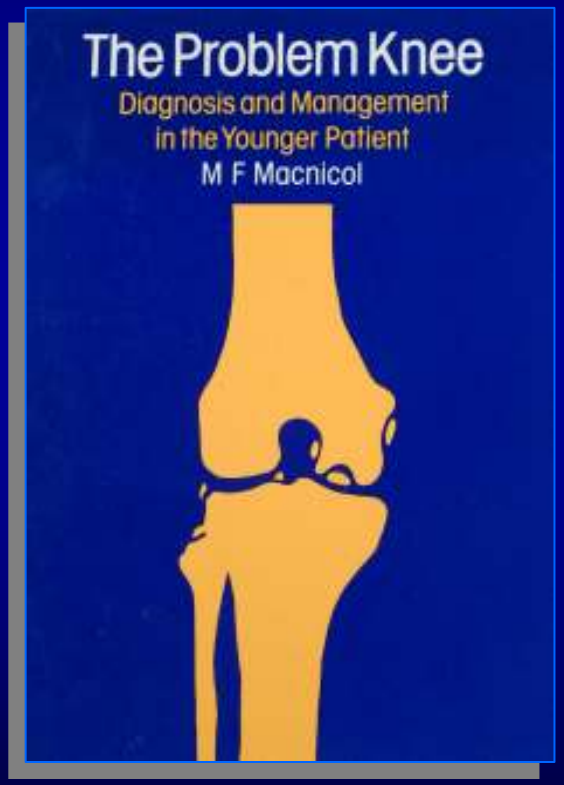
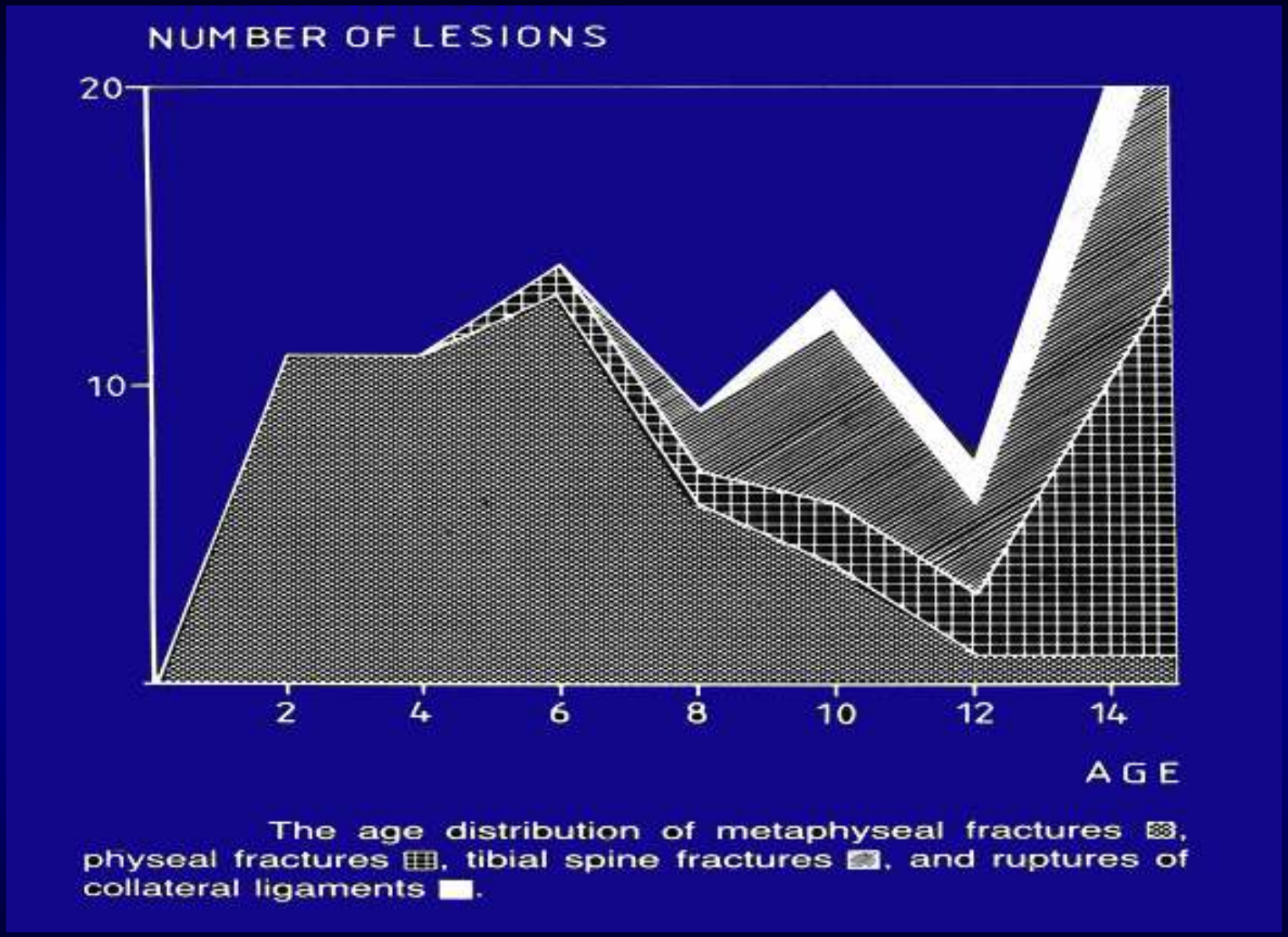
Intra-articular Fractures of the Paediatric Knee

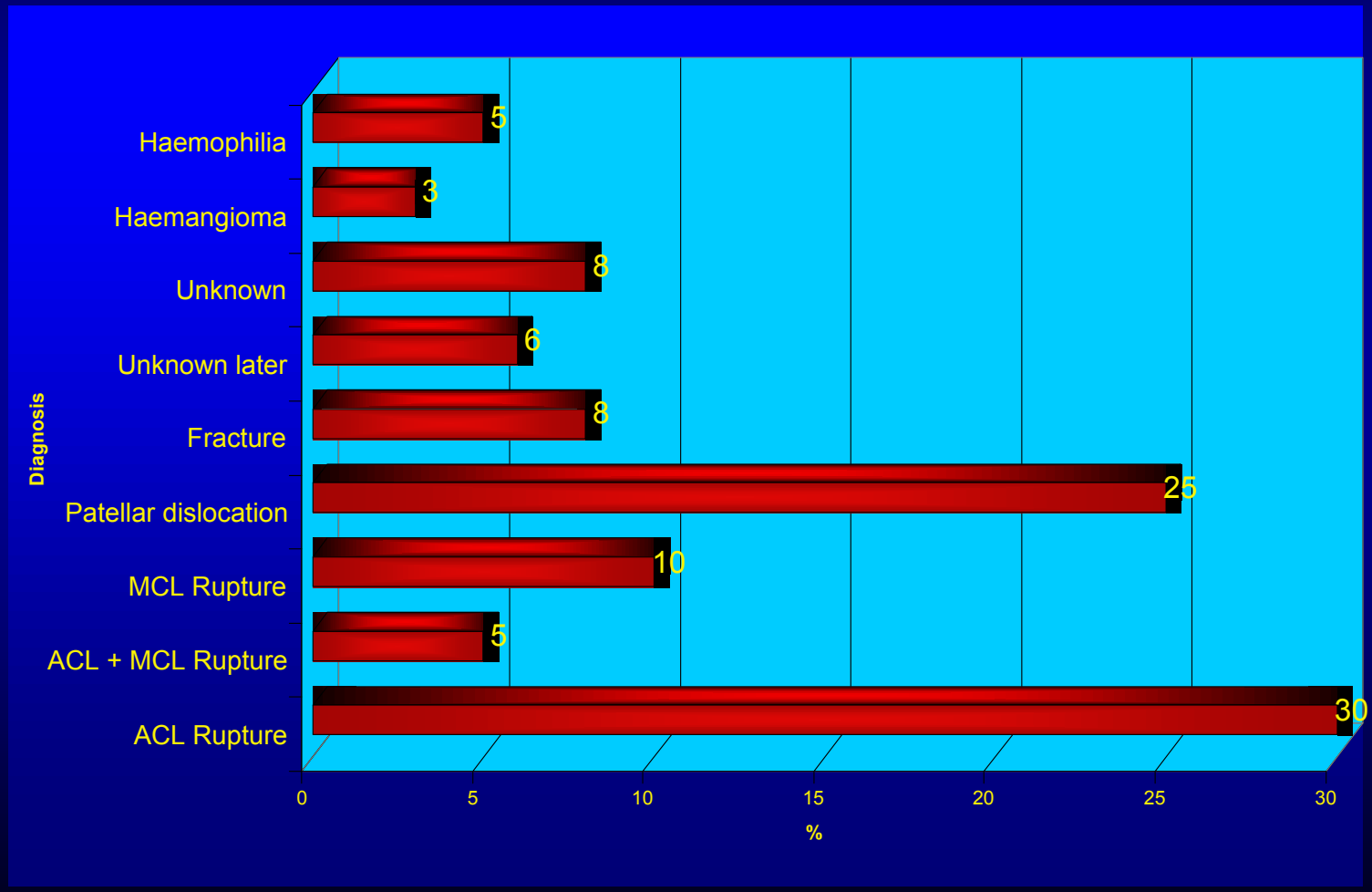


Mr M F Macnicol



The age distribution of metaphyseal fractures ▩, physeal fractures ▦, tibial spine fractures ▩, and ruptures of collateral ligaments ■.

Causes of Haemarthrosis
(55 cases over 10yrs)



Age group

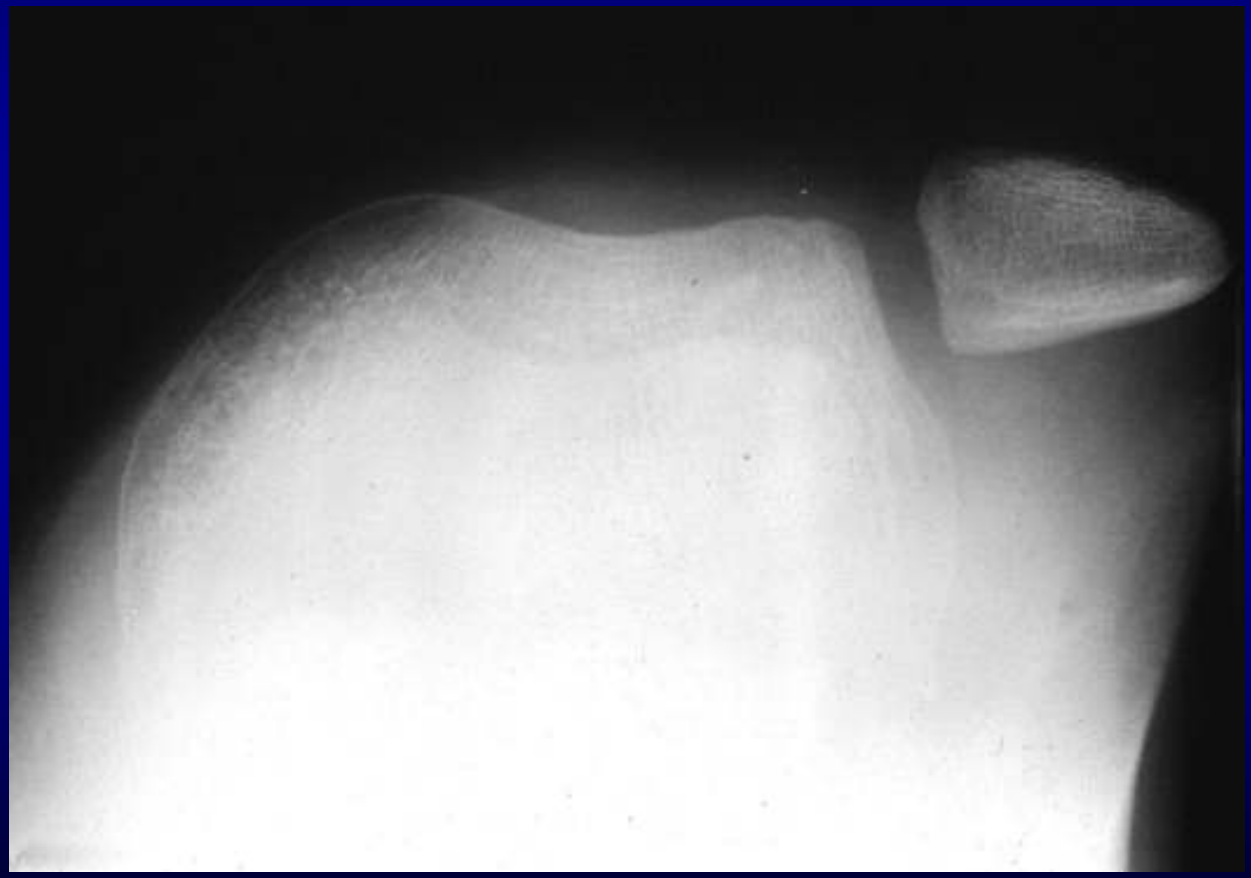
Years

0 –10 metaphysial tibial (femoral),intra-articular and patellar sleeve fractures (patellar dislocation, sprain with synovial tear)

