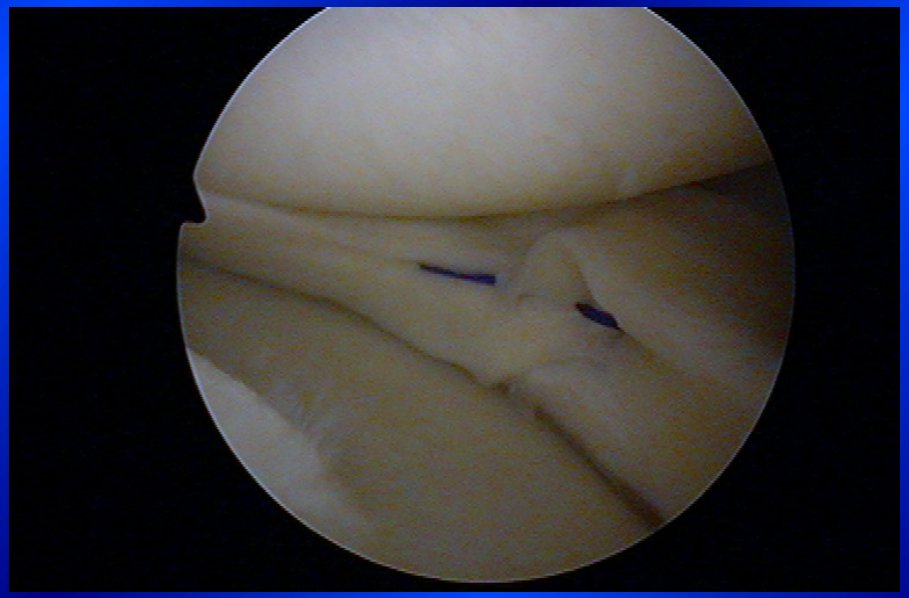
Suture of meniscus- meniscopexis

outside-in

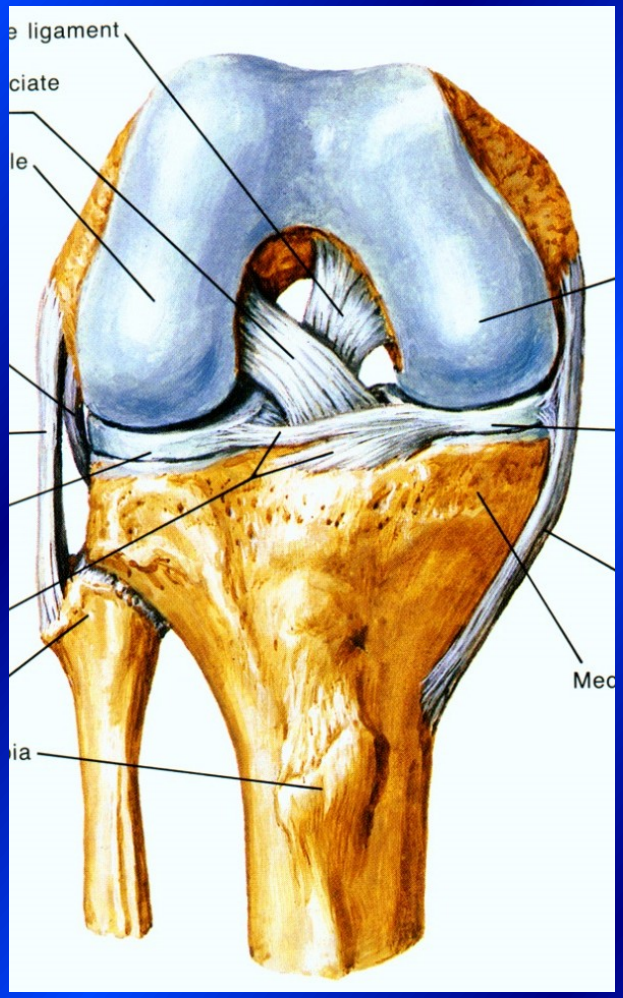
inside-out

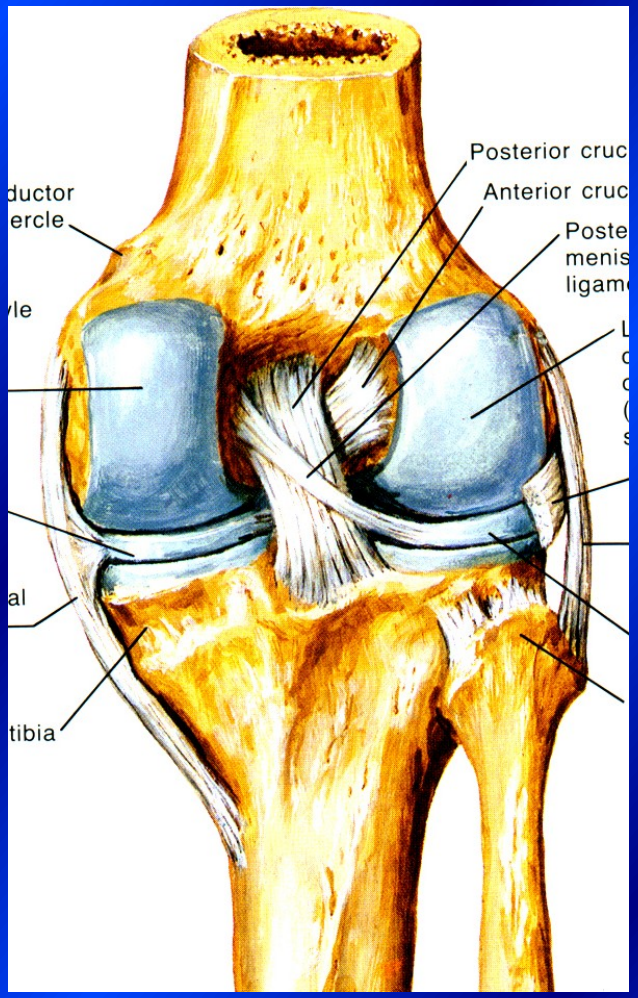
all-inside





Ligaments- ACL, PCL

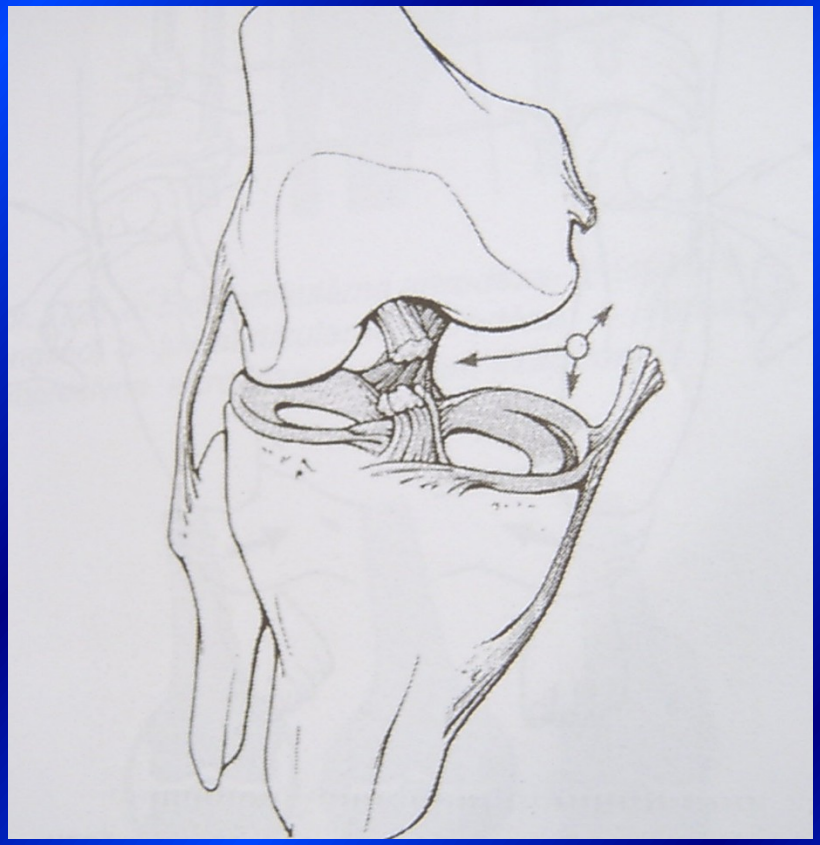




Rupture of ligaments

- **Sprain**
- **partial rupture**
  total rupture

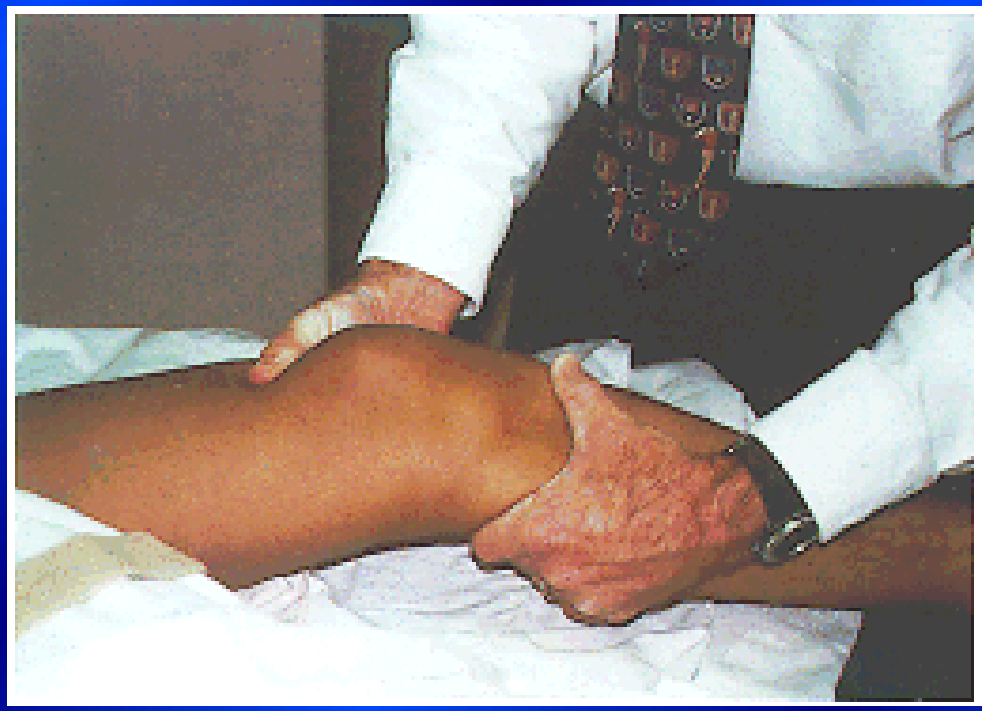
- Mechanism of injury
- Tests of stability



Unhappy trias

Rupture of ACL

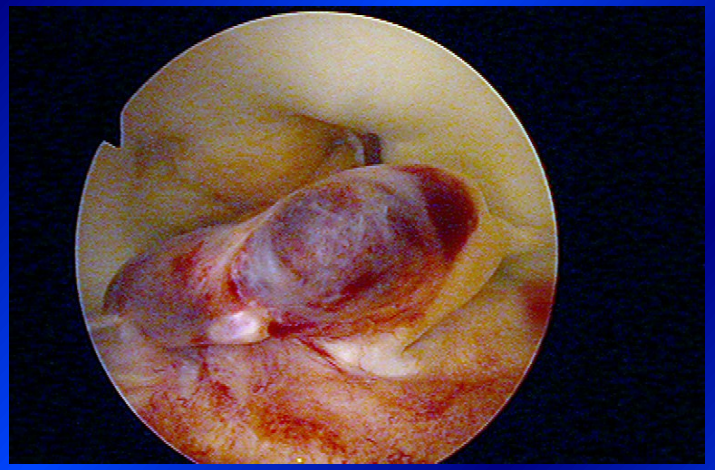
- Tests of stability
- Lachman test
- Anterior drawer sign
- Pivot-shift test



Lachmann test

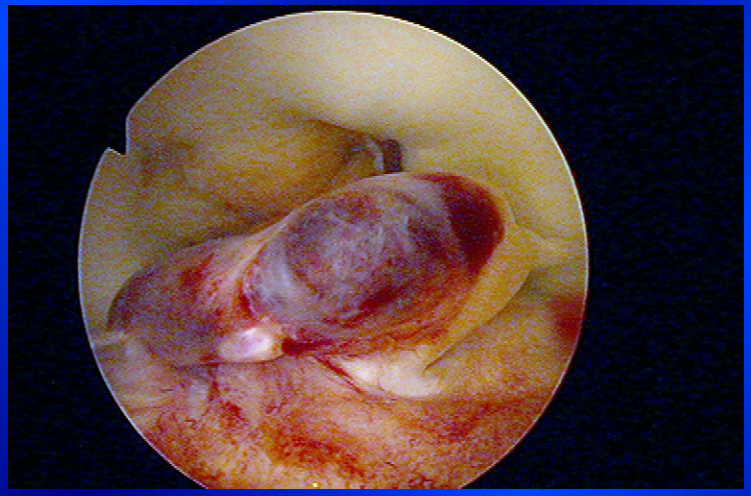
Rupture of ACL

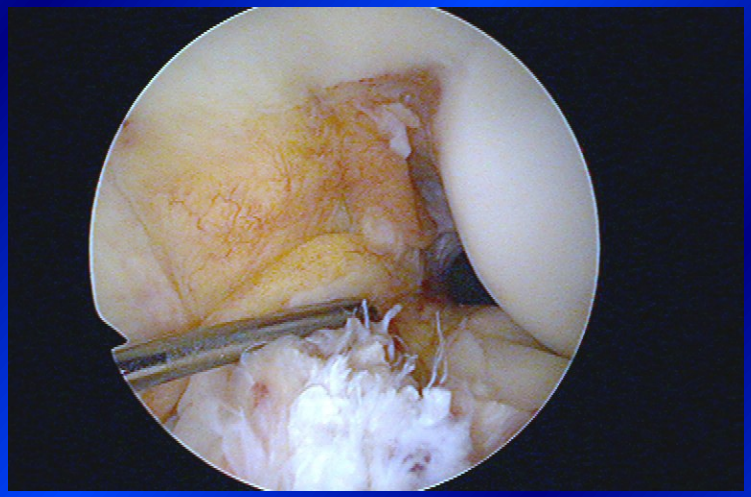
- Frequent injury



Rupture of ACL

- Debridement
- Physiotherapy
- Limited activity
- Orthesis



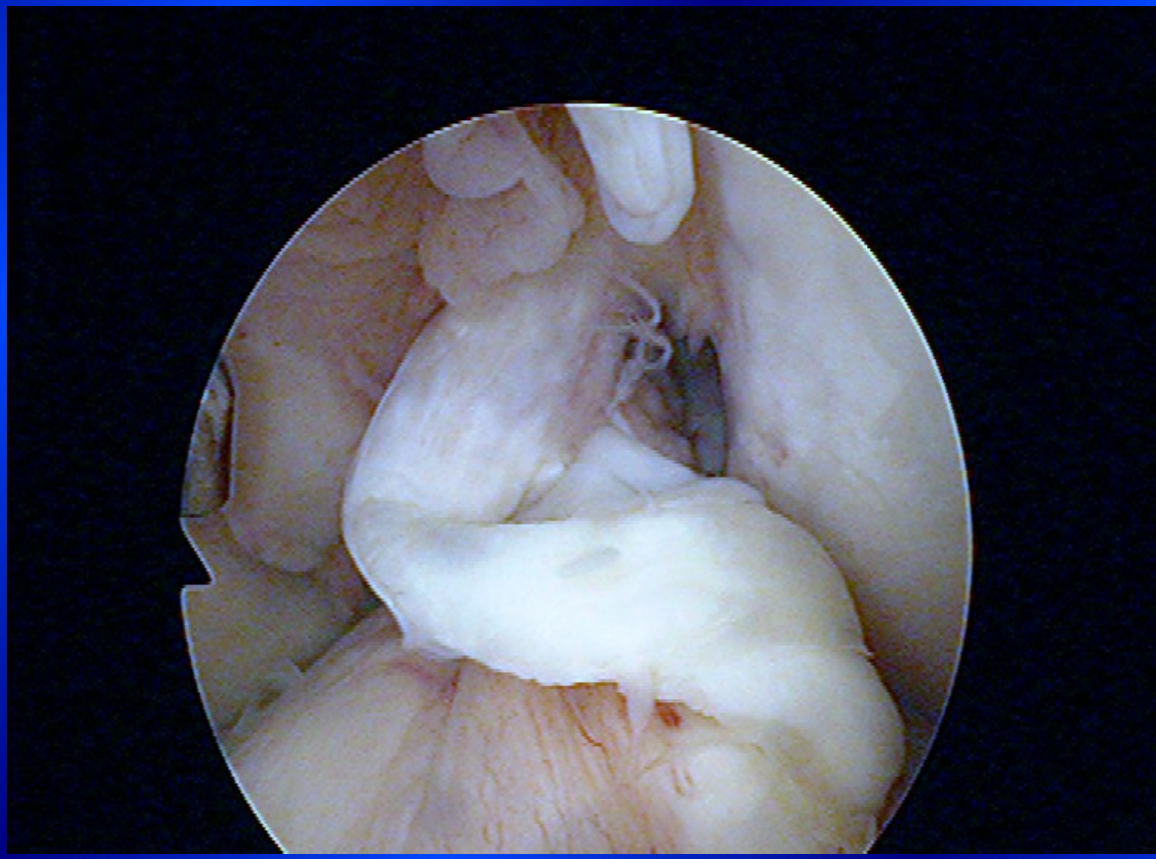


Physiotherapy

Orthesis

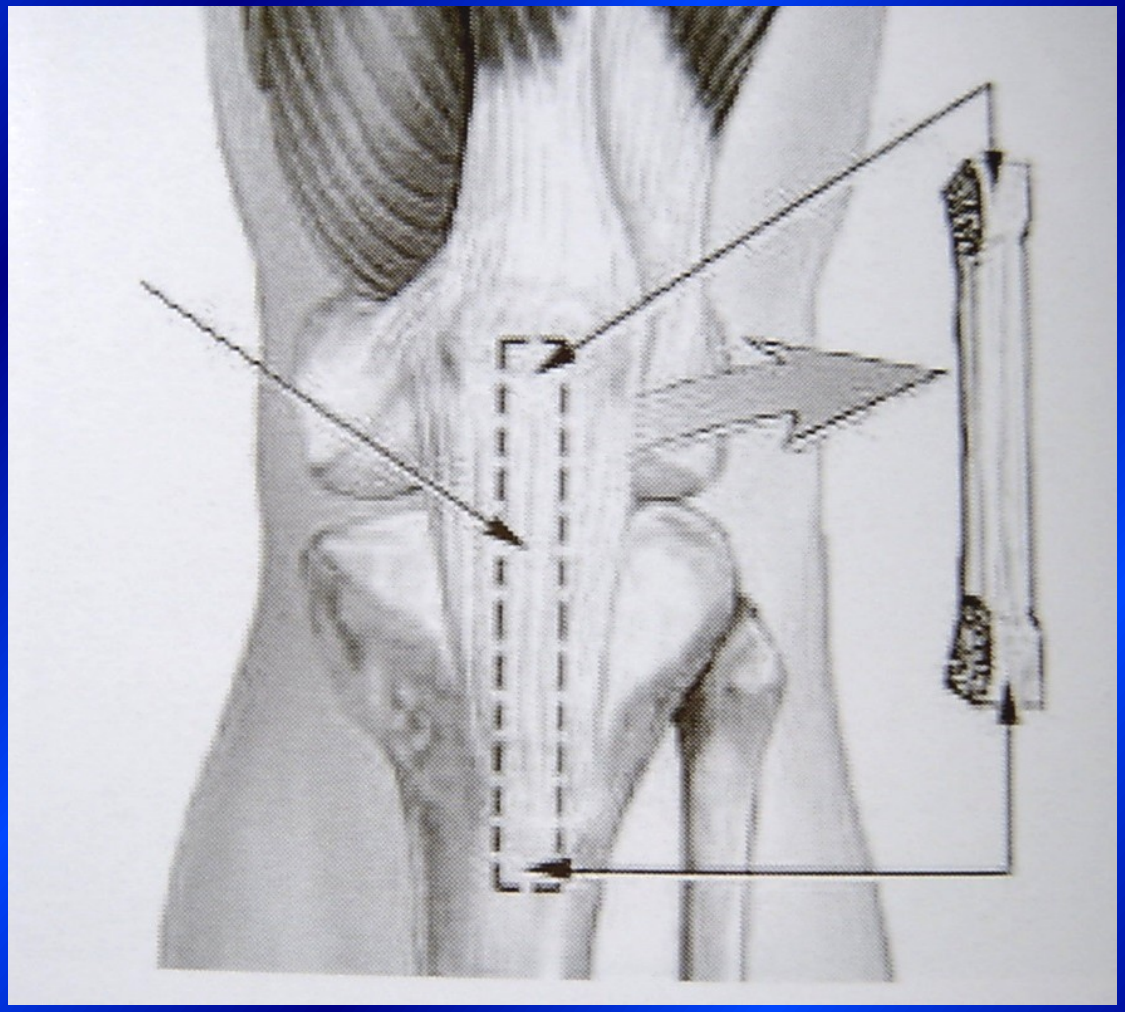
Indication for reconstruction

- 1/3 of cases



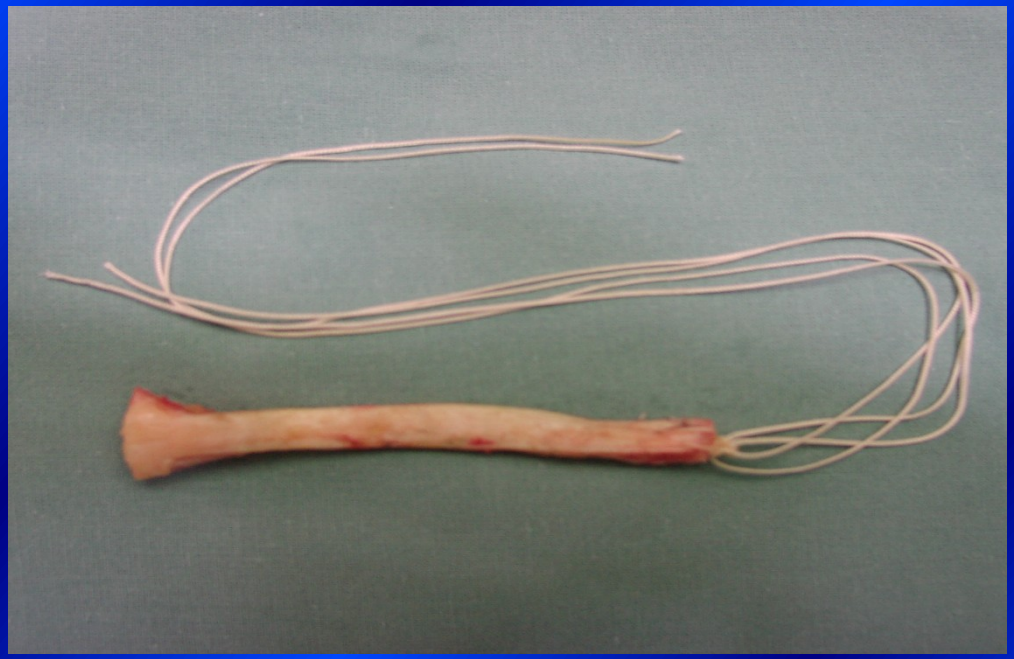
BTB graft

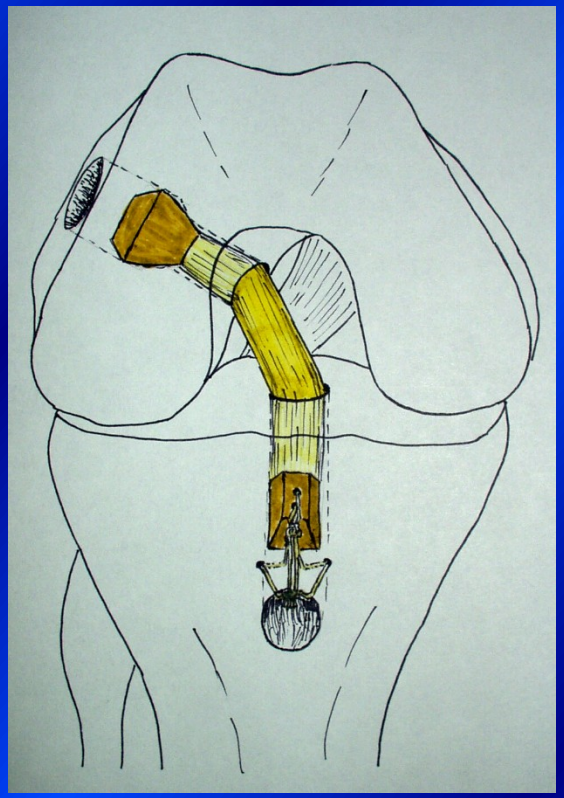
- **B**one-**T**endon-**B**one



BTB graft

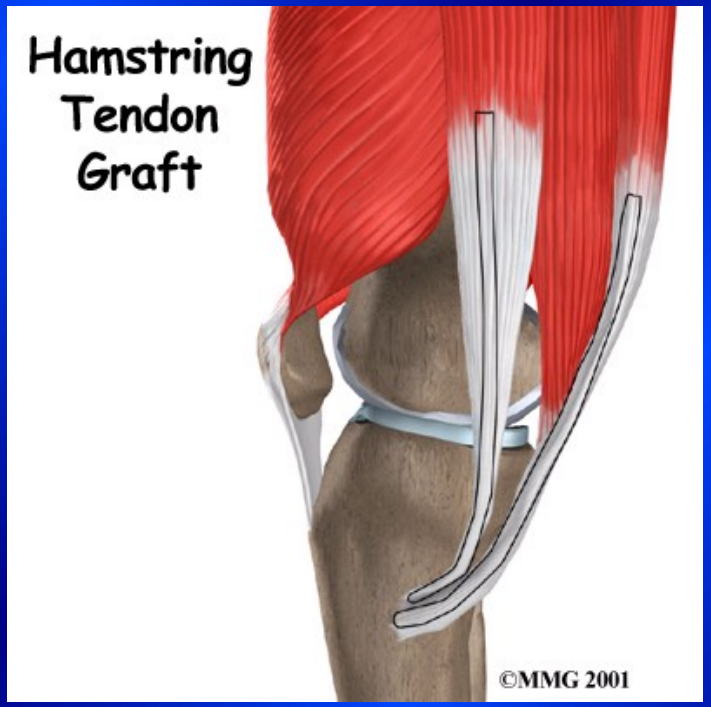
- **B**one-**T**endon-**B**one

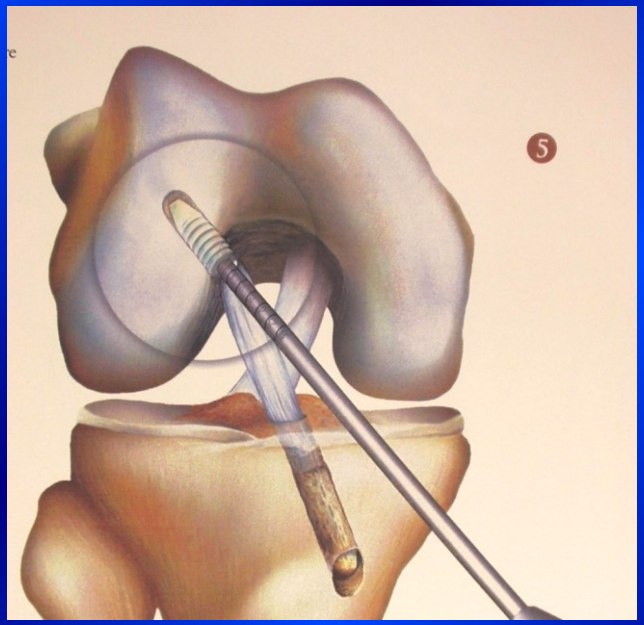


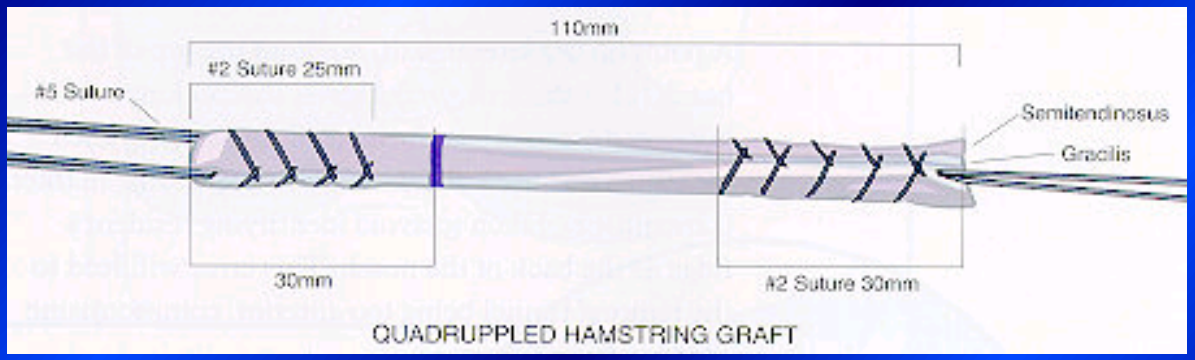


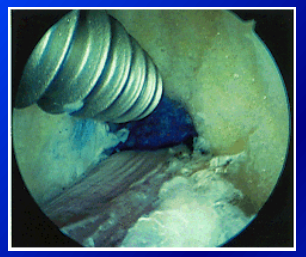
Press fit technique

Hamstrings
(m. semitendinosus + m. gracilis)