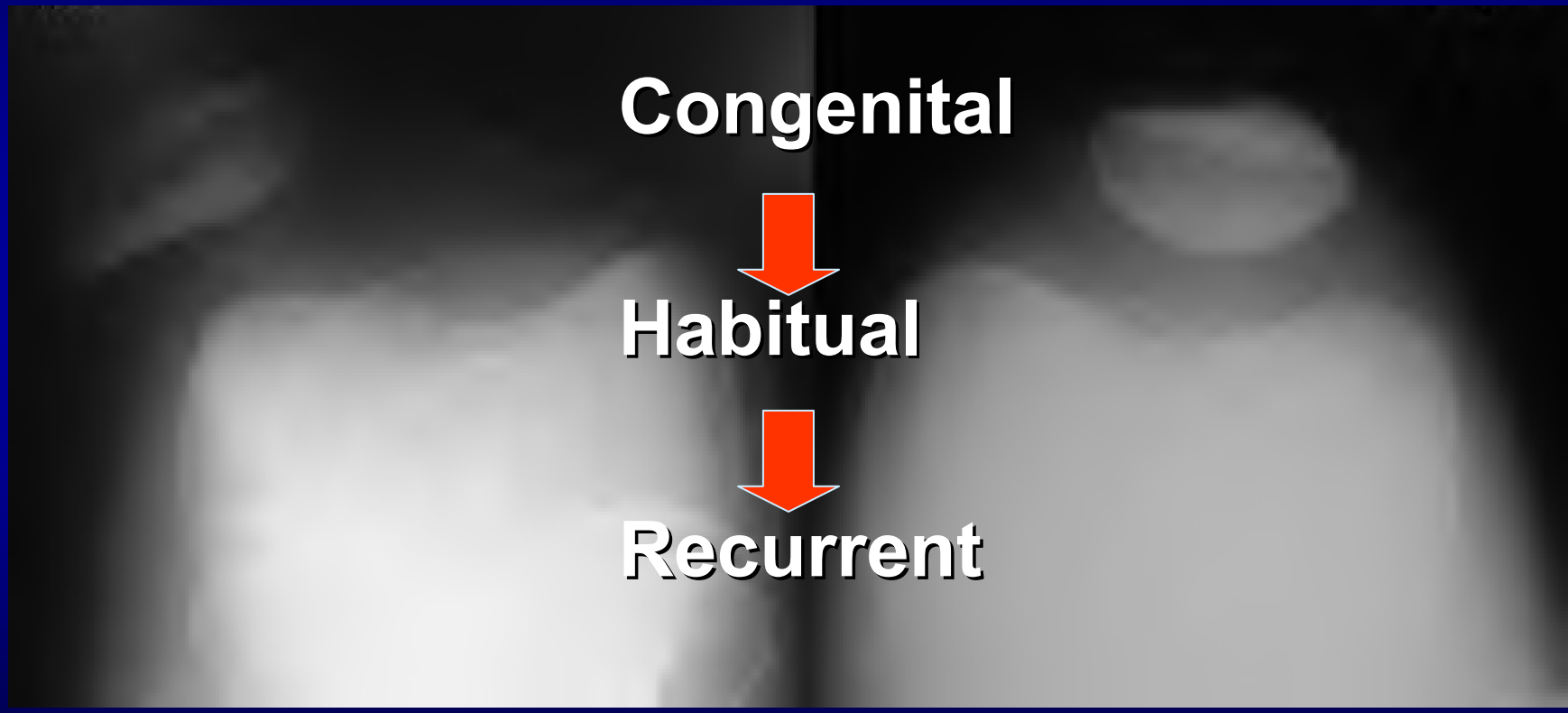
11-12 intra-articular and patellar fractures, tibial spine avulsion, patellar dislocation.

13-16 patellar dislocation with fracture, tibial spine avulsion, sprains and ligament tears.

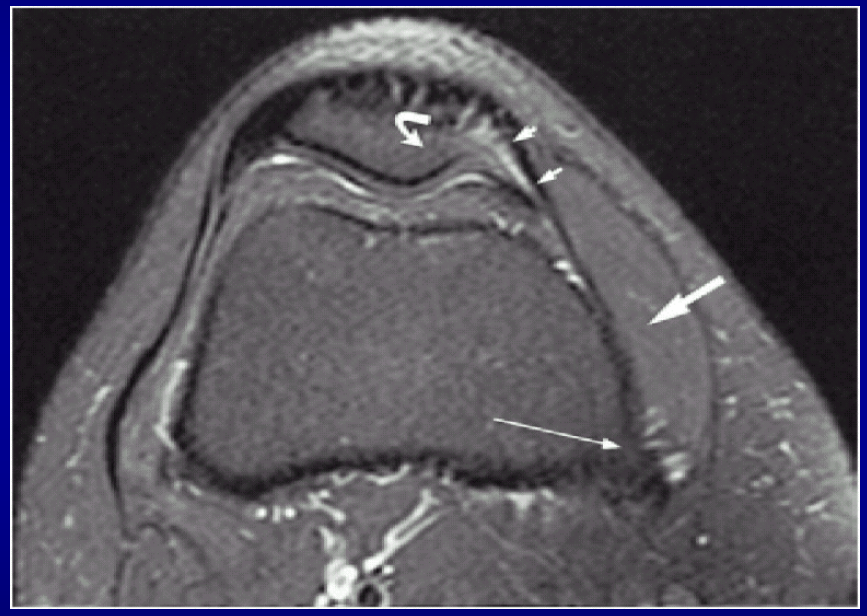
Patellar dislocation

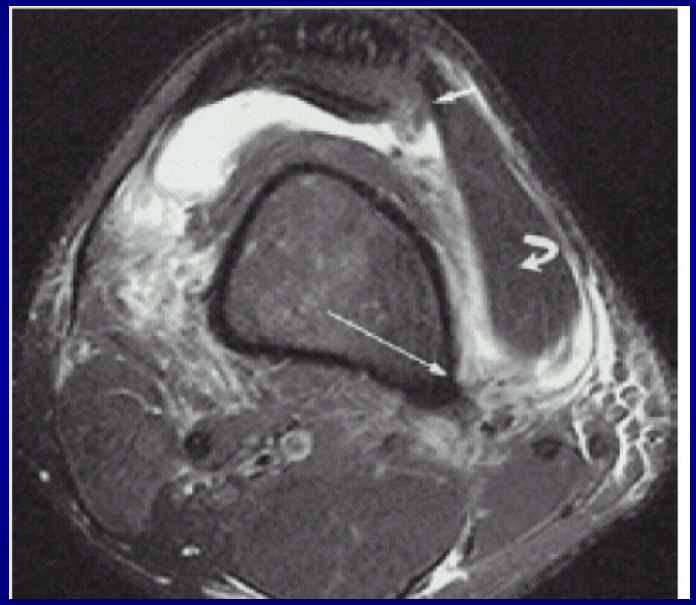


Lateral Patellar Dislocation



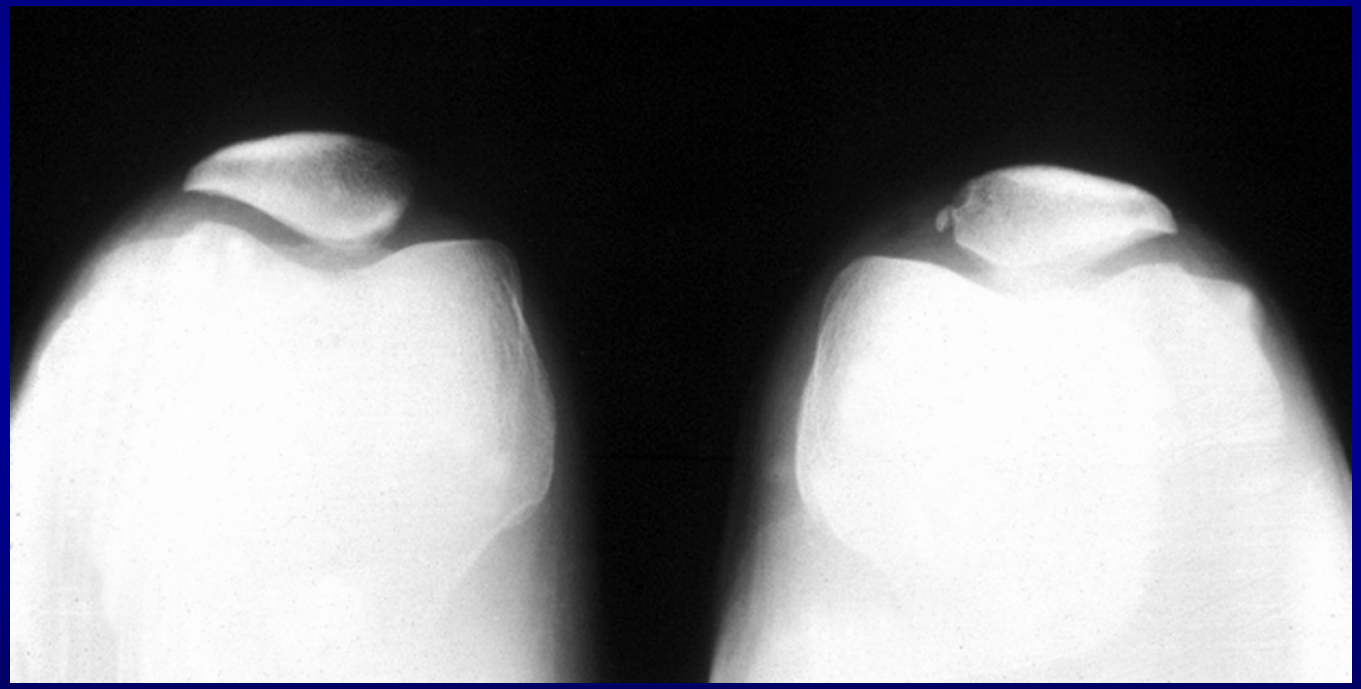
Medial Patellofemoral Ligament Disruption