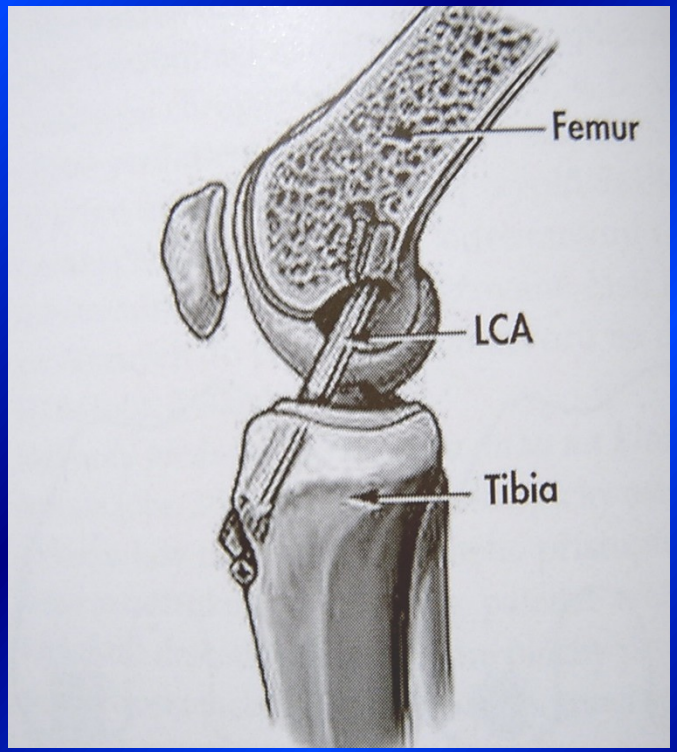


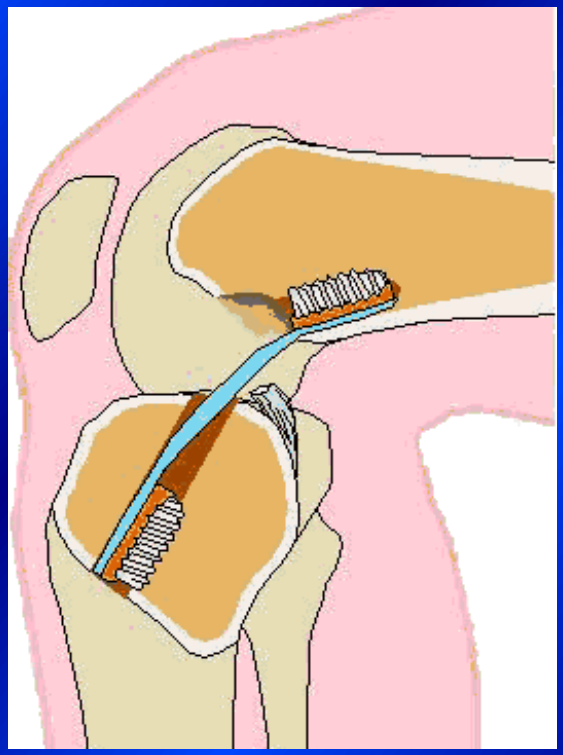




Fixation by screws

Technique

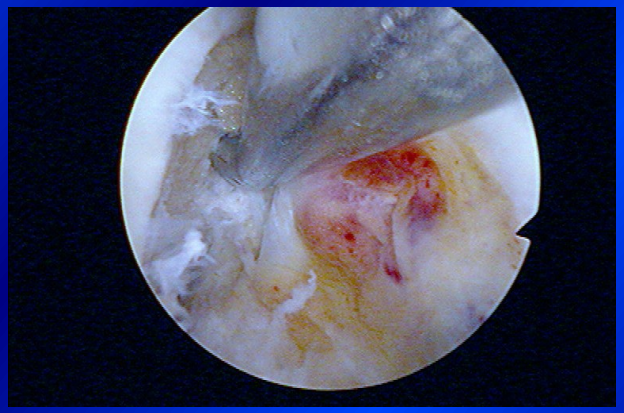
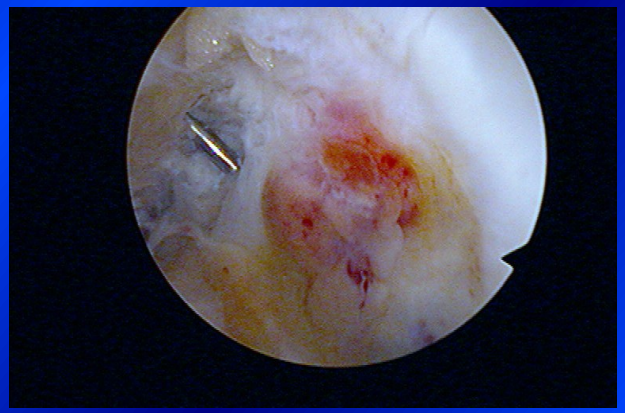




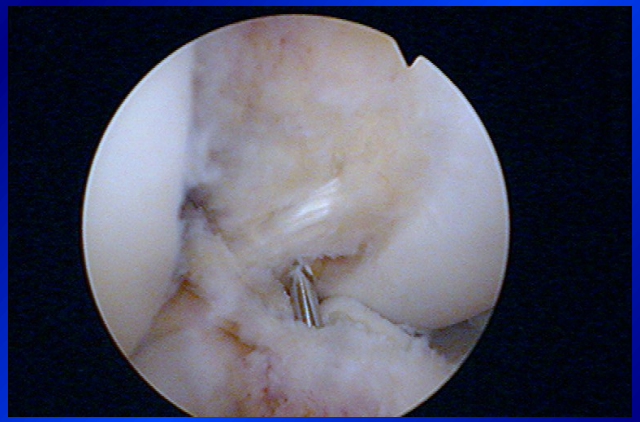
ACL plasty- press fit technique

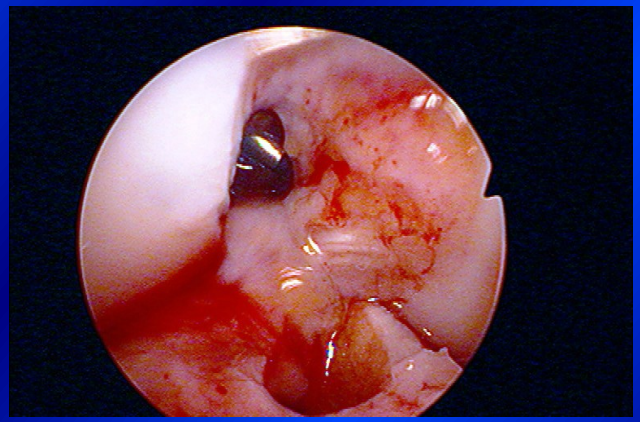
Femoral canal



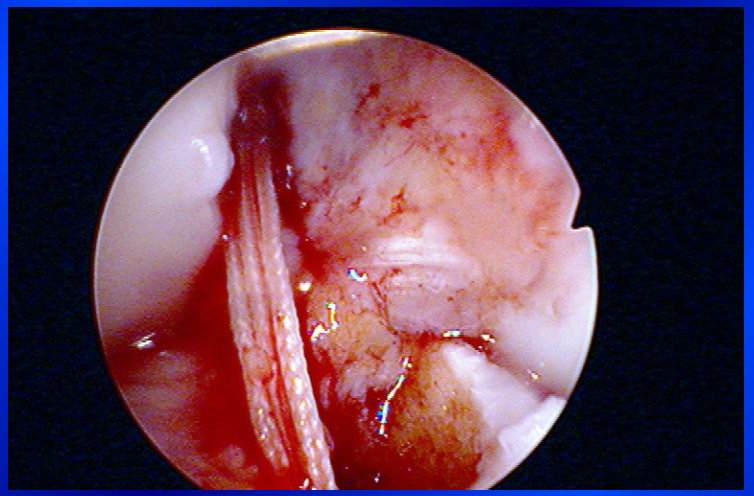




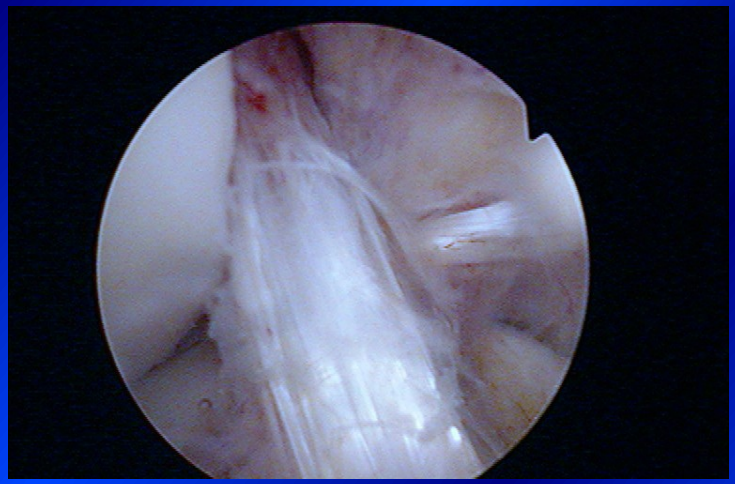

Tibial canal





Tightening of the graft

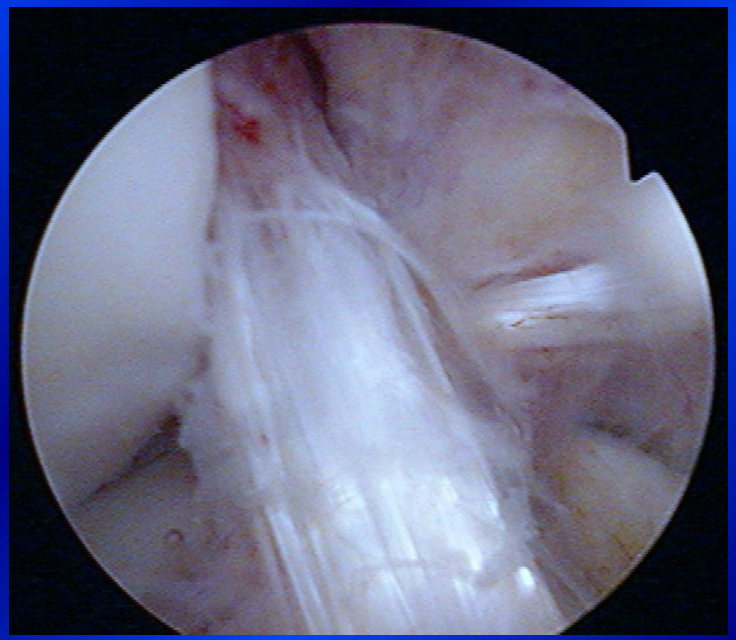




Graft in situ

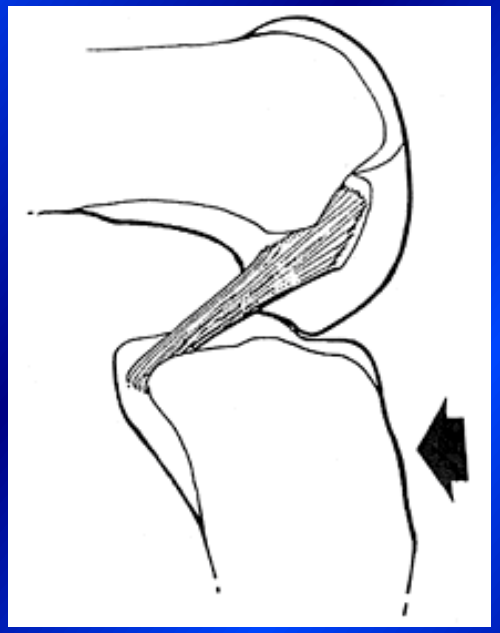
Aftertreatment

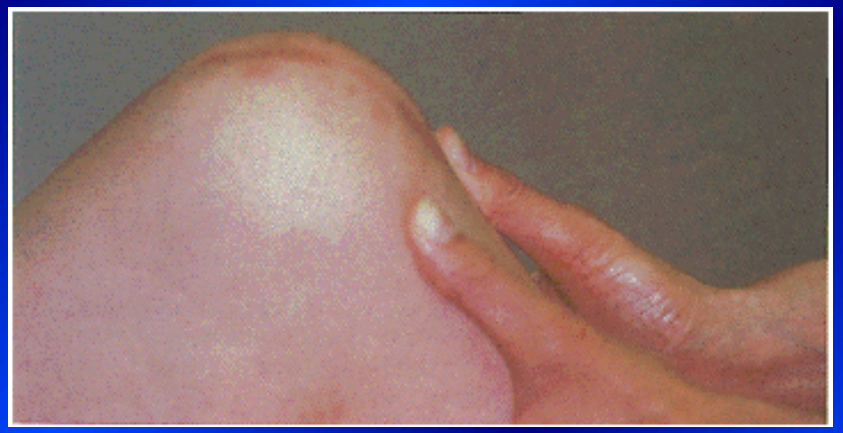
- 6 weeks orthesis
- Weight bearing after 6 weeks
- Sports activity after 9 months



Rupture of PCL

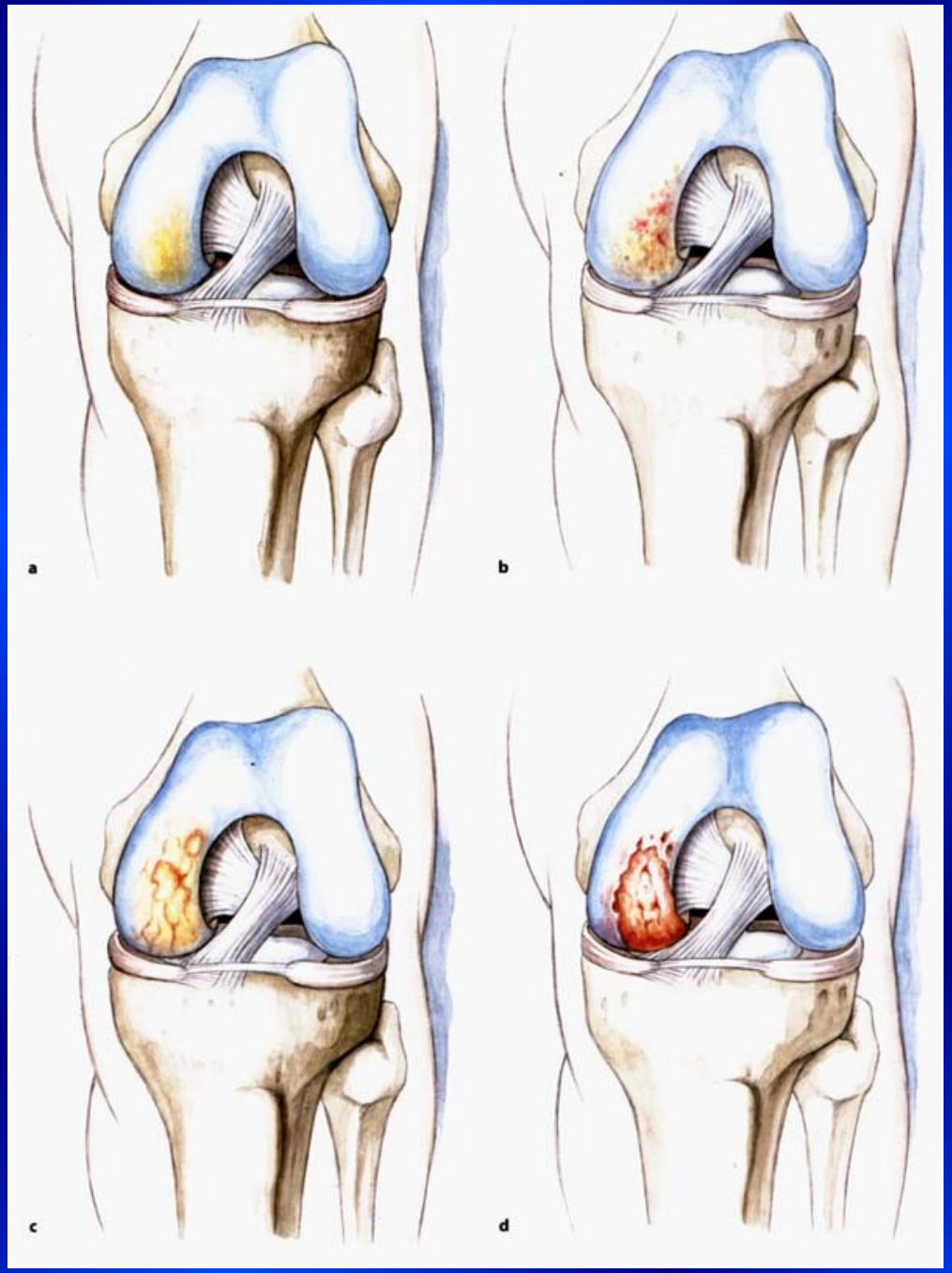
- In **dashboard injury**
- Posterior drawer sign



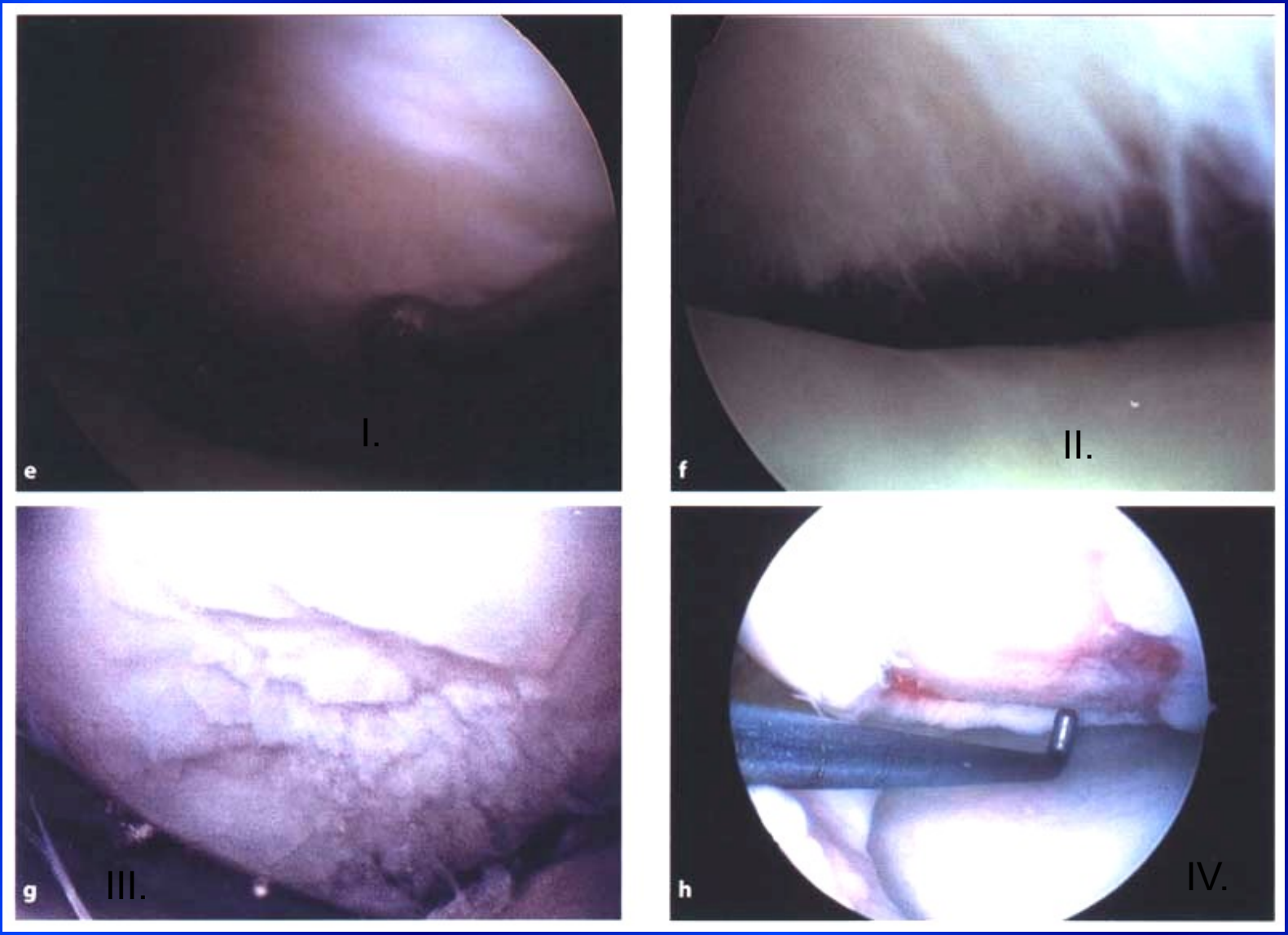


Chondropathy

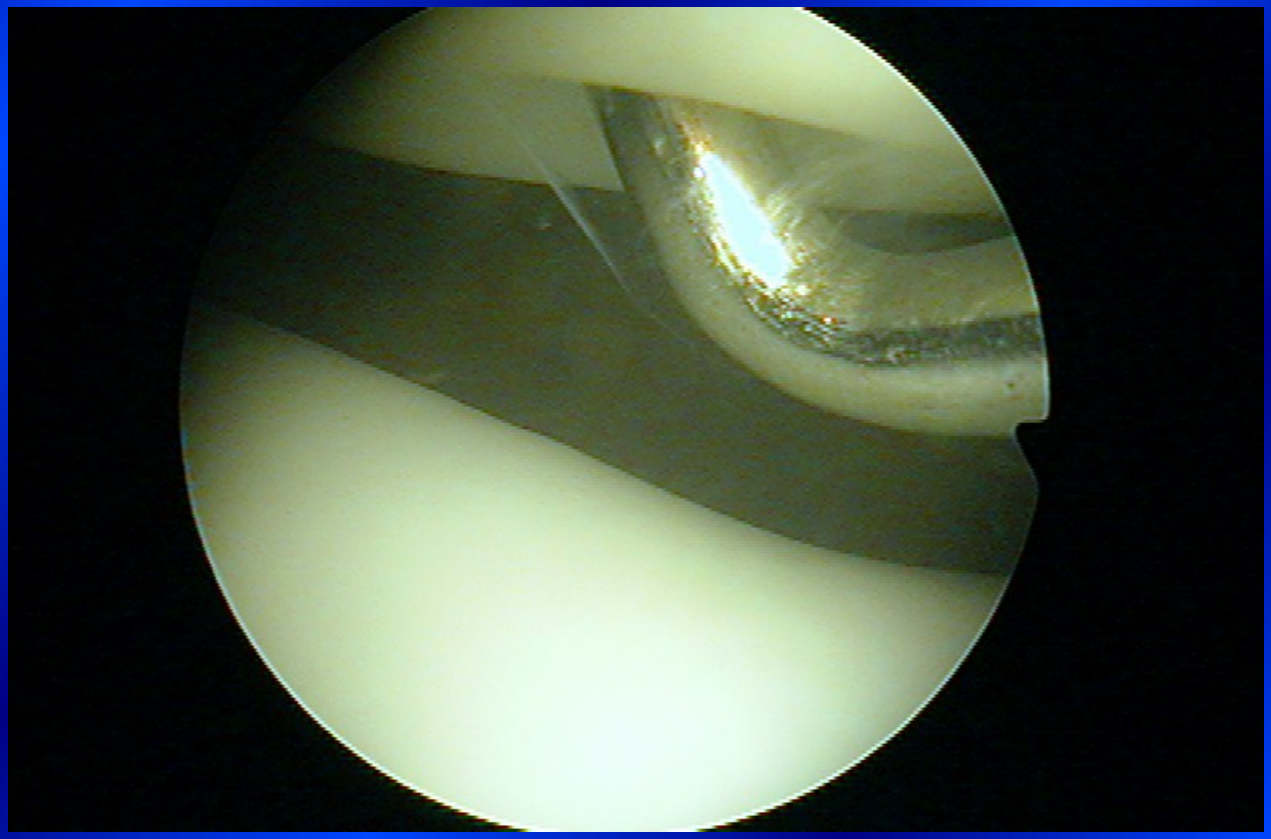
Outerbridge. H.K.

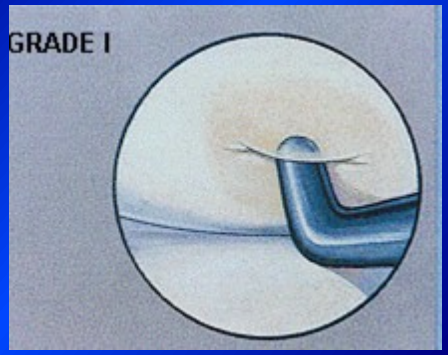


Chondropathy



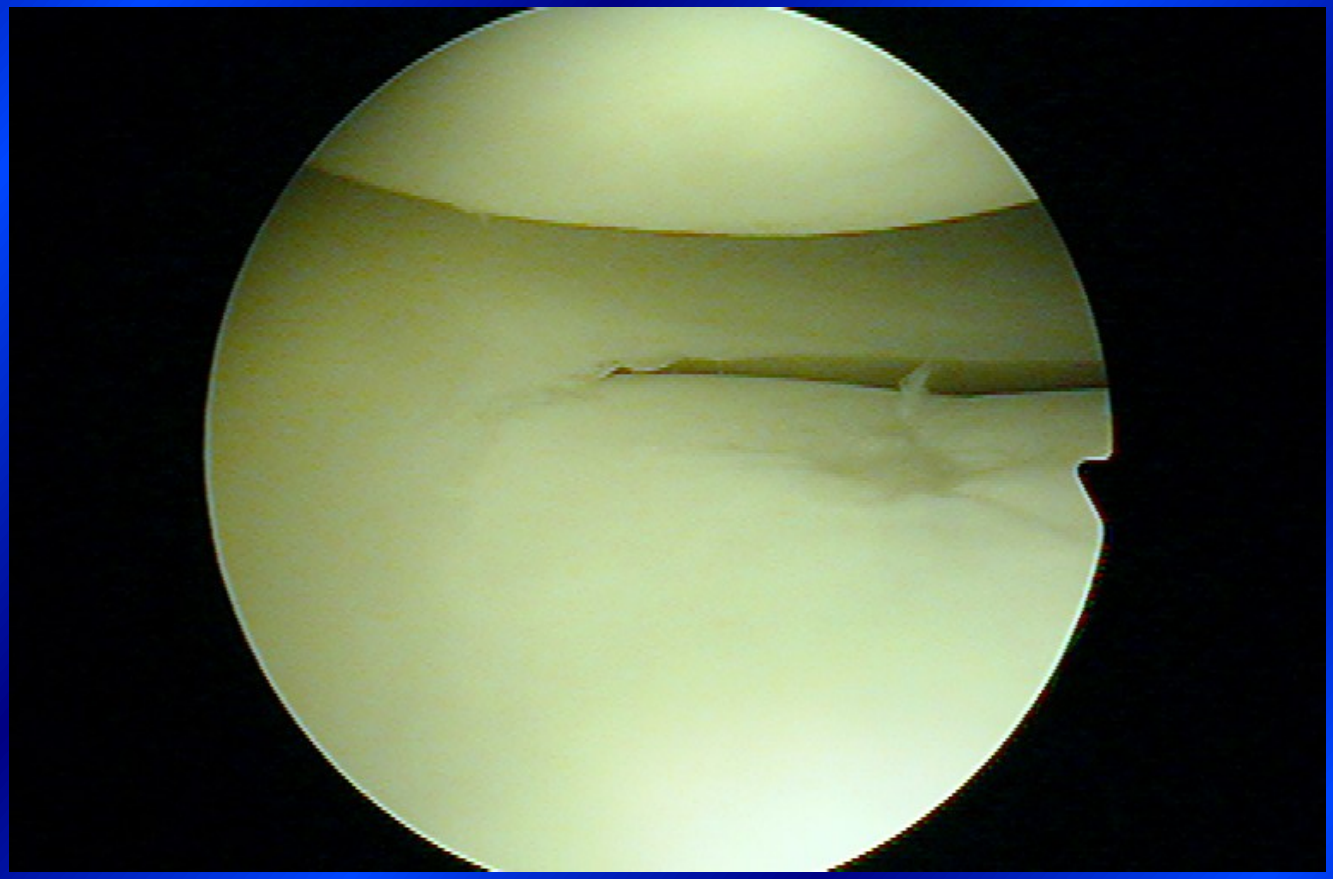
Chondropathy I. st.

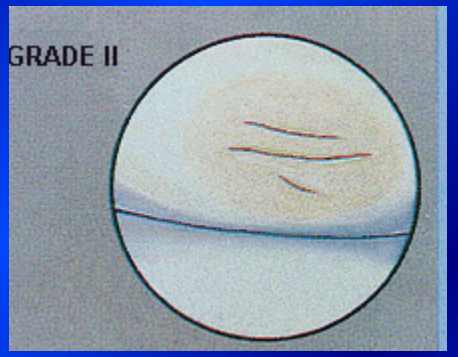




Soft cartilage, chondromalatia

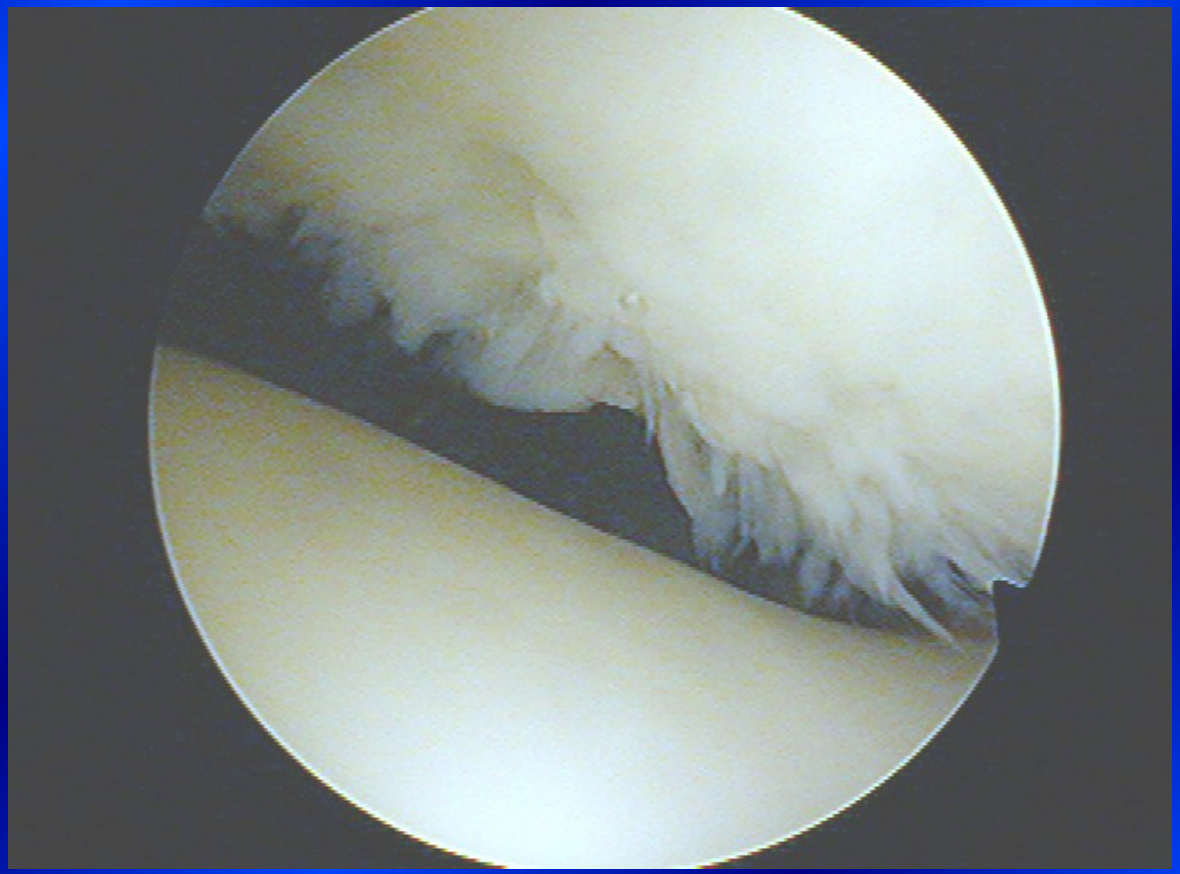
Chondropathy II. st.