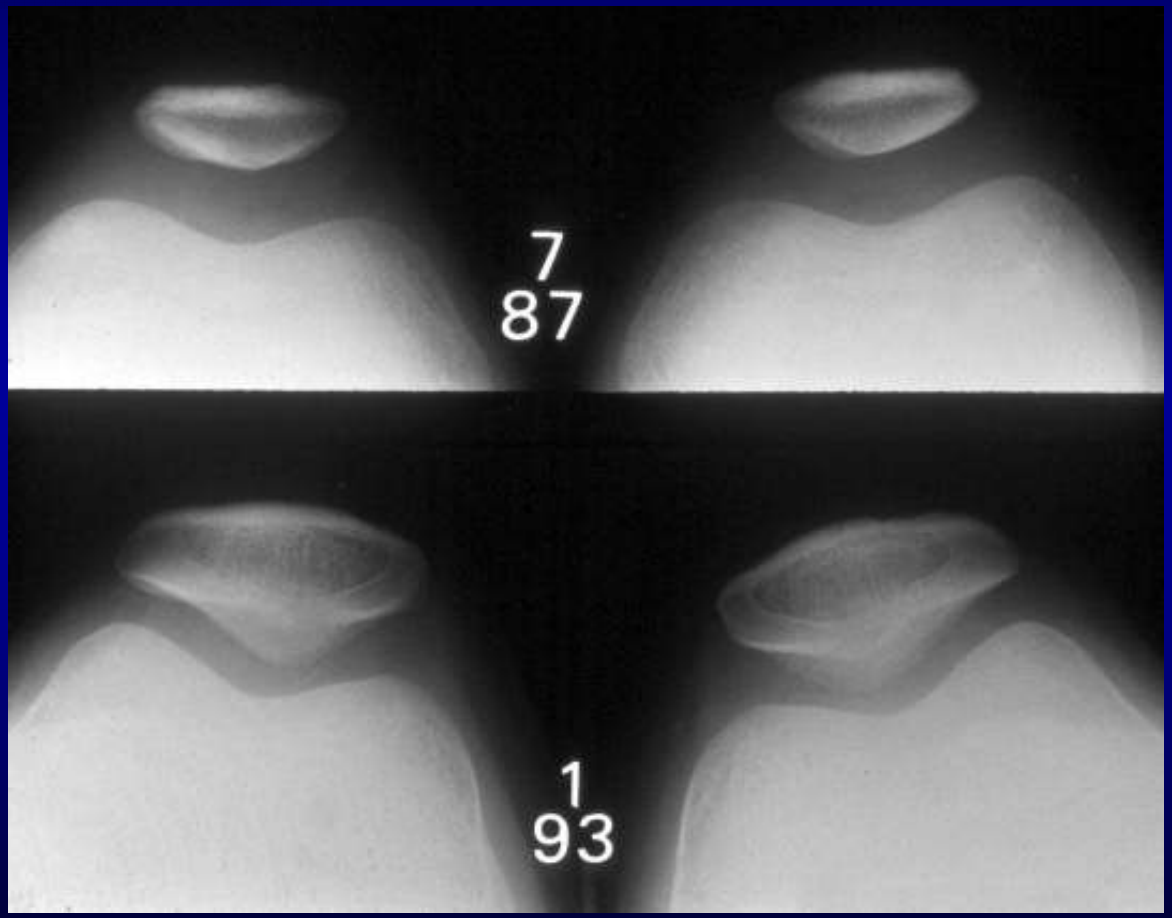


Sanders: J Comput Assist Tomogr, Volume 25(6).November/December 2001.957-962

Bony Avulsion Medially



Harris Growth Arrest Lines



Articular Cartilage Lesions

Softening

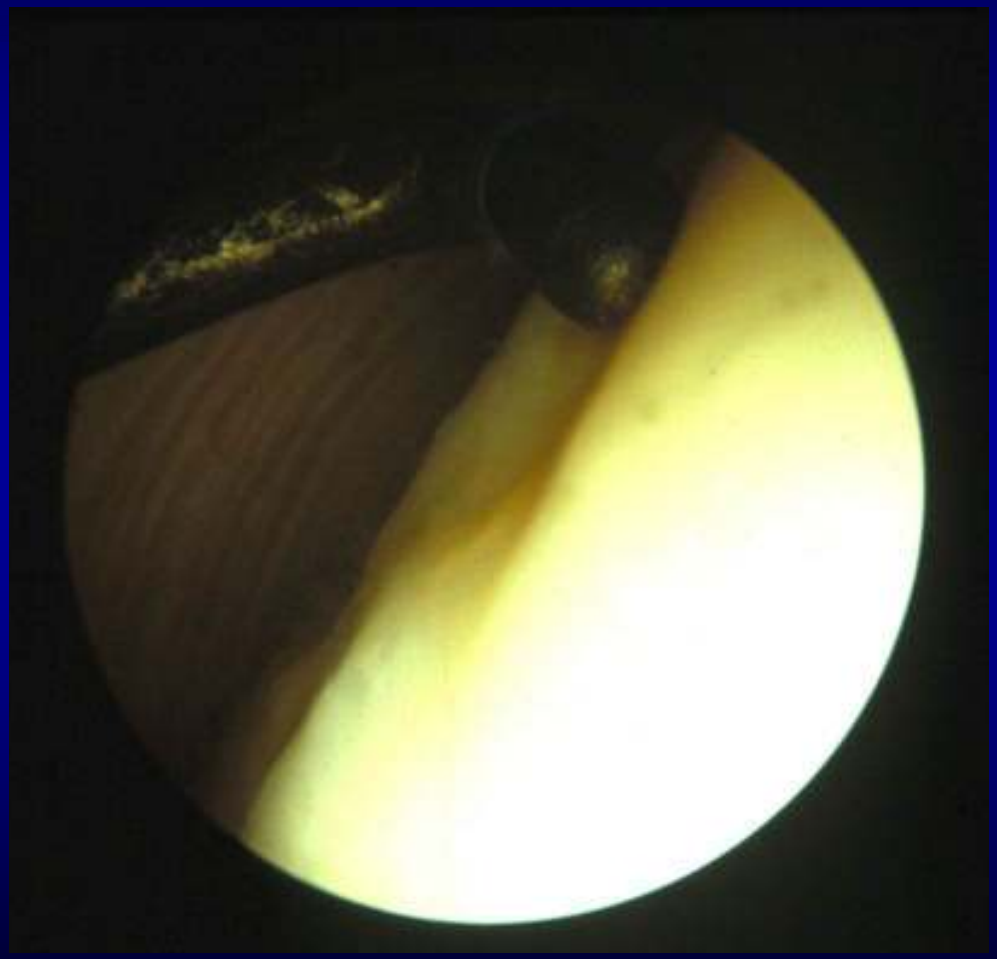
Fibrillation

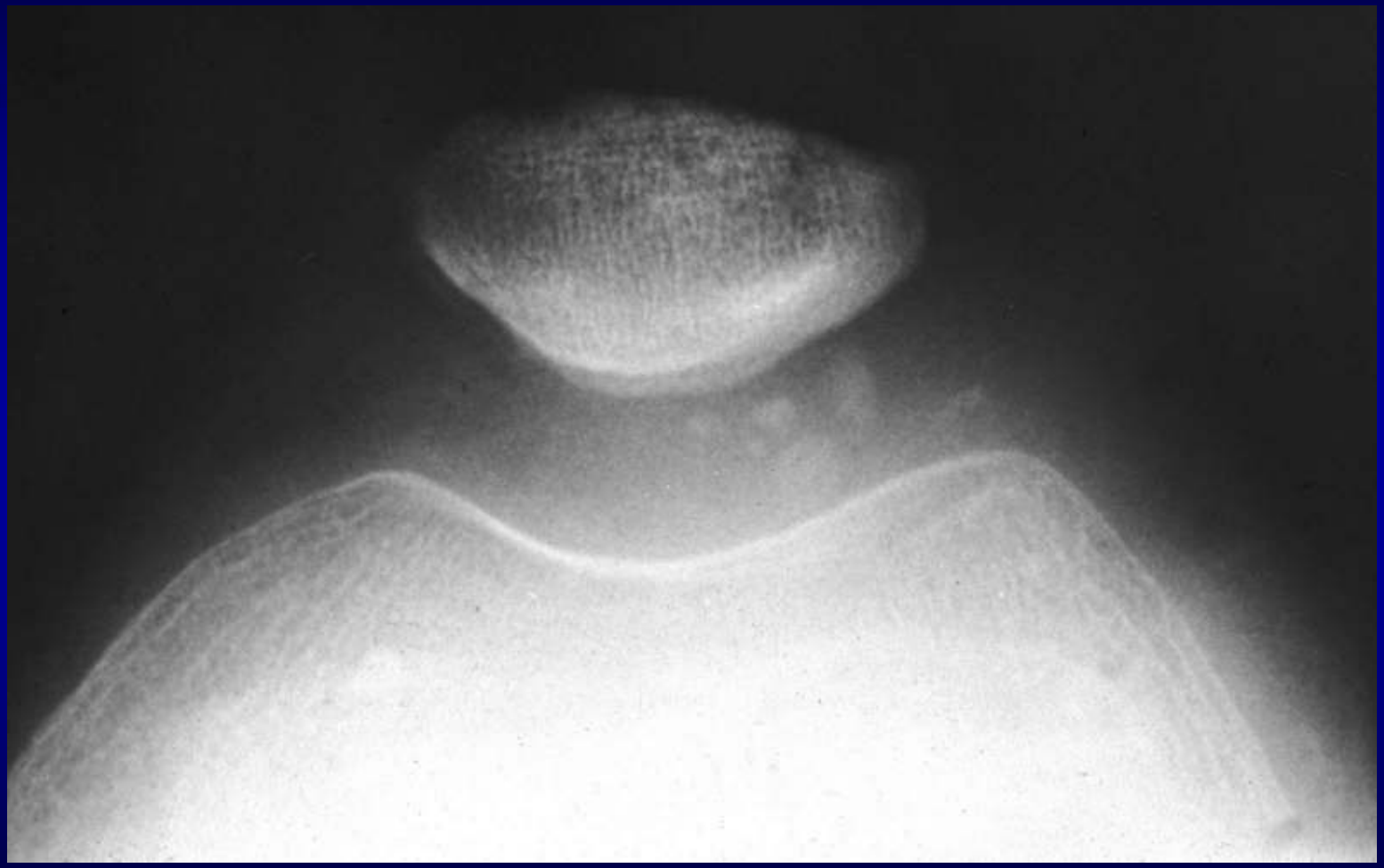
Flaps

Separations

Debris

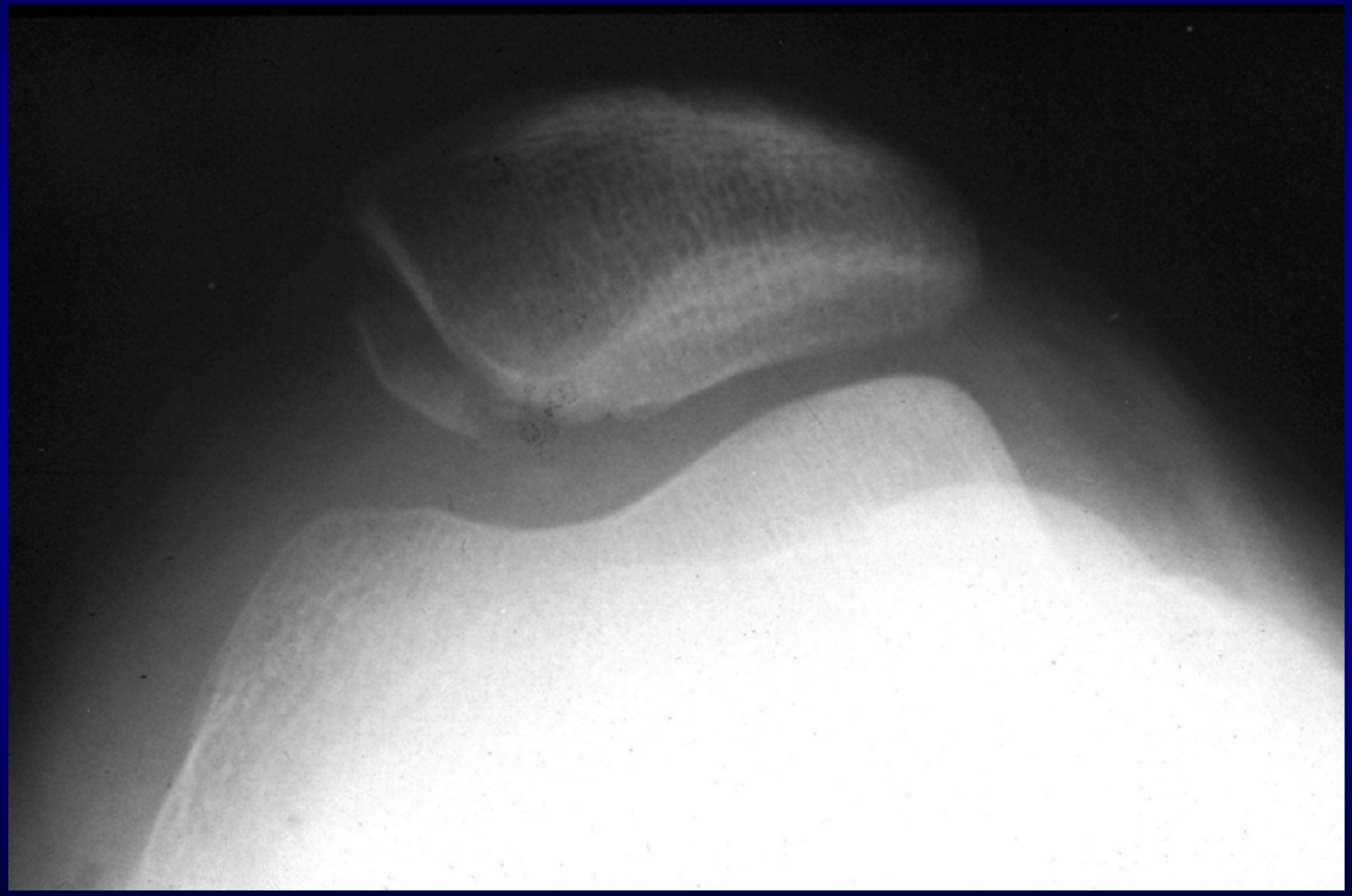
Indentation lesion






mm 10 20 30 4

Patellar osteochondral defect



Cartilage defect in the knee

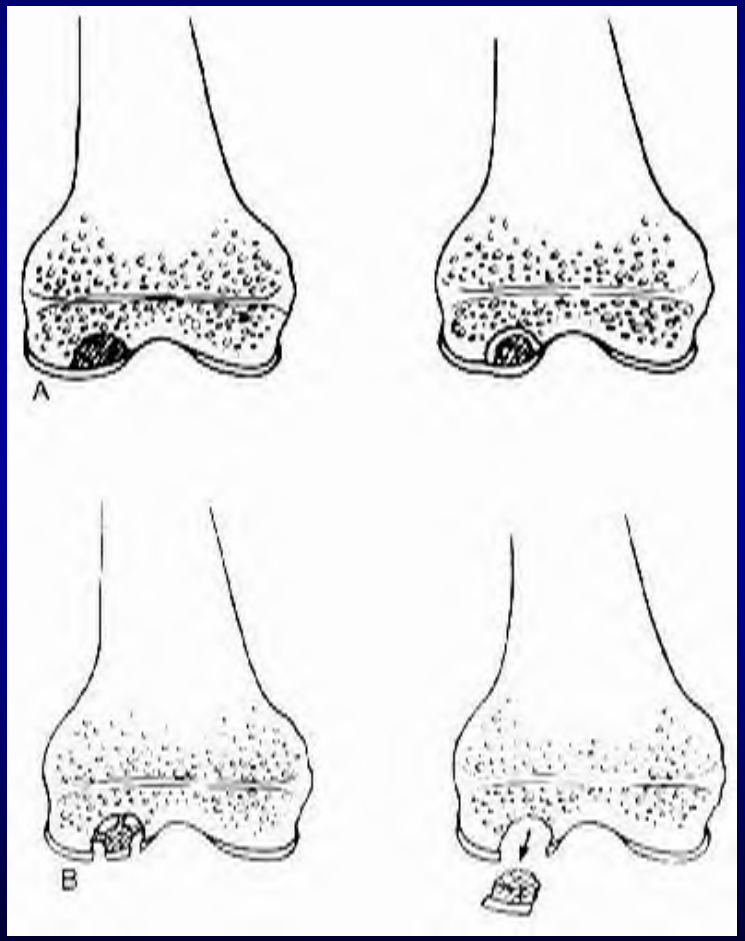
Osteochondritis Dissecans (Guhl Arthroscopic Classification)