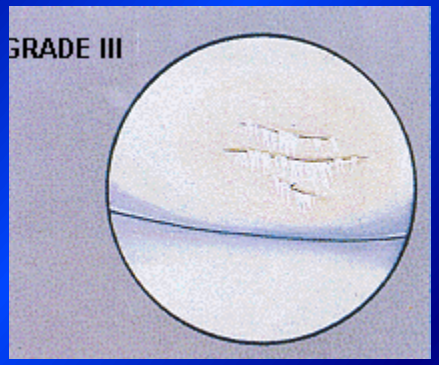




Fissures in the cartilage

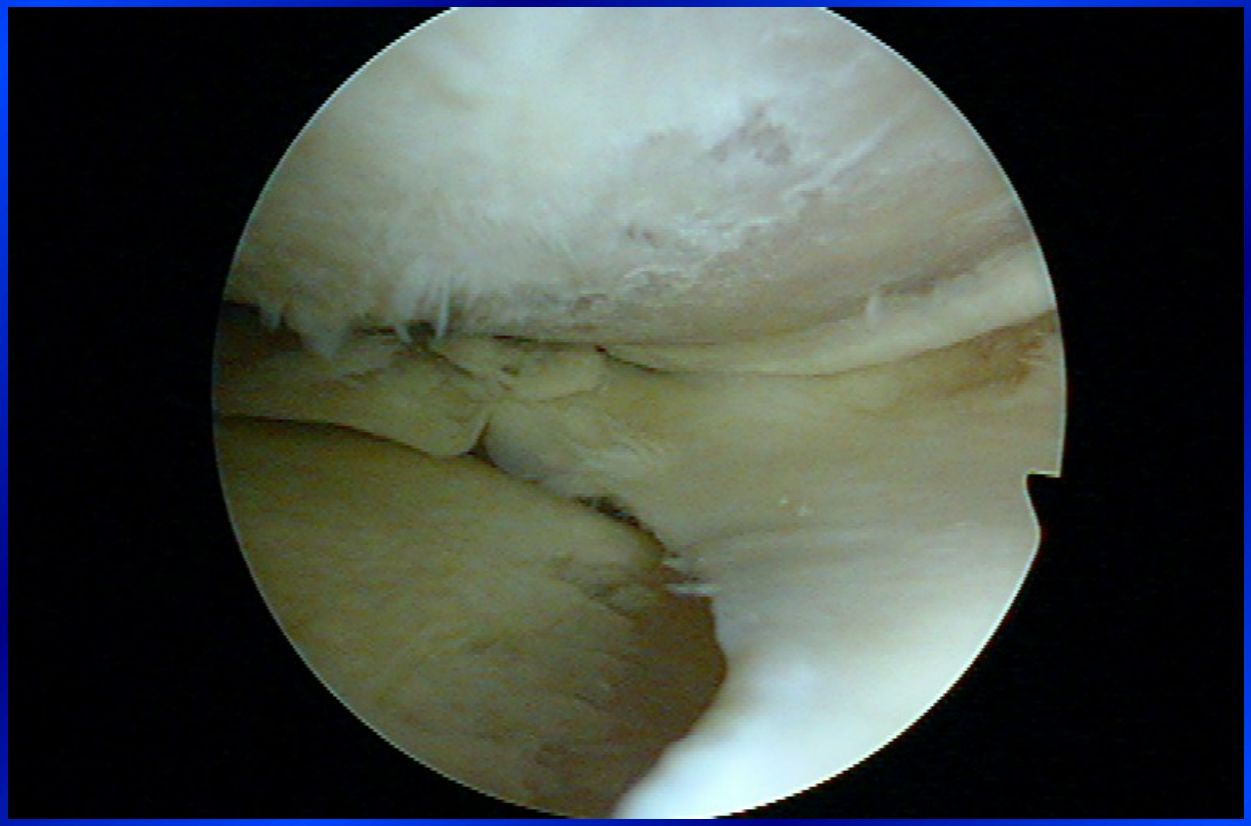
Chondropathy III. st.

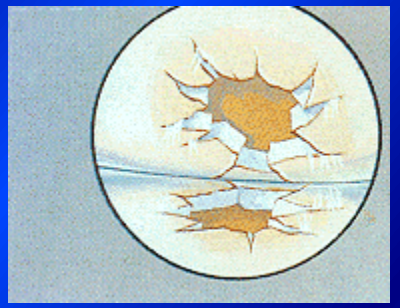




Fibrilation- „ crab meet“

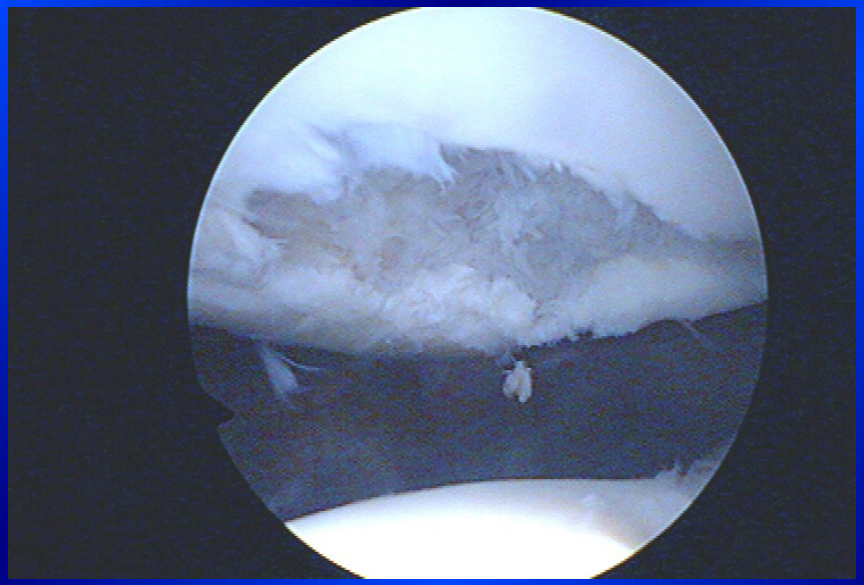
Chondropathy IV. st.