A - Intact lesions

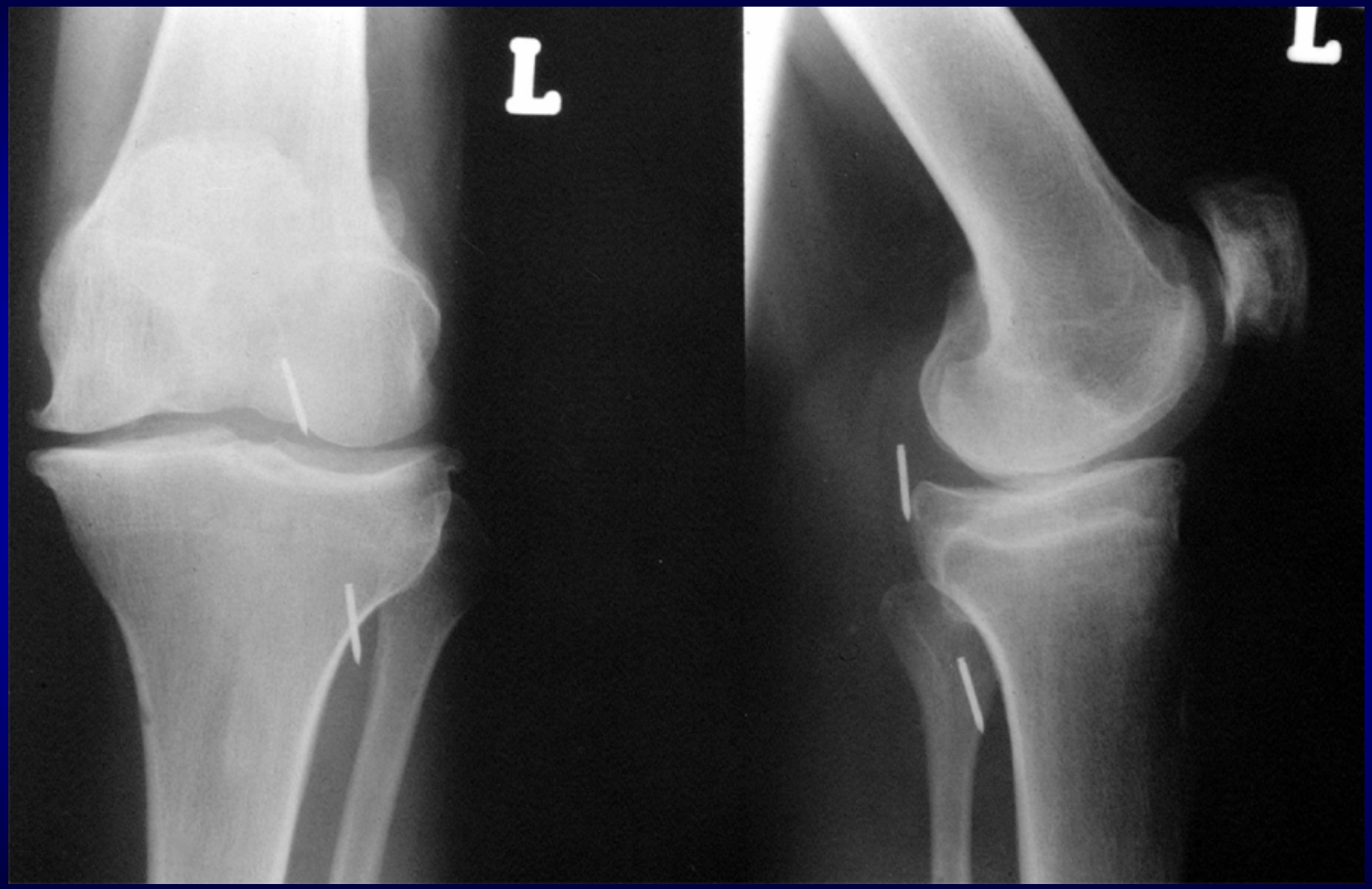
B - Lesions showing signs of early separation

C - Partially detached lesions

D - Craters with loose bodies (salvageable or unsalvageable)




3 10 85
28 1 87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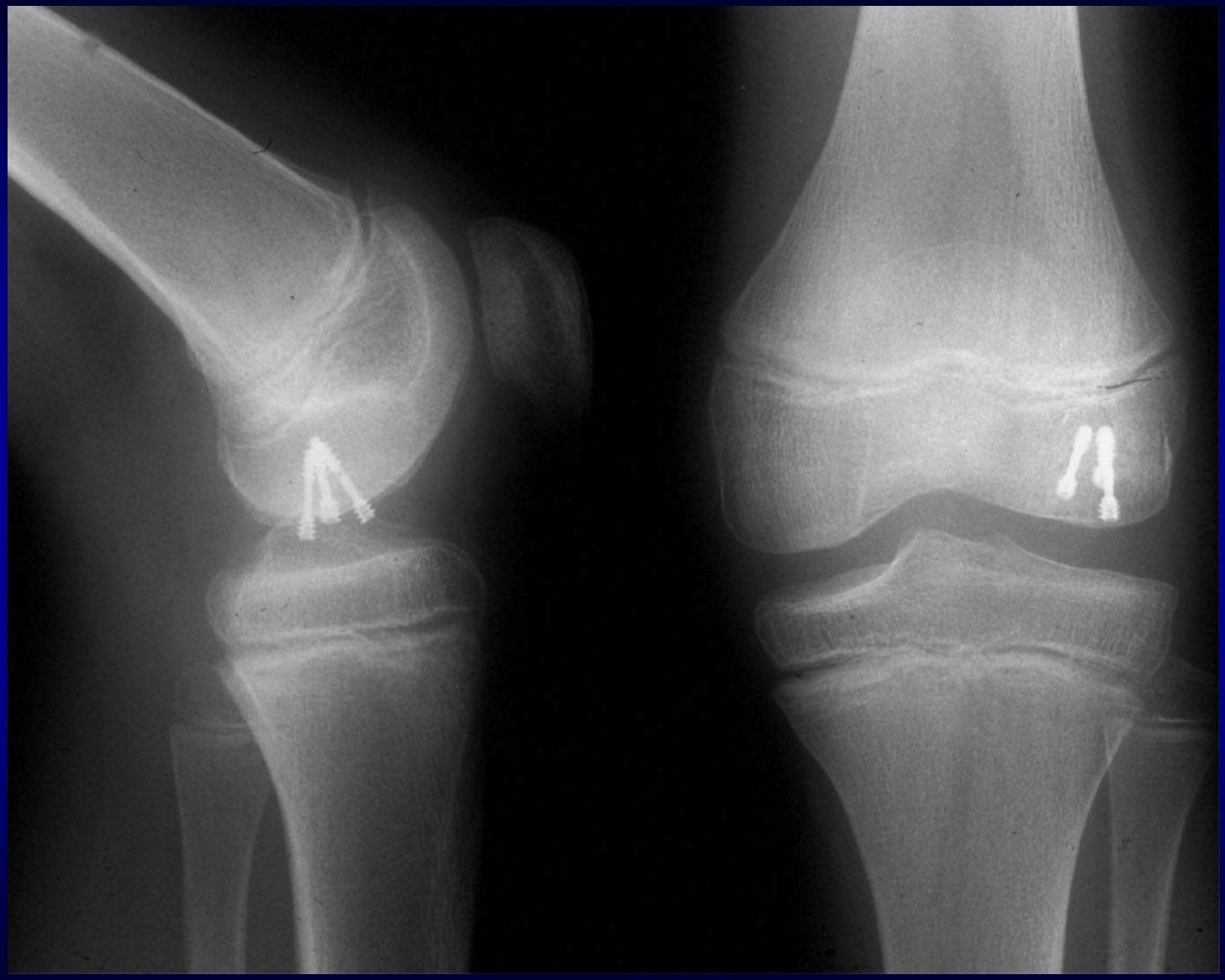
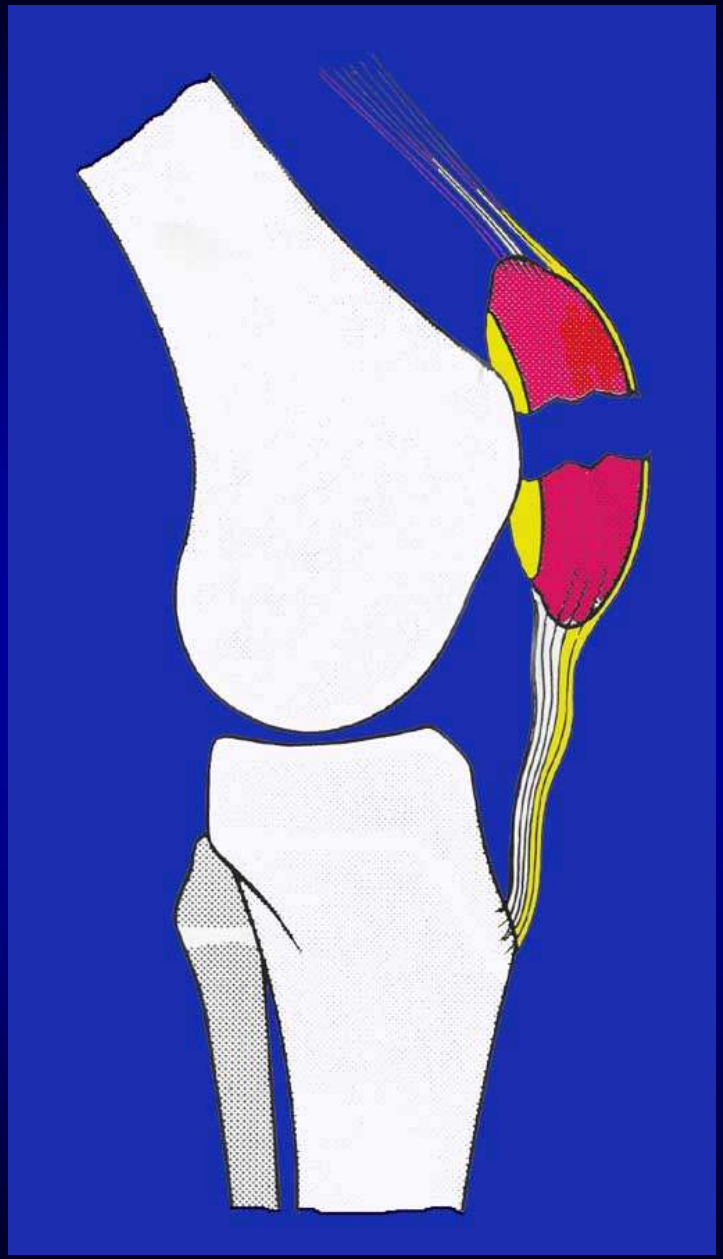
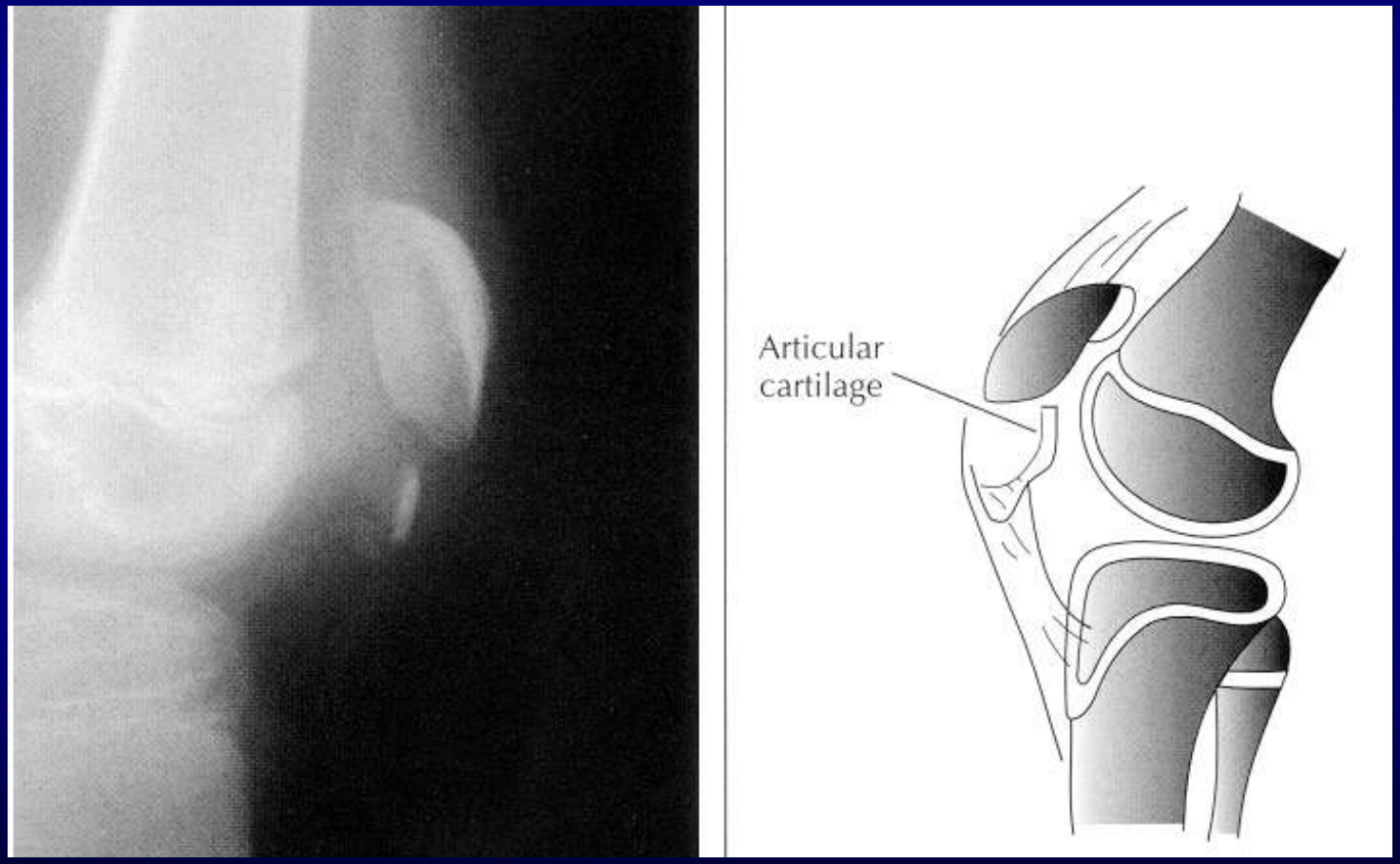


Patellar Fractures in Childhood

- avulsion
  - medial
  - lateral
- separation of bipartite fragment
- sleeve fracture
  - lower pole
  - upper pole
  - bipartite
- transverse
- stellate (comminuted)



Patellar Sleeve Fracture



Patellar Sleeve Fracture

57% of all patellar fractures in childhood

peak incidence at 12 to13 years old

the sleeve includes articular cartilage and periosteum

Patellar Sleeve Fracture

through zone of osseochondrous transformation

tendon collagen fibres blend directly into the cartilage (no Sharpey Schafer fibres)

(similar to avulsions of epicondyles, tibial tuberosity, intercondylar eminence)

Patellar Sleeve Fracture

inability to weight bear or SLR

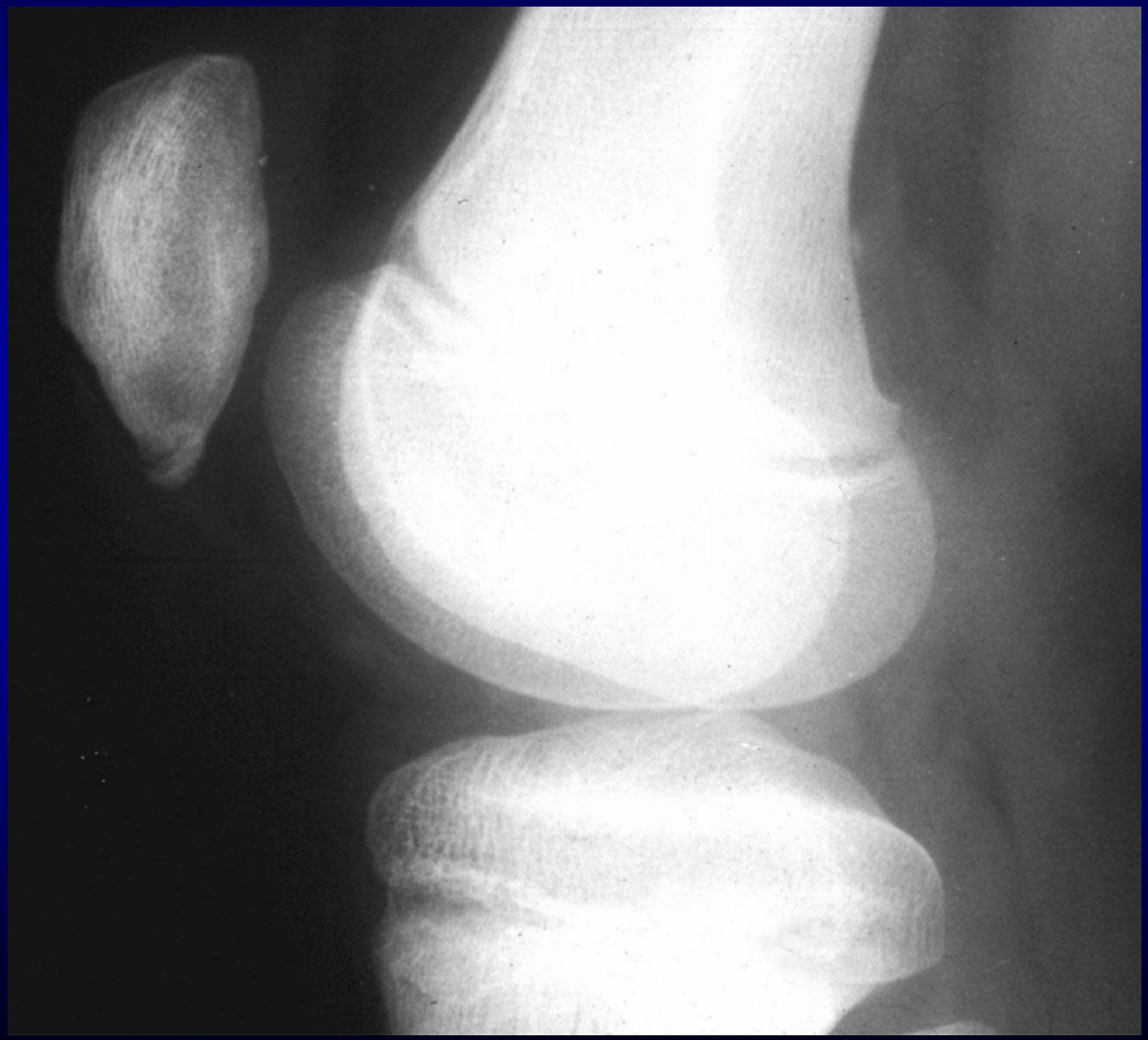
haemarthrosis/ecchymosis

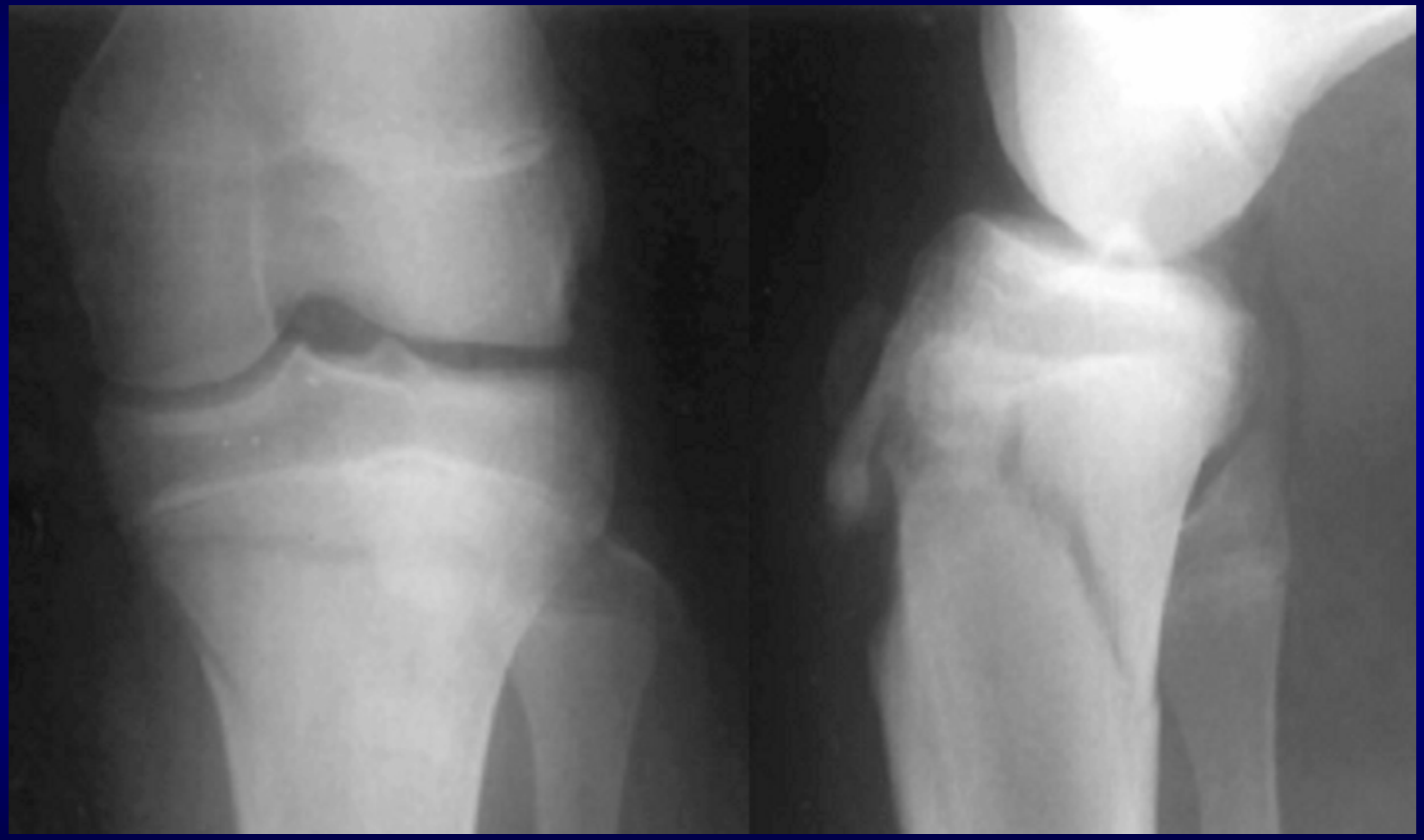
palpable gap (ultrasound helpful)