Defects to subchondral bone

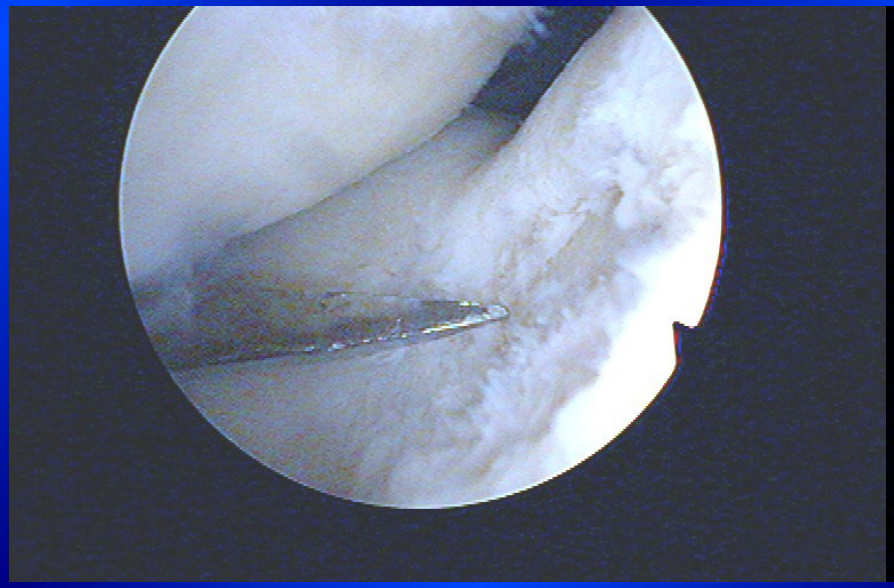
Defects of cartilage

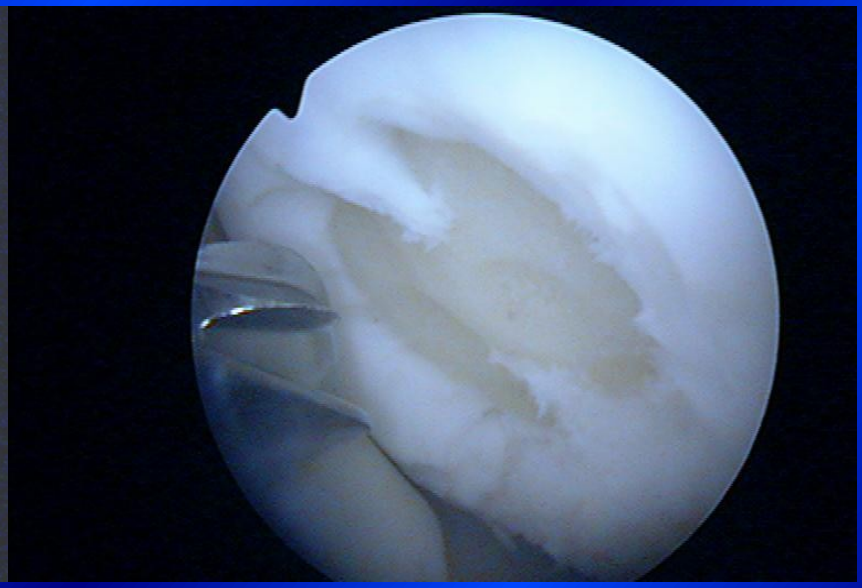


Patella

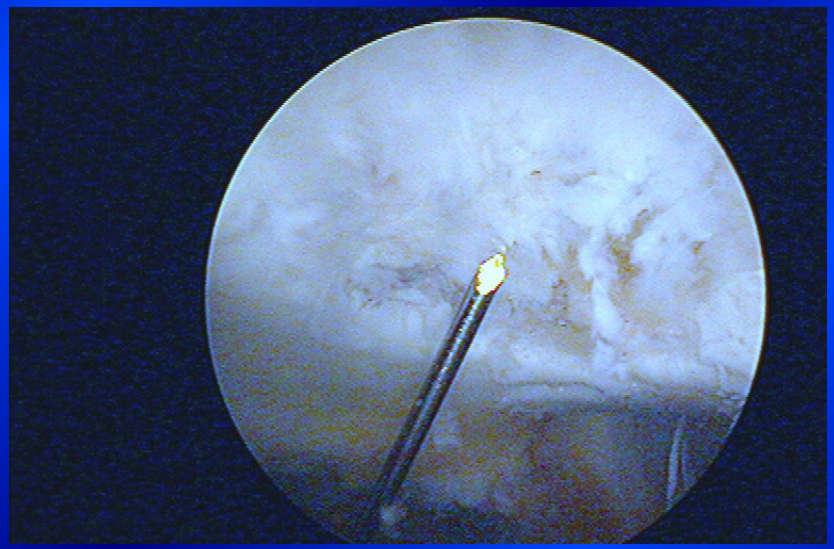
Medial condyle

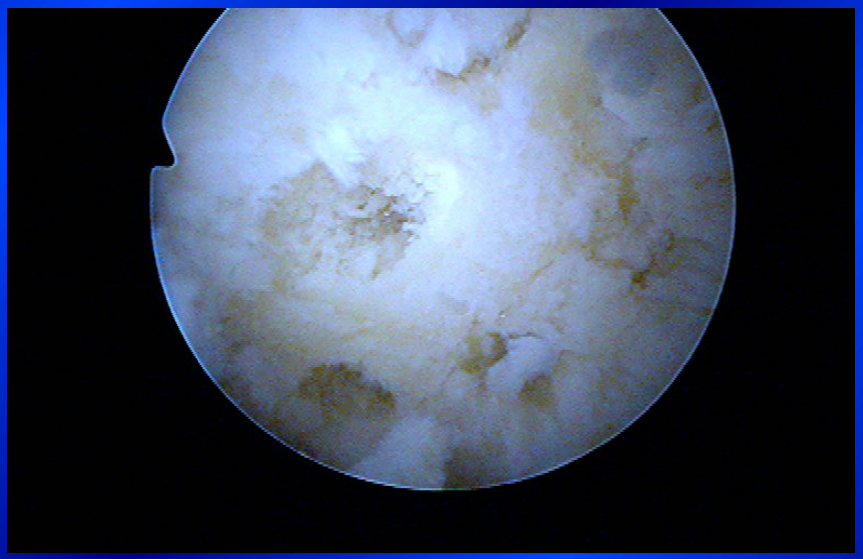
Shaving and drilling





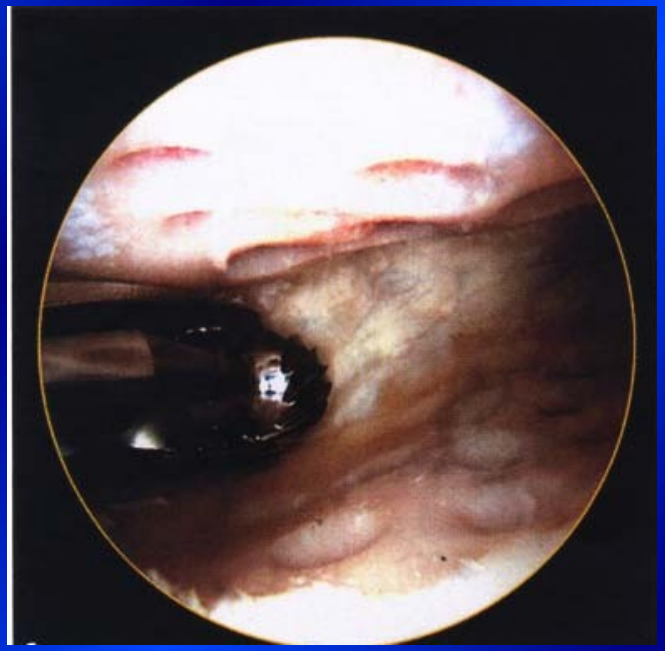
Drilling

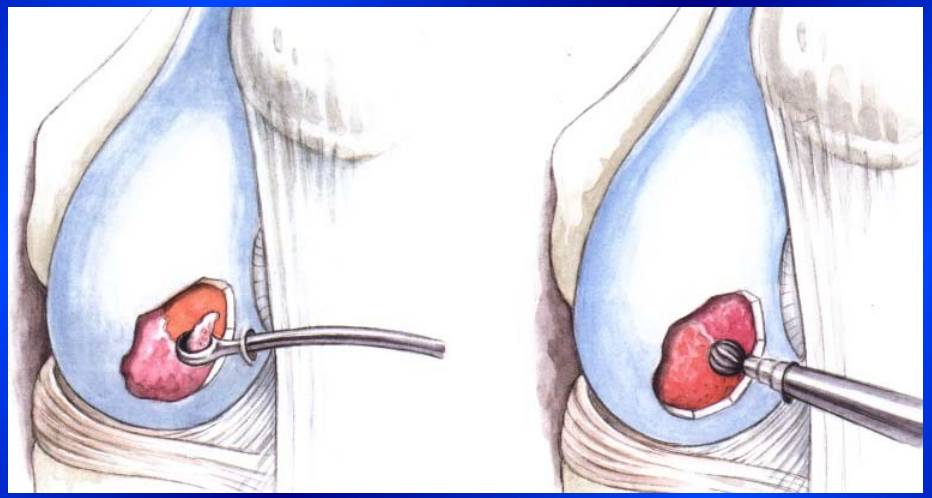




Abrasion chondroplasty

Curretage
Shaver



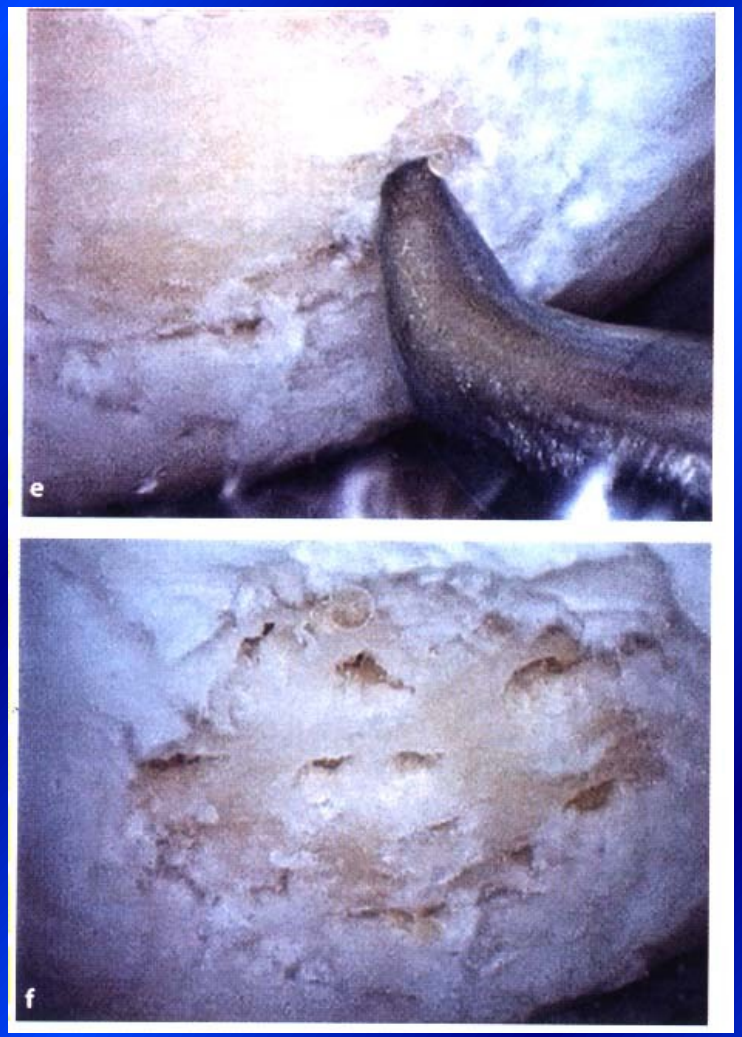


Microfractures

Perforation of subchondral bone
- slight bleeding
Steadman, J.R., 1999

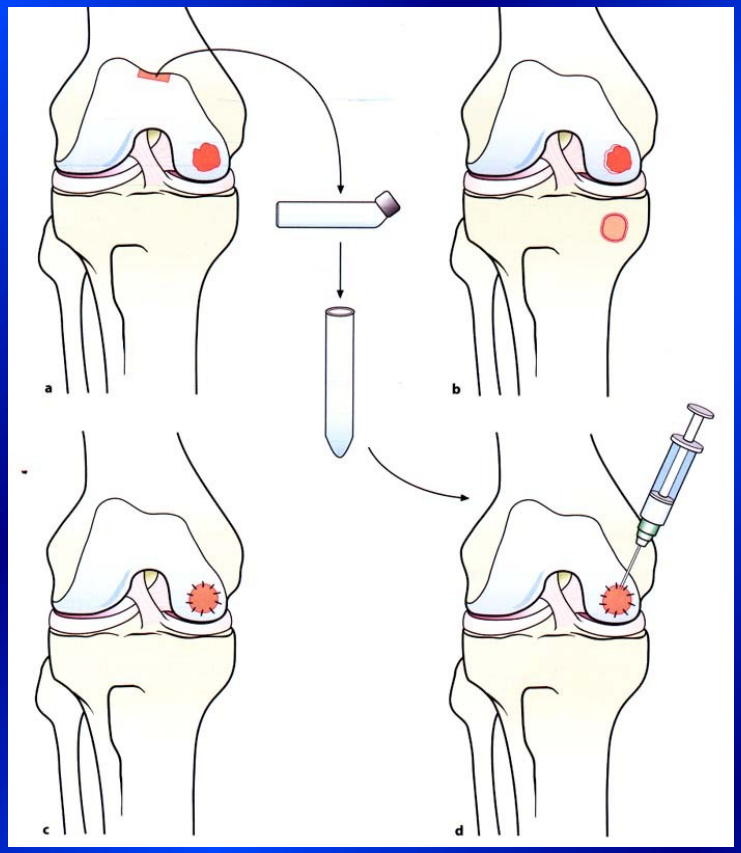
Multipotent stem cells into
the defecfts
The aim- to create fibrocartilago

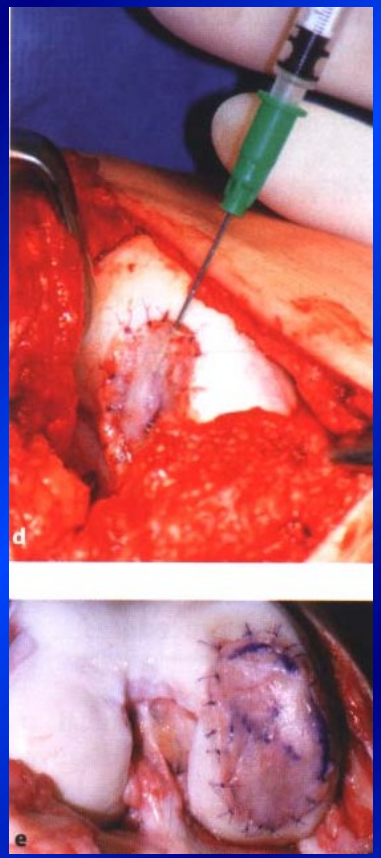
Microfractures



ACI – autologous chondrocyte implantation

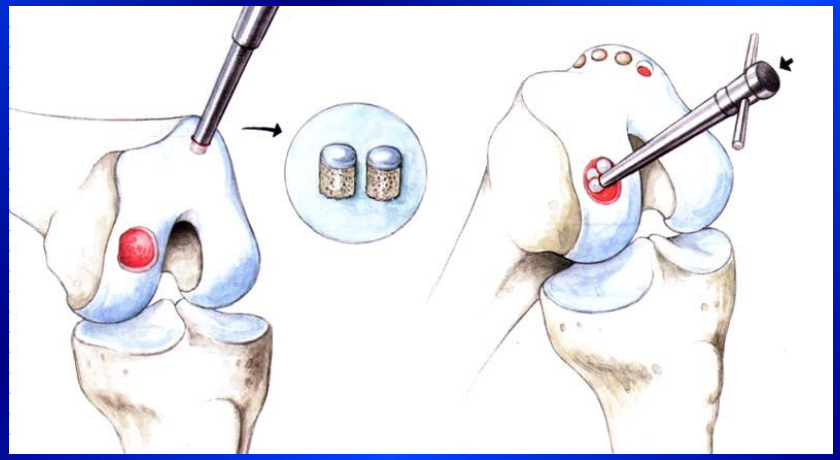
Transplantation of autologous chondrocytes
into defects of cartilage
Chondrocytes in suspension under periostal layer



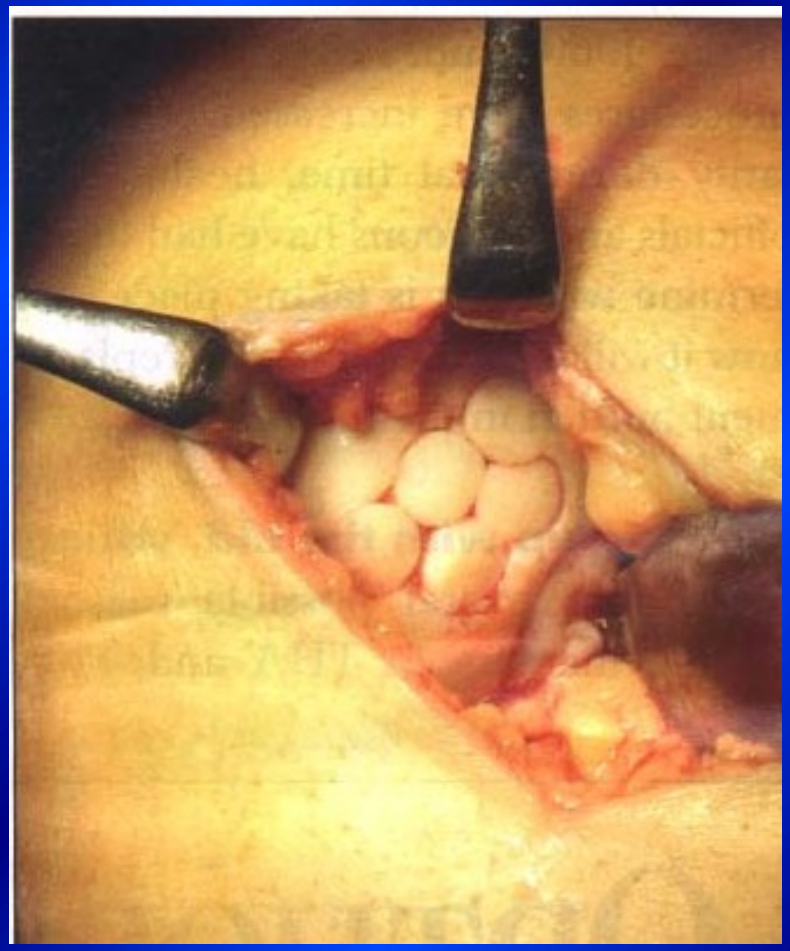


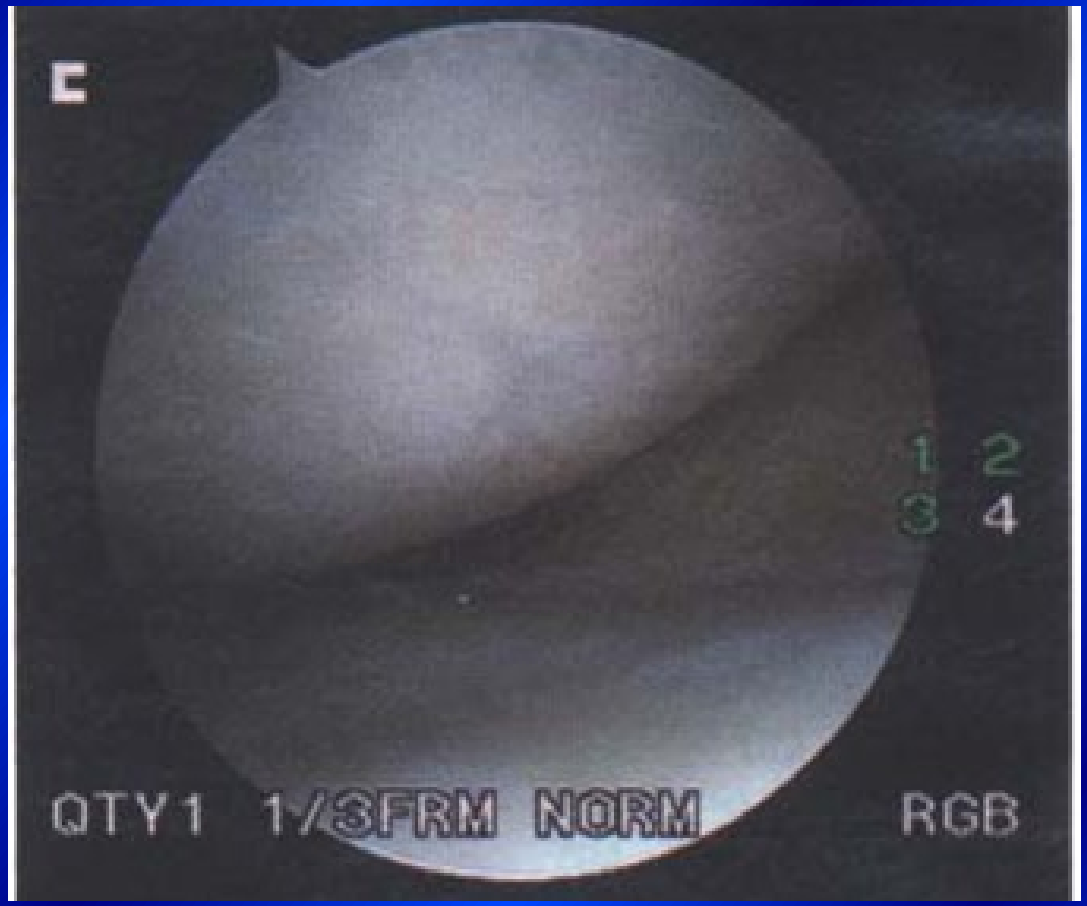
Osteochondral autograft transfer- OAT
Mosaic plasty