patella alta

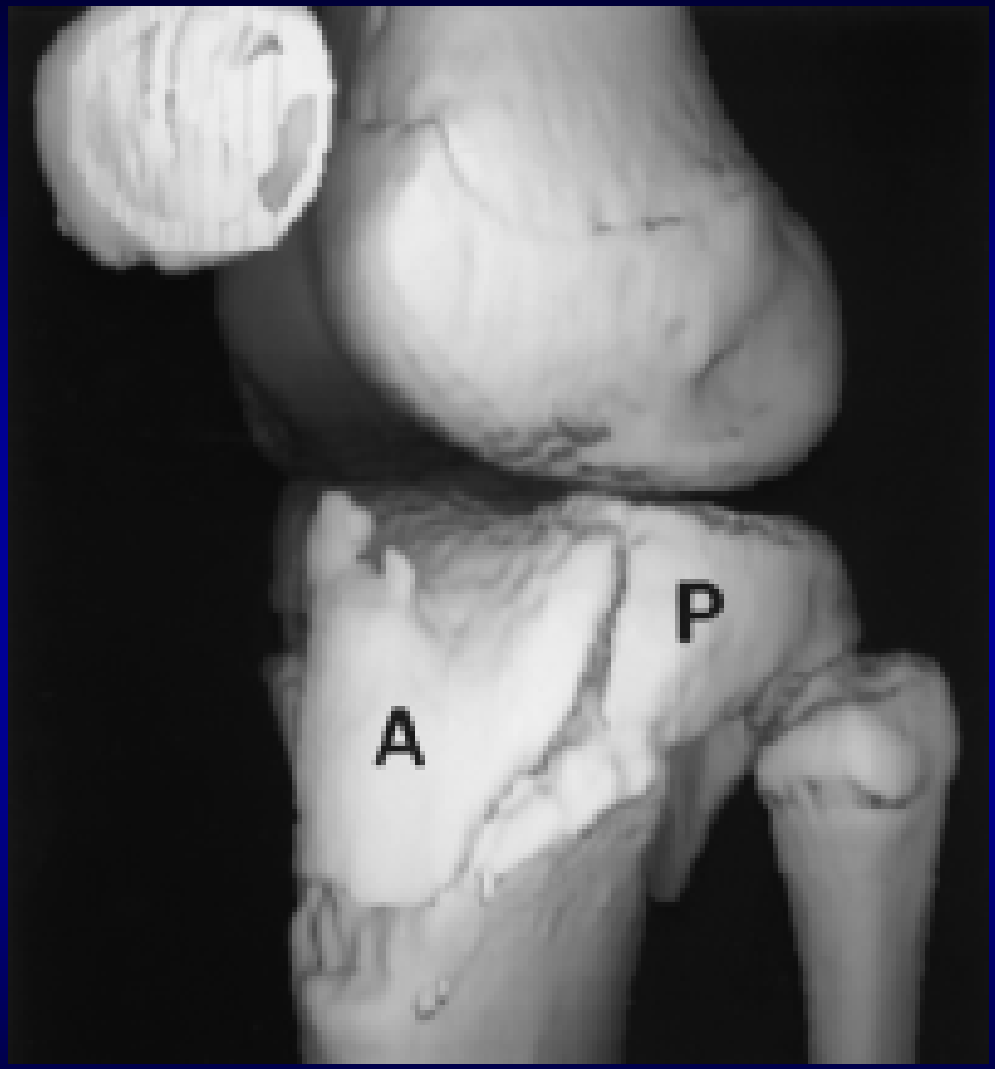
lax patellar tendon

Inferior Patellar Ossicle



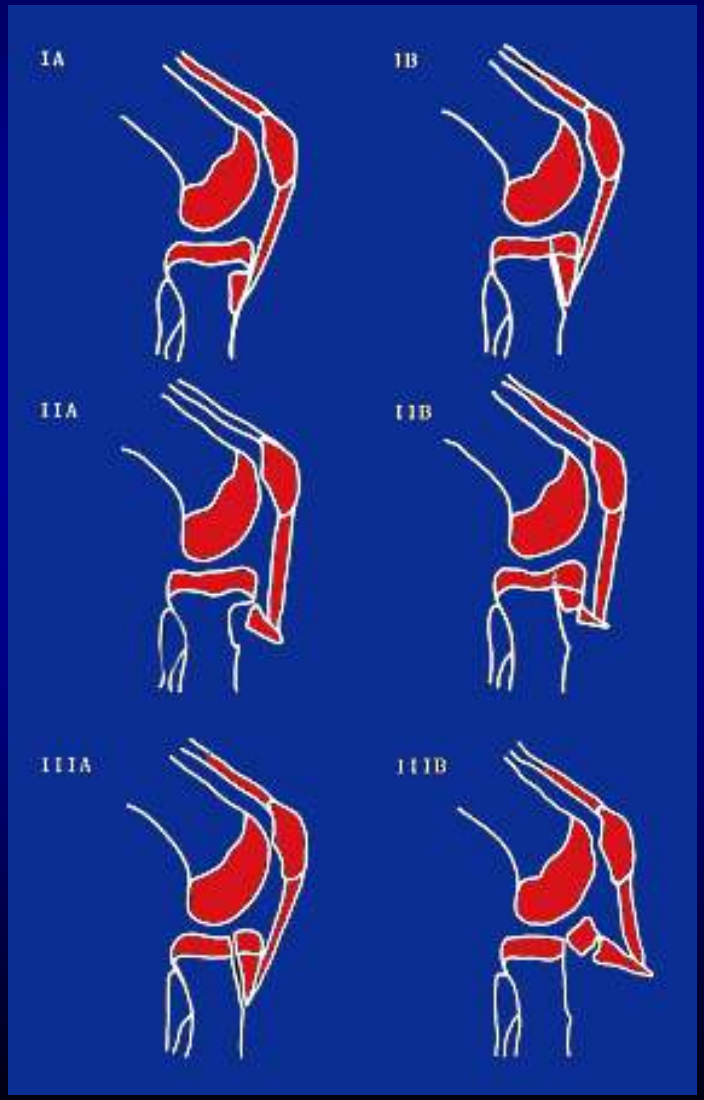


Tibial Tuberosity Avulsion



Patari: J Pediatr Orthop, Volume 21(4).July/August 2001.451-455

Classification of Tibial Tuberosity fractures

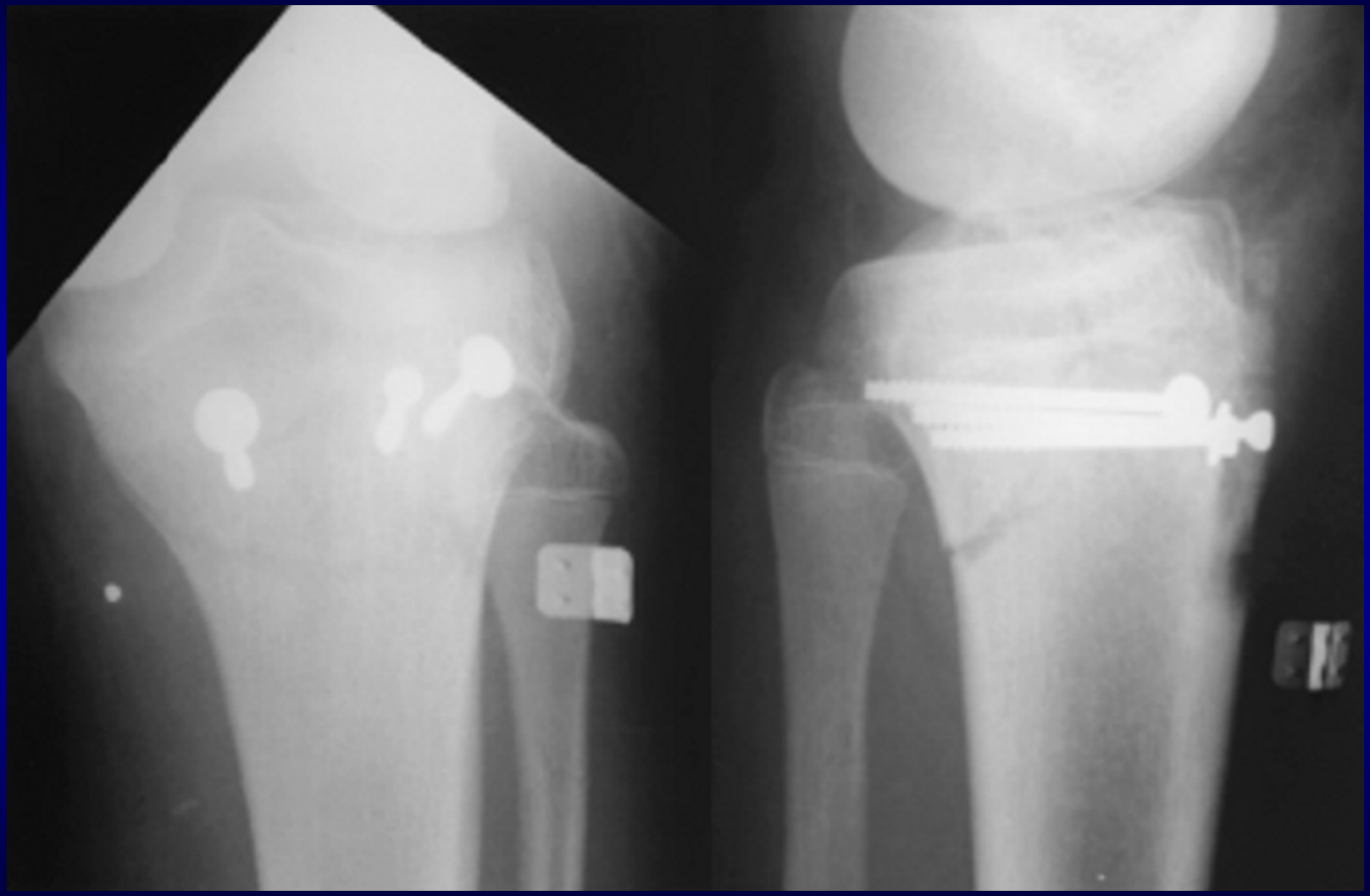


Watson-Jones (Modified by Ogden 1980)

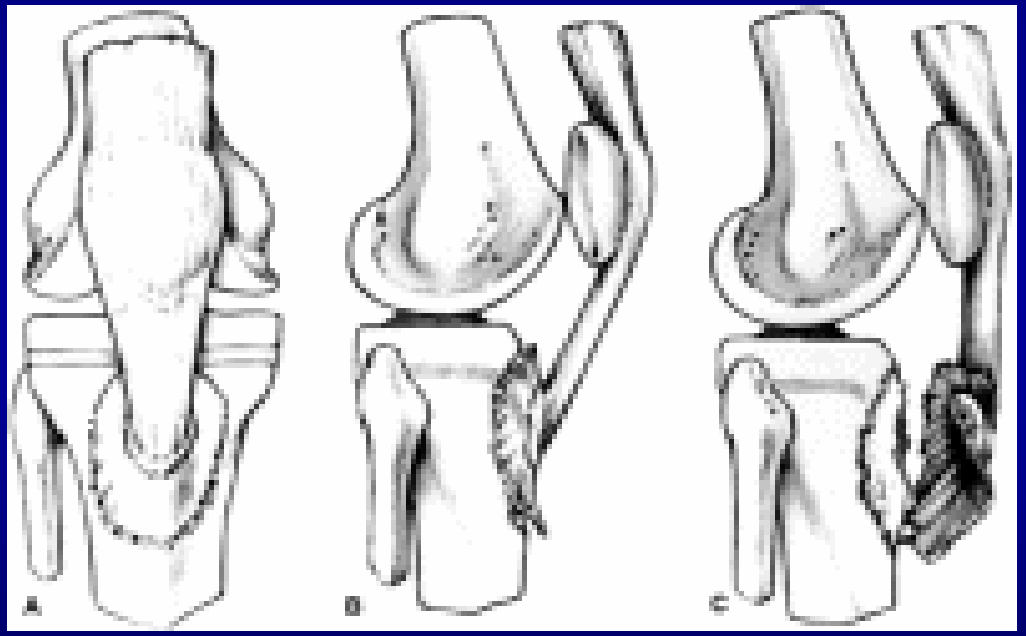
Type I A/B

Type II A/B

Type III A/B

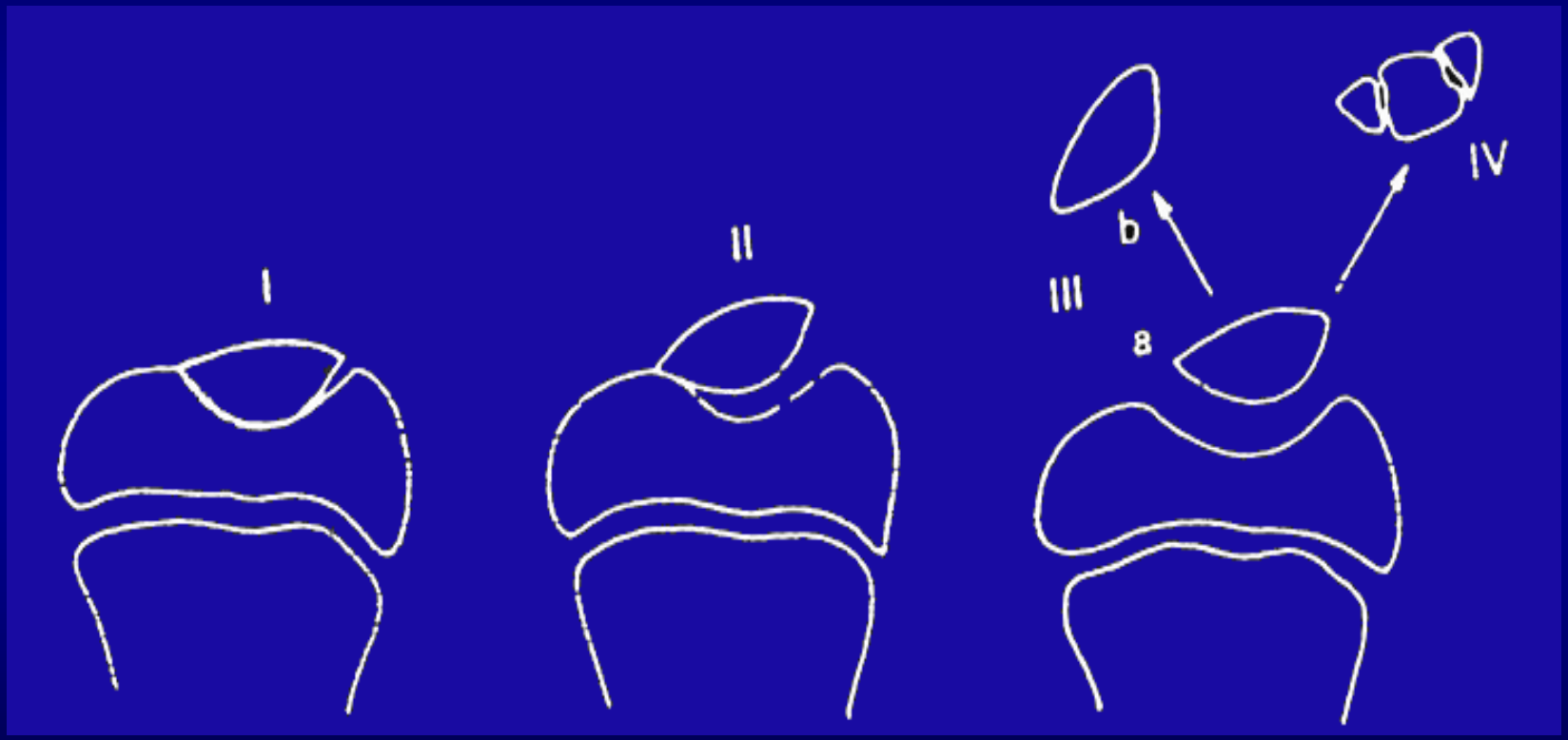


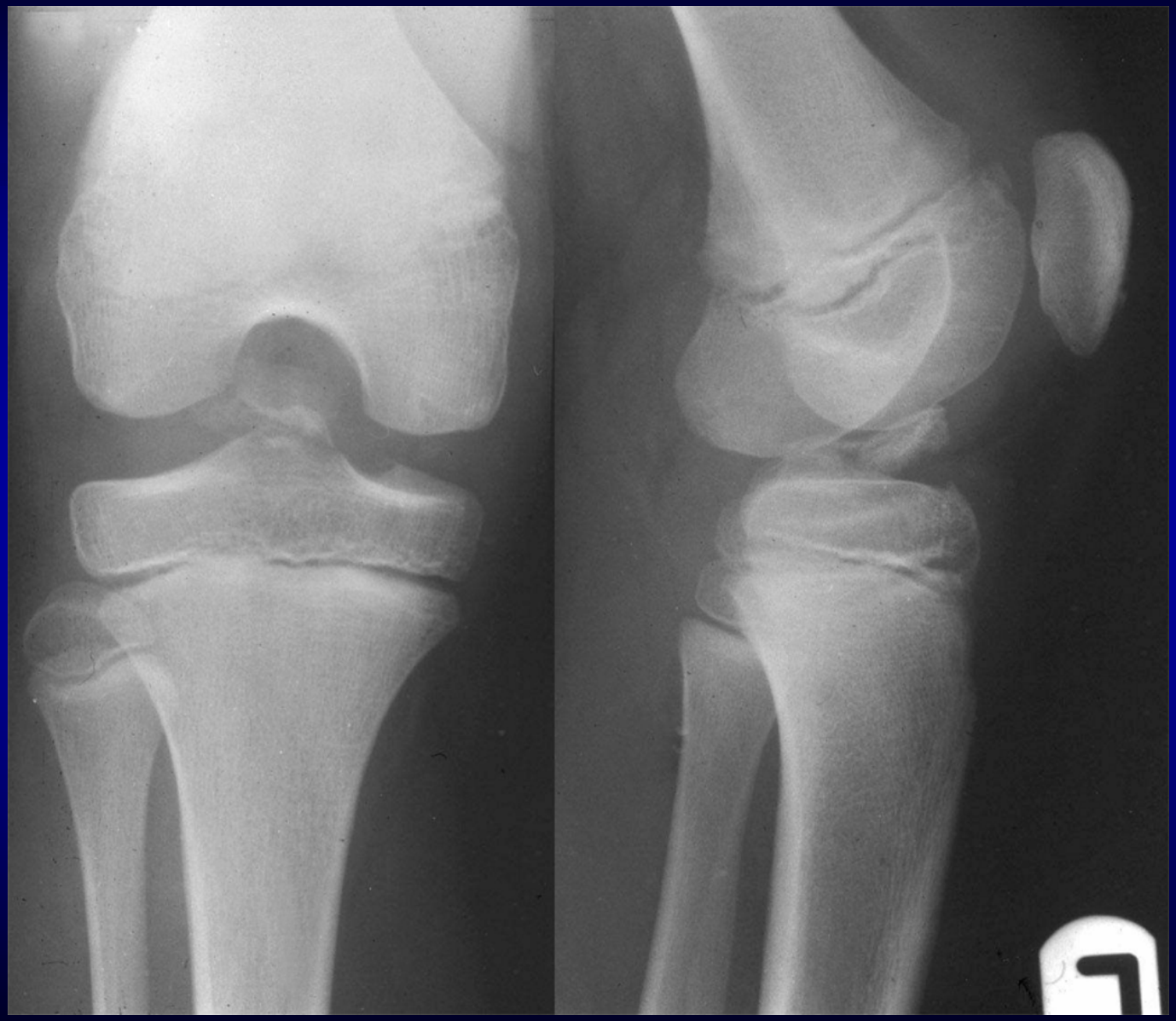
Partial Sleeve fracture of the tibial tuberosity



Davidson: J Pediatr Orthop, Volume 22(1).January/February 2002.36-40

Myers and McKeever (1970) -modified by Zarczynj (1977)





Tibial Eminence Avulsion

47 Cases

80% Grade I 0r II
(all did well conservatively)

20% Grade III
(poor results from splintage)
Myers and McKeever 1970

Fractures of the Tibial Eminence

(Anterior Cruciate Avulsion)

good quality AP and lateral radiographic views
stress radiographs
arthroscopic irrigation
arthroscopic probing/reduction
arthroscopic internal fixation
(or anteromedial arthrotomy)

Treatment

Non operative

Operative
- Arthroscopic
- Anteromedial limited arthrotomy

Peripheral absorbable sutures
K-wires
Screw

Internal Fixation

20mm cannulated screw
(peripheral or transphyseal suture : K wire)

avoid growth plate (intra epiphyseal)

countersink the screw within the ACL

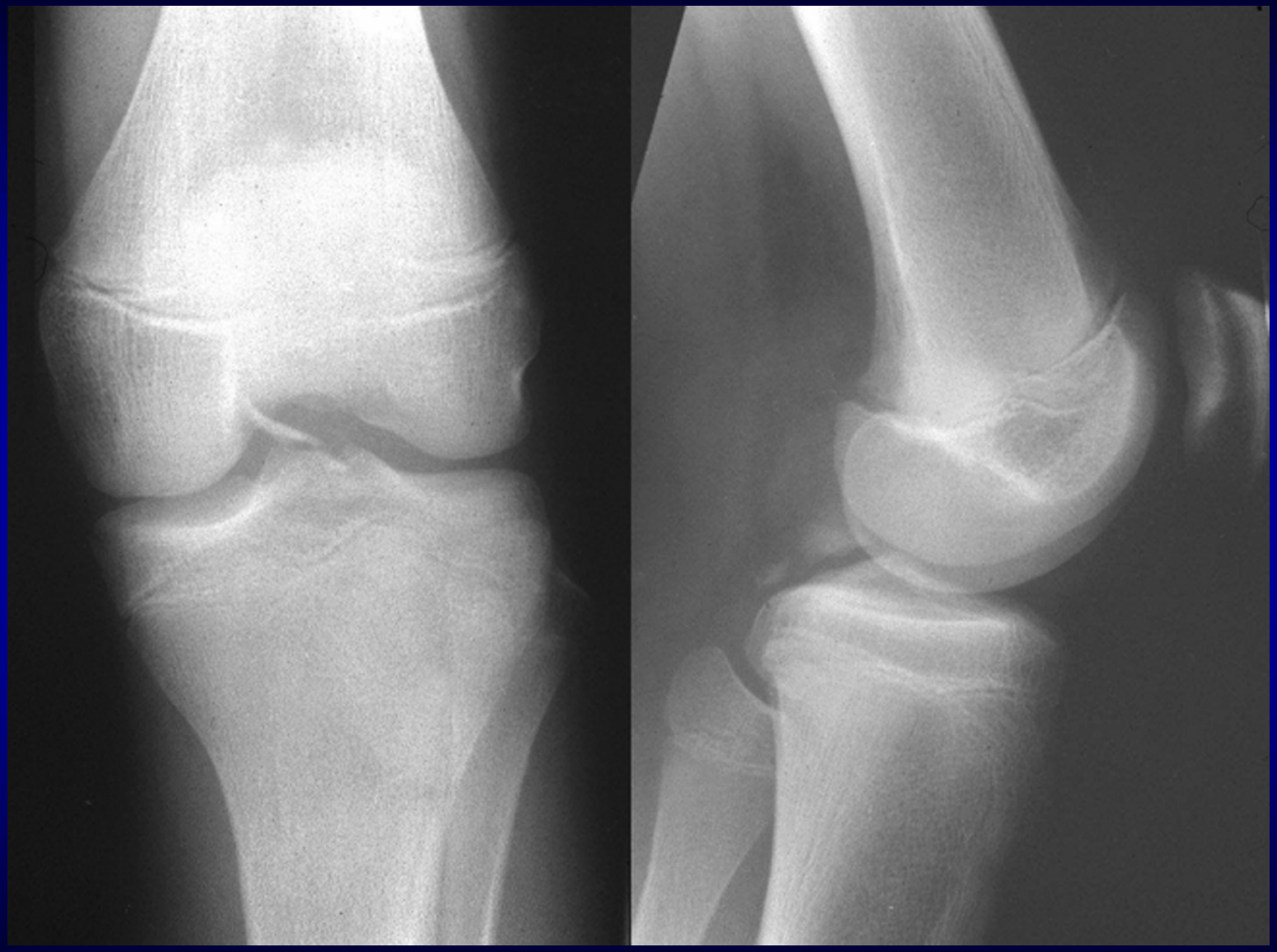
check stability in flexion/extension

Tibial Eminence Avulsion

Half the patients suffered pain/instability on average 7 yrs later (Smith 1984)

Late instability proportional to the age of the patient (Gronquist et al. 1984)

No symptoms of instability in 51% (Wiley and Baxter 1990)



Posterior Cruciate Ligament Avulsion

Tibial or femoral attachment should be anchored operatively

(Mayer and Mitchell 1979)

(Goodrich and Ballard 1988)