Hangody, L., 1992
Defects up to 2 - 4 cm^2



OAT





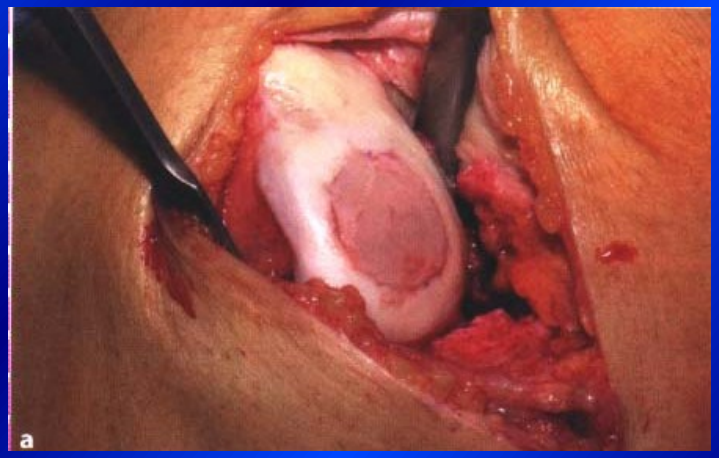
4 years after surgery

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

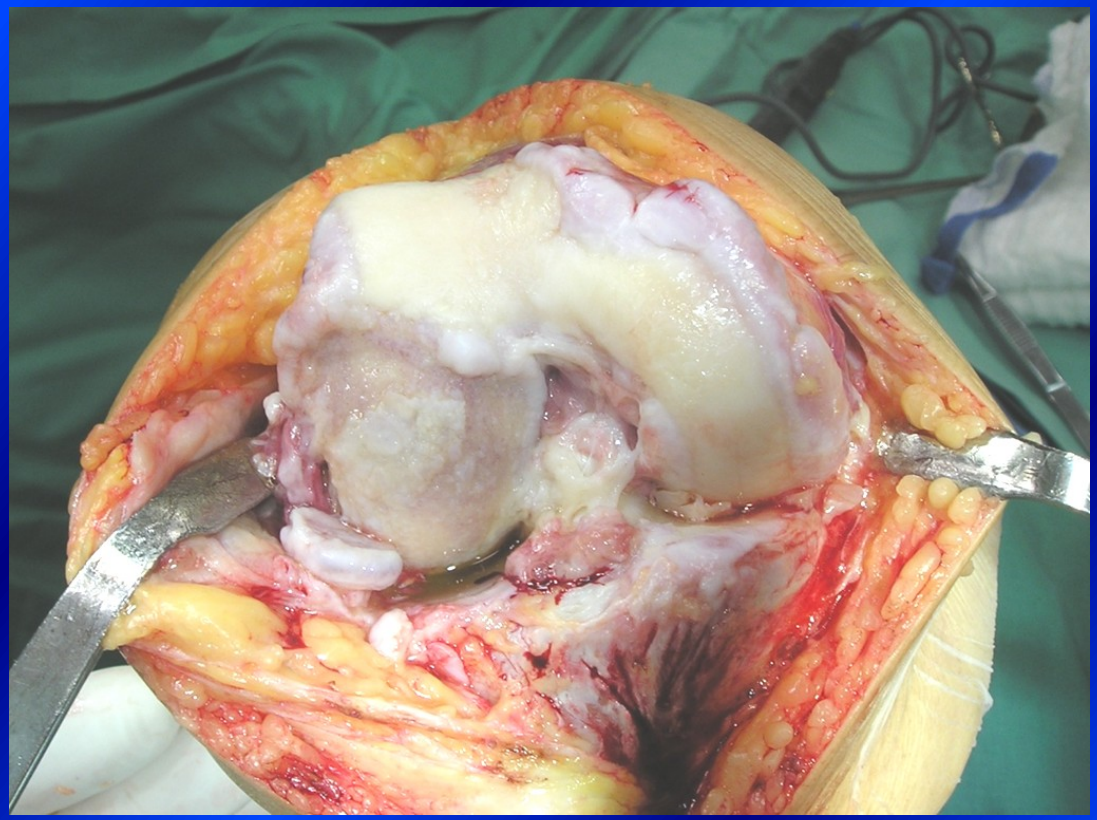
No special fixation

Scaffold serves for maintaining of stem cells from bone marrow

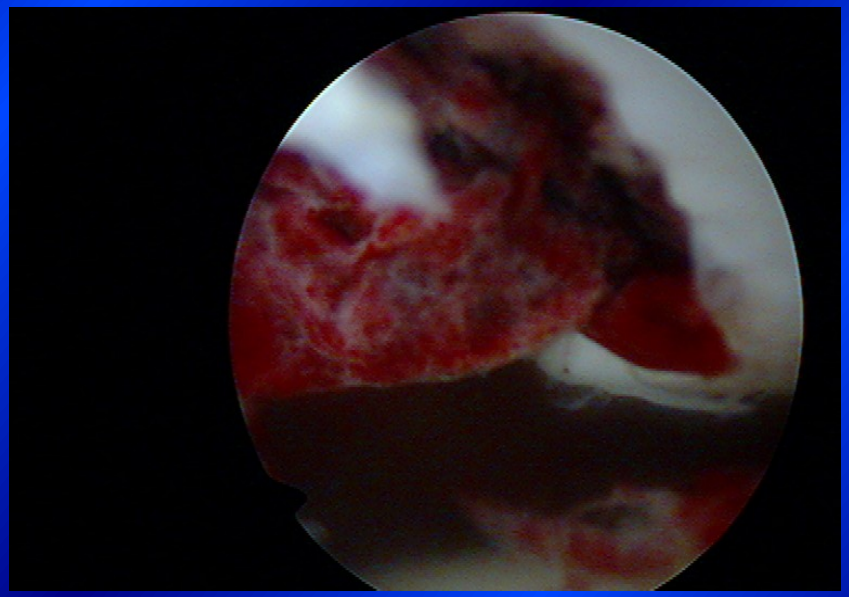
Supports viable cells

Fills the defects of hyaline cartilage

Osteoarthritis



Transchondral fractures

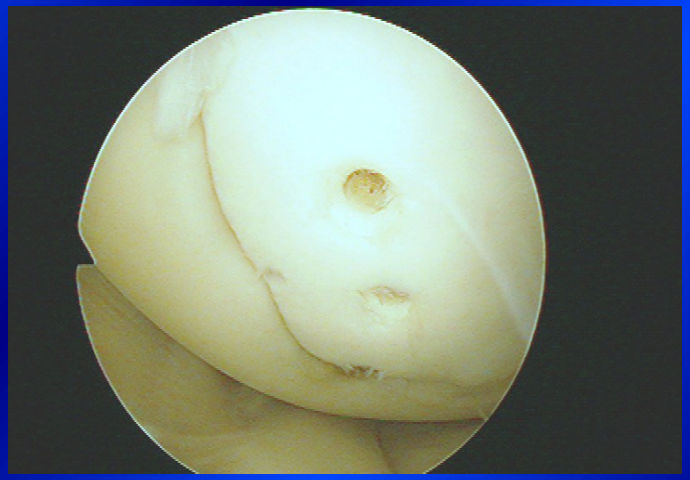


Removal

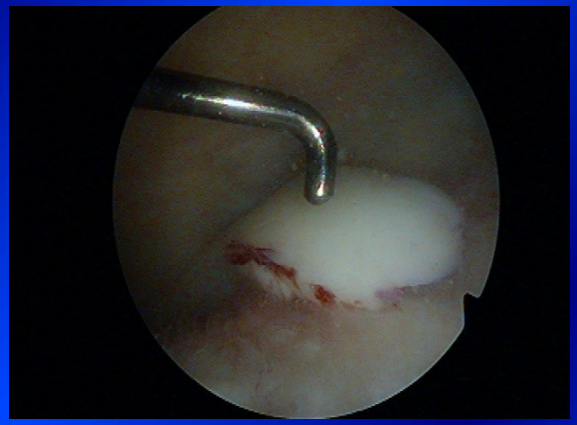
- Subchondral abrasion
- Drilling

Osteochondral fractures

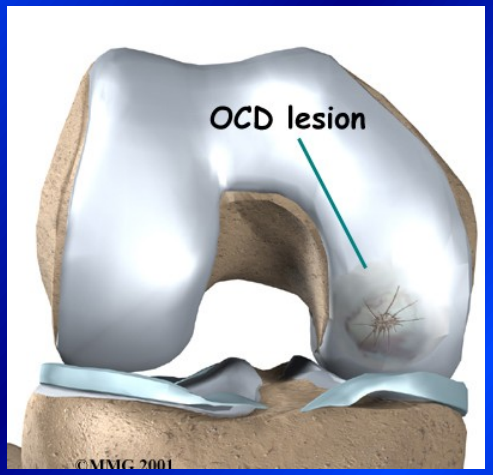
- Removal
- Fixation



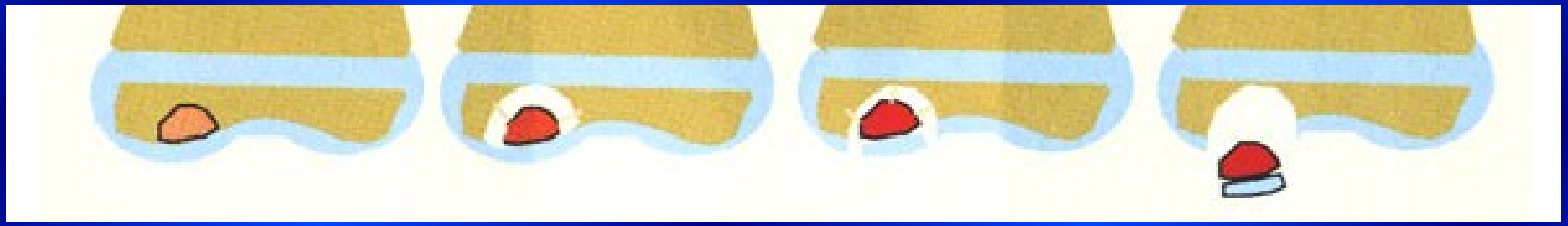
- Loose body



Osteochondrosis dissecans

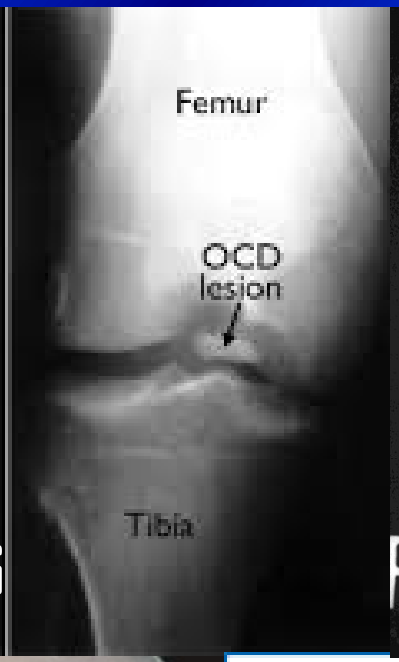


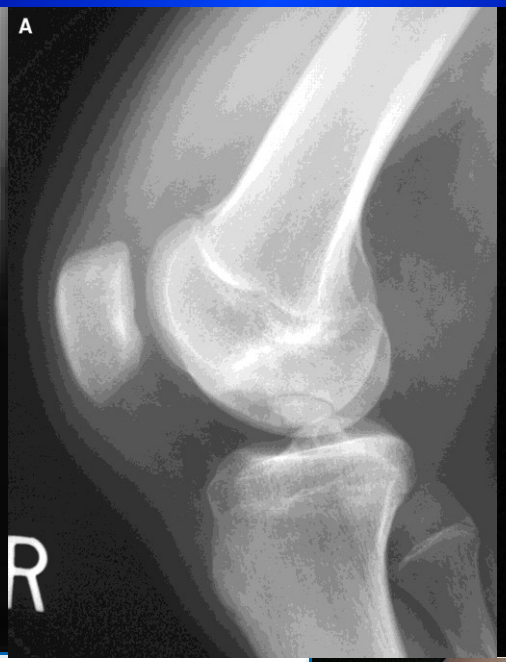
- Local necrosis in subchondral bone
- Mostly on medial femoral condyle
- Etiology- trauma, microtraumatisation
- vascular

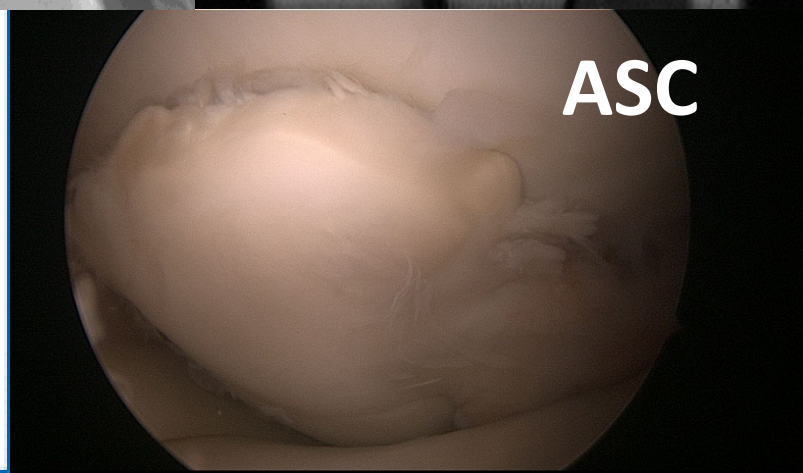


- Diagnostics:

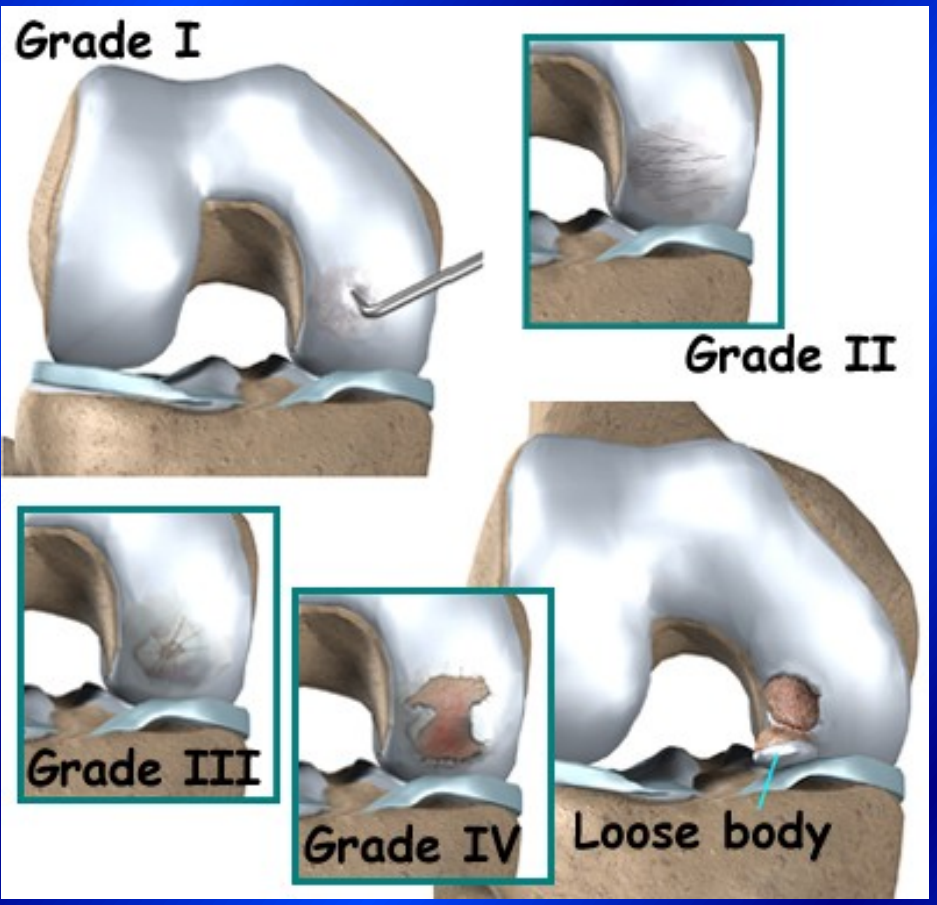
  X ray, MRI, CT, artroscopy

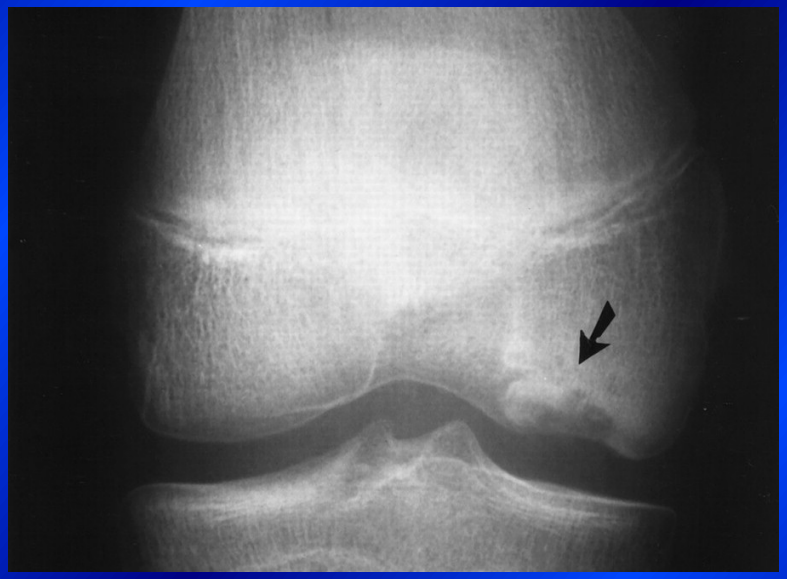






ASC classification





X ray classification

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

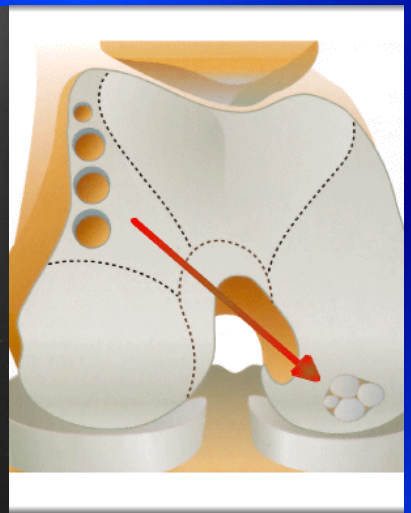
Therapy

Juvenile form

- conservative
- ASC drilling

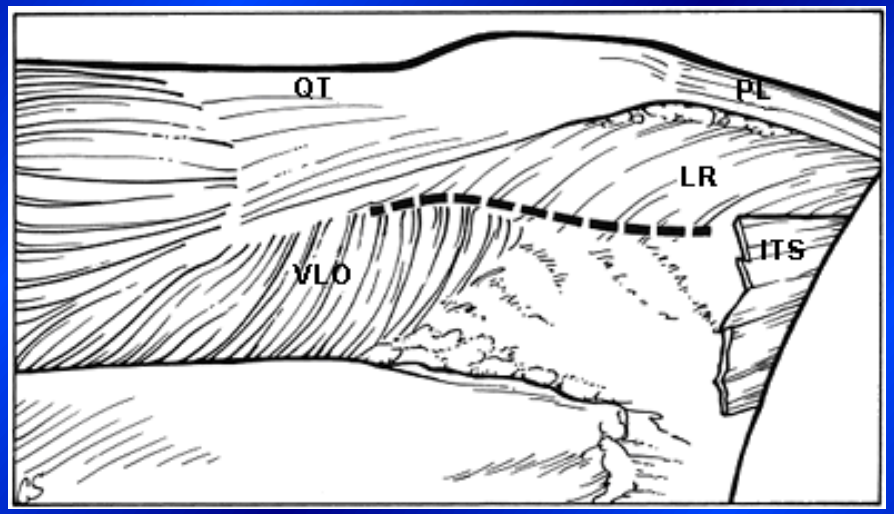
Adult form

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



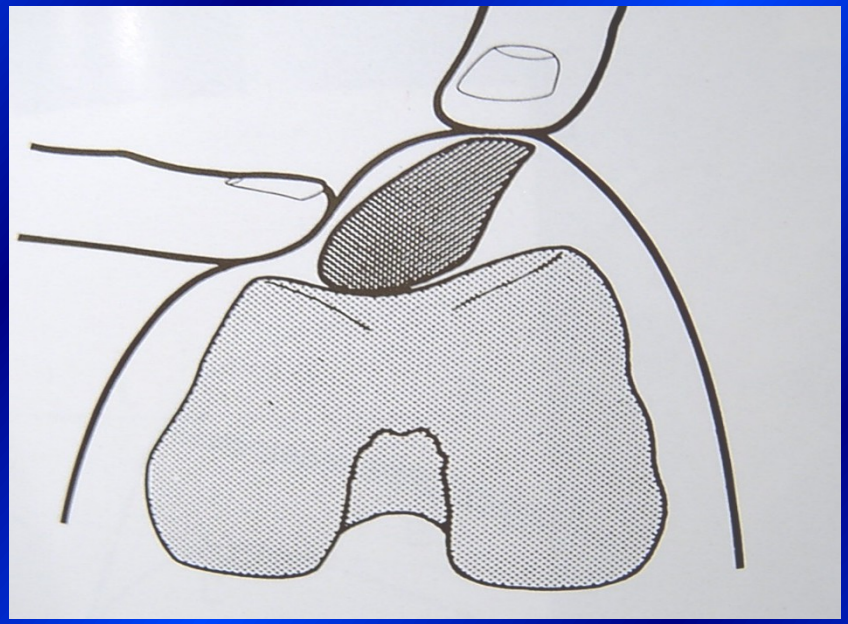
Patella

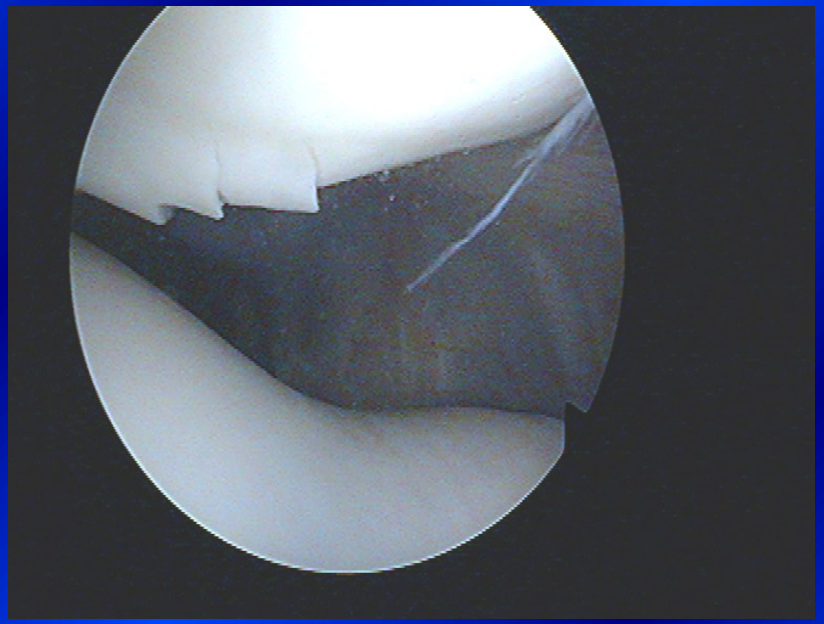
- Chondropathy
- Subluxation
- Dislocation



Chondropathy of the patella

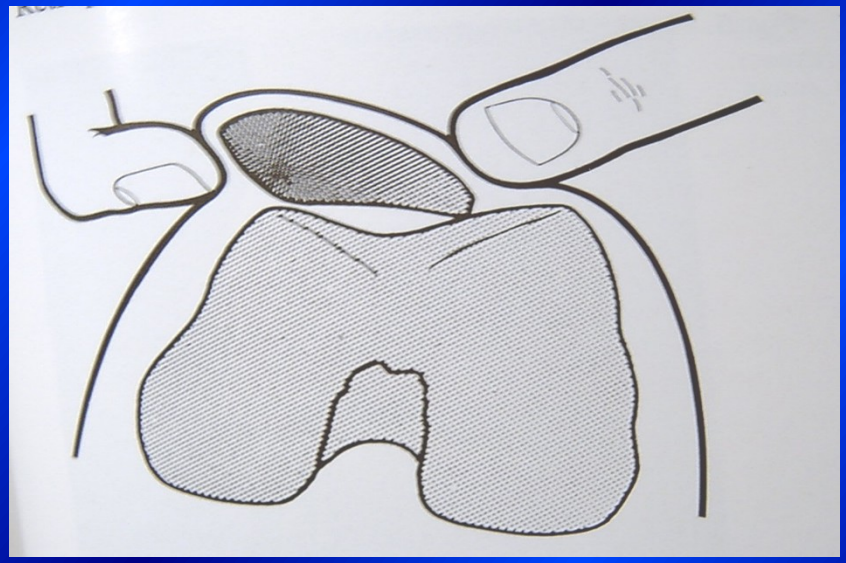
Clinical symptoms

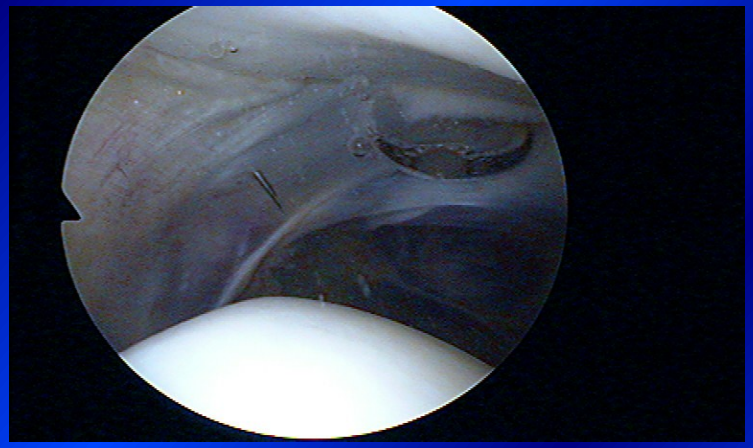


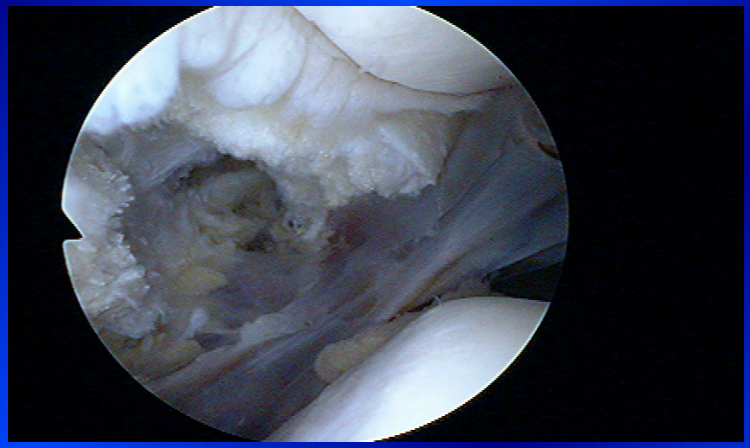


Chondropathy of the patella

- Conservative
- In lateral hyperpression lateral release

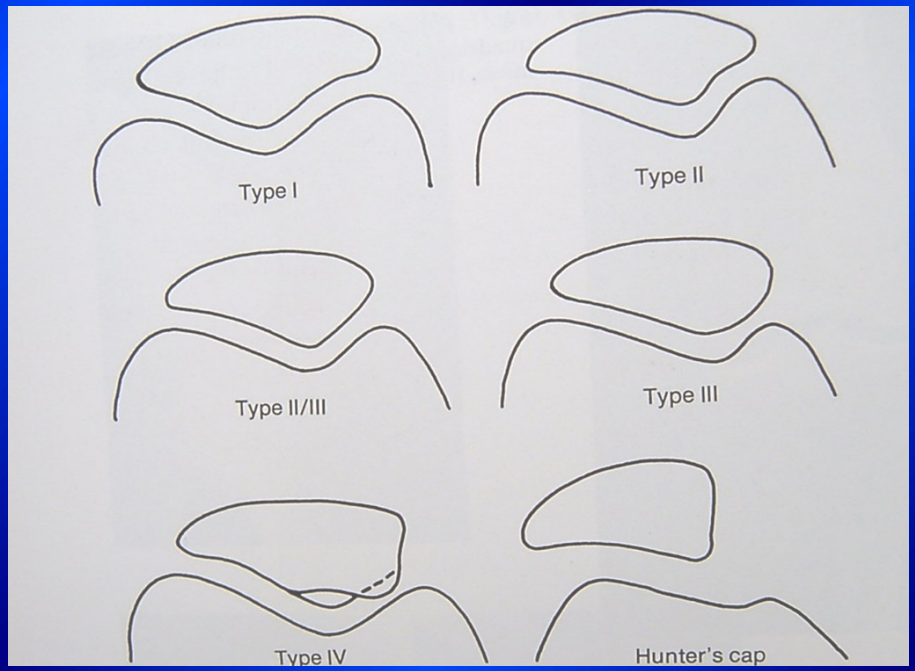






Traumatic dislocation of the patella

- Always laterally
- Conservative treatment
- Operative treatment



Types of patella

Recurrent dislocation of the patella

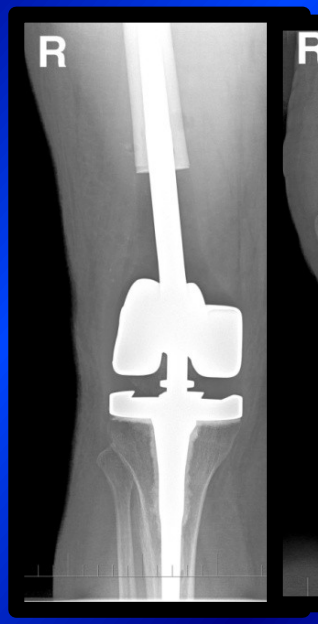
- posttraumatic
- congenital
- habitual

ASK – lateral release + medial capsuloraphy

Open surgery

Tumors

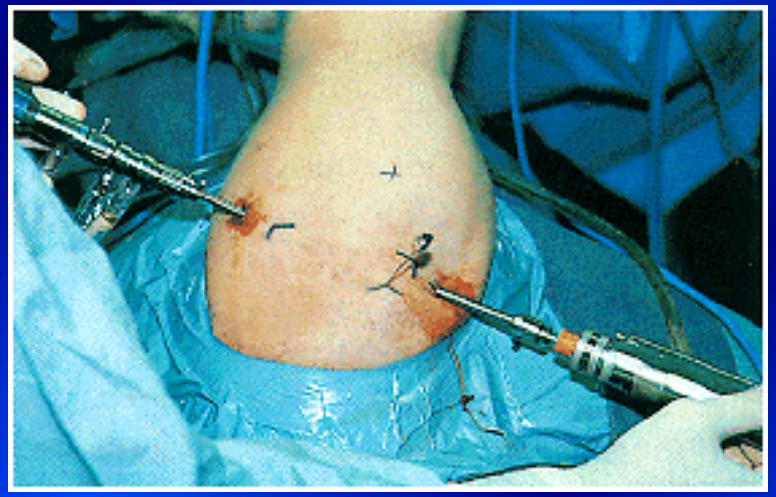
- Osteosarcoma
- Ewing sarcoma
- Osteoclastoma
- Chondrosarcoma
- Soft tissue sarcomas
- Bone metastases



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