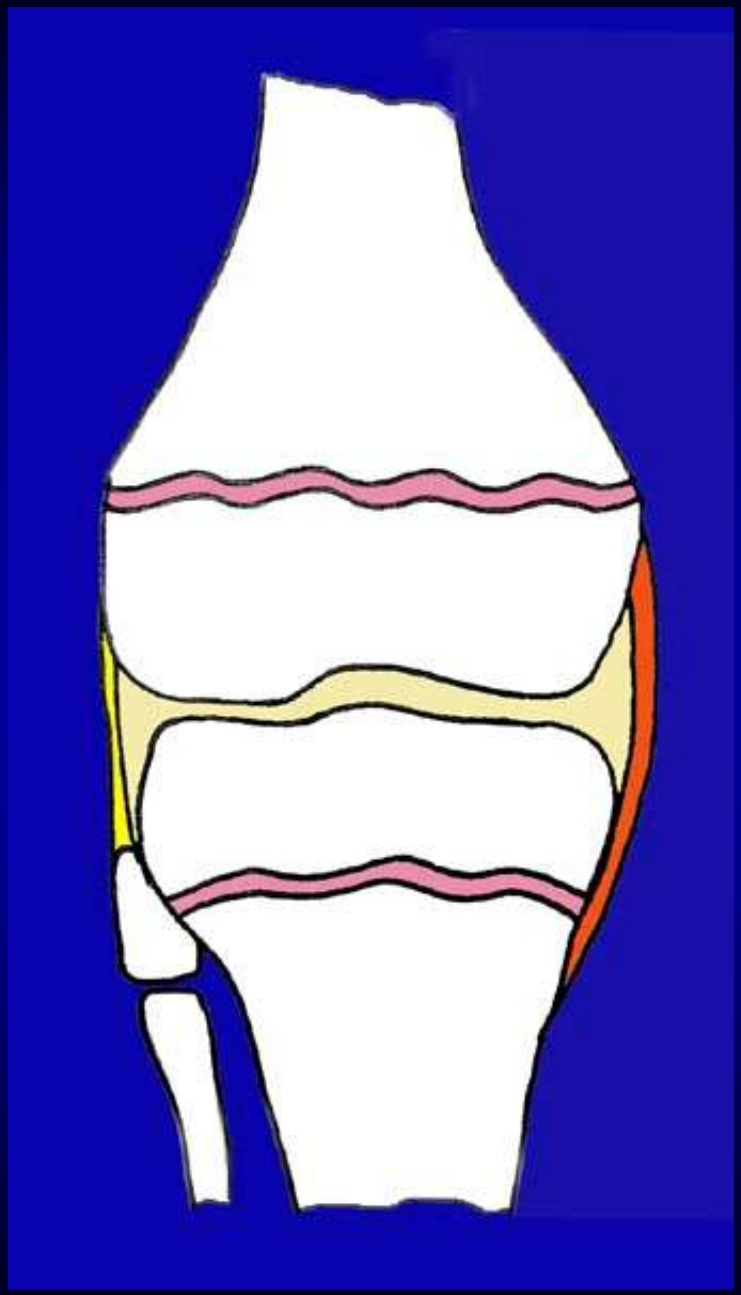
PCL Fixation

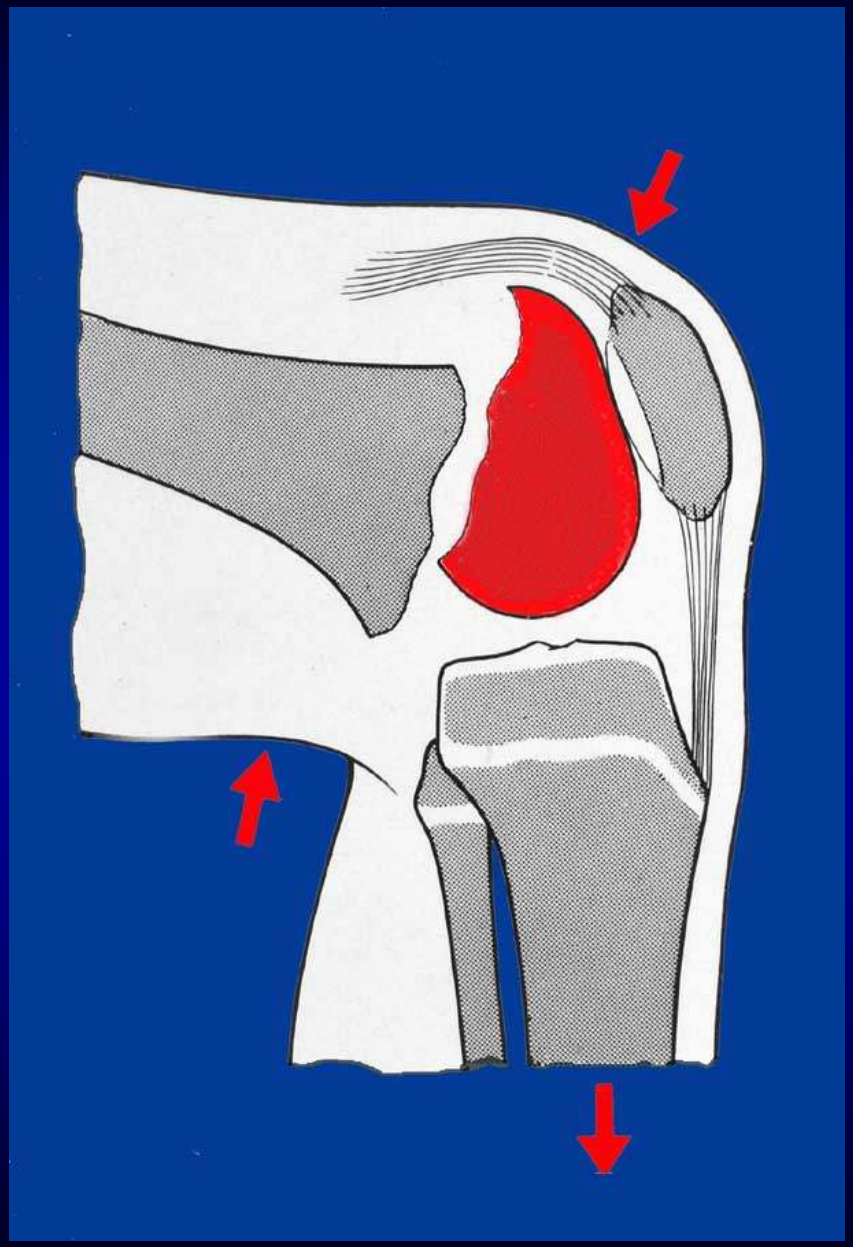
Epiphysial Separation

30-50%	distal tibia, distal fibula
7%	distal femur
4%	proximal tibia
<1%	proximal femur, proximal fibula

Distal Femoral Epiphysial Separation

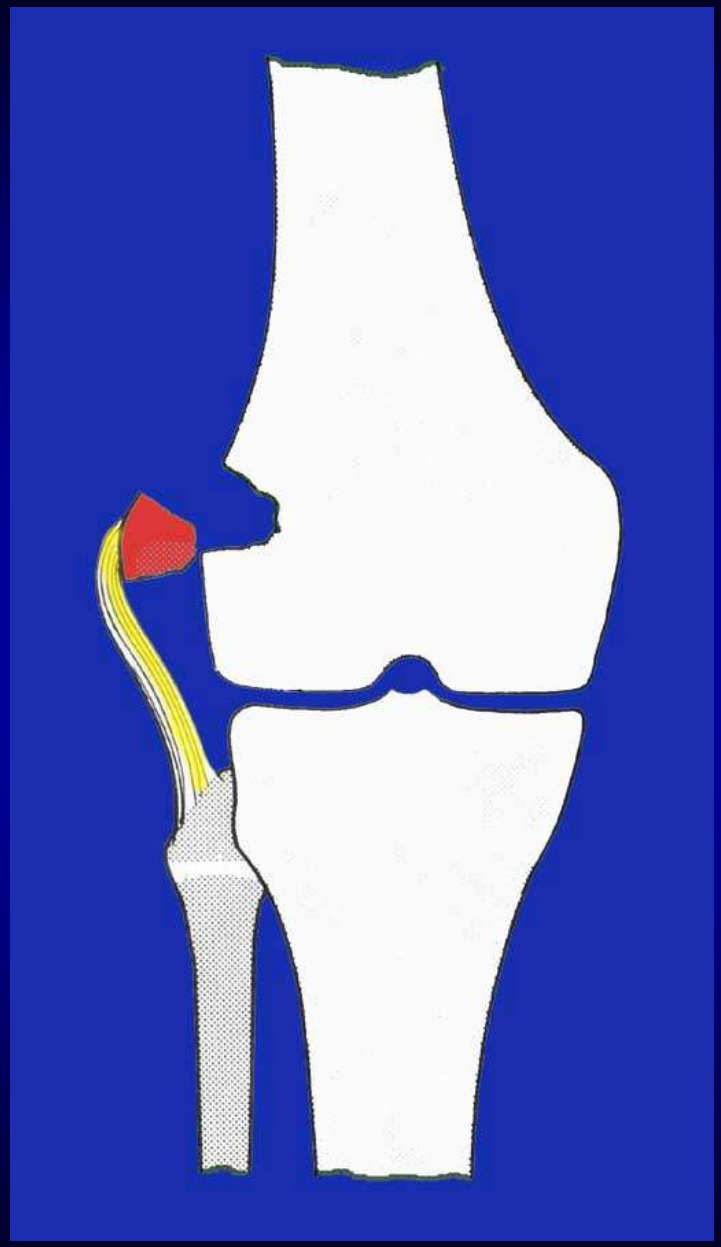
neurovascular injury and displacement (any direction)
growth arrest and age of child > fracture pattern





Distal Femoral Epiphysial Separation

clinical findings including peripheral circulation
stress film and reduction (closed or open)
methods of fixation
CT & MR scanning



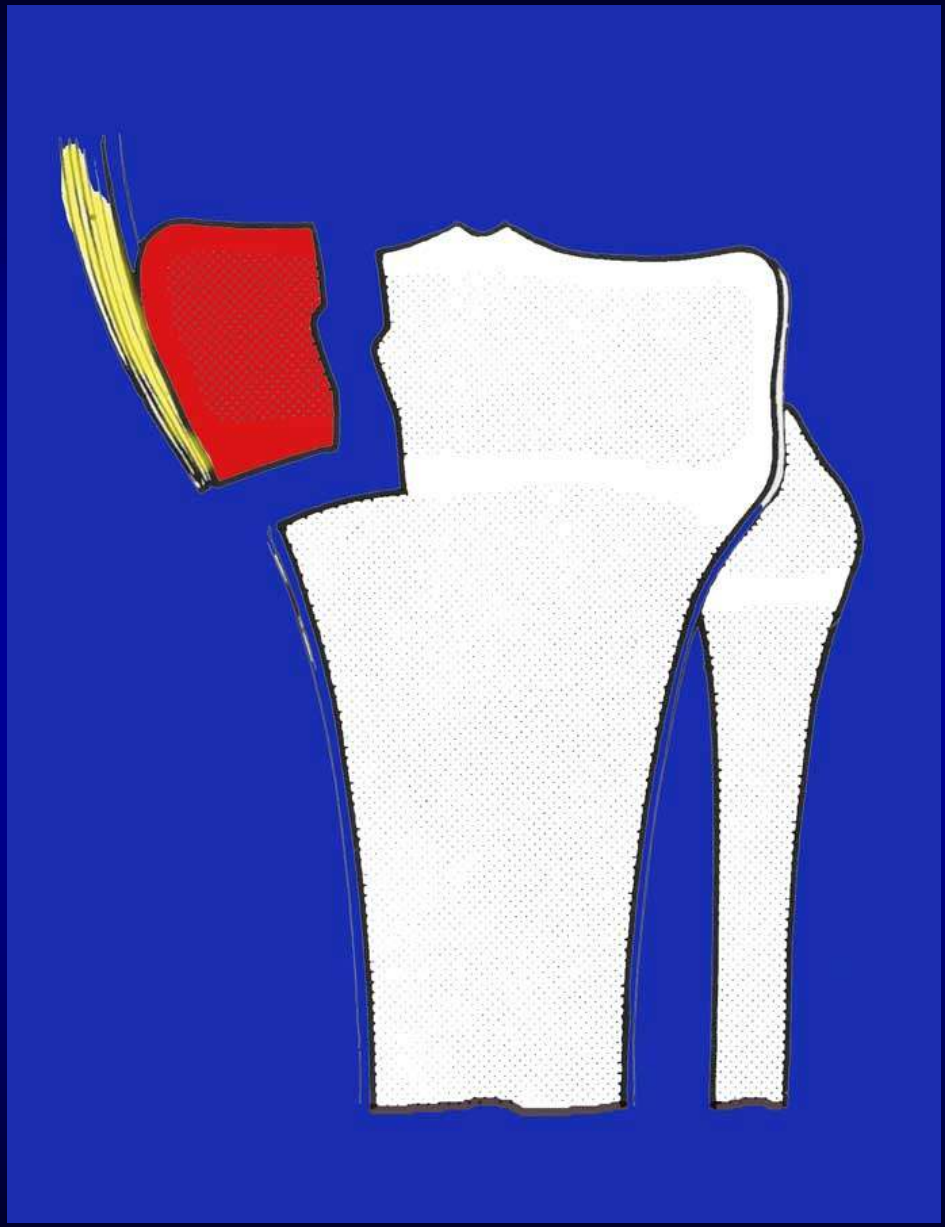
Complications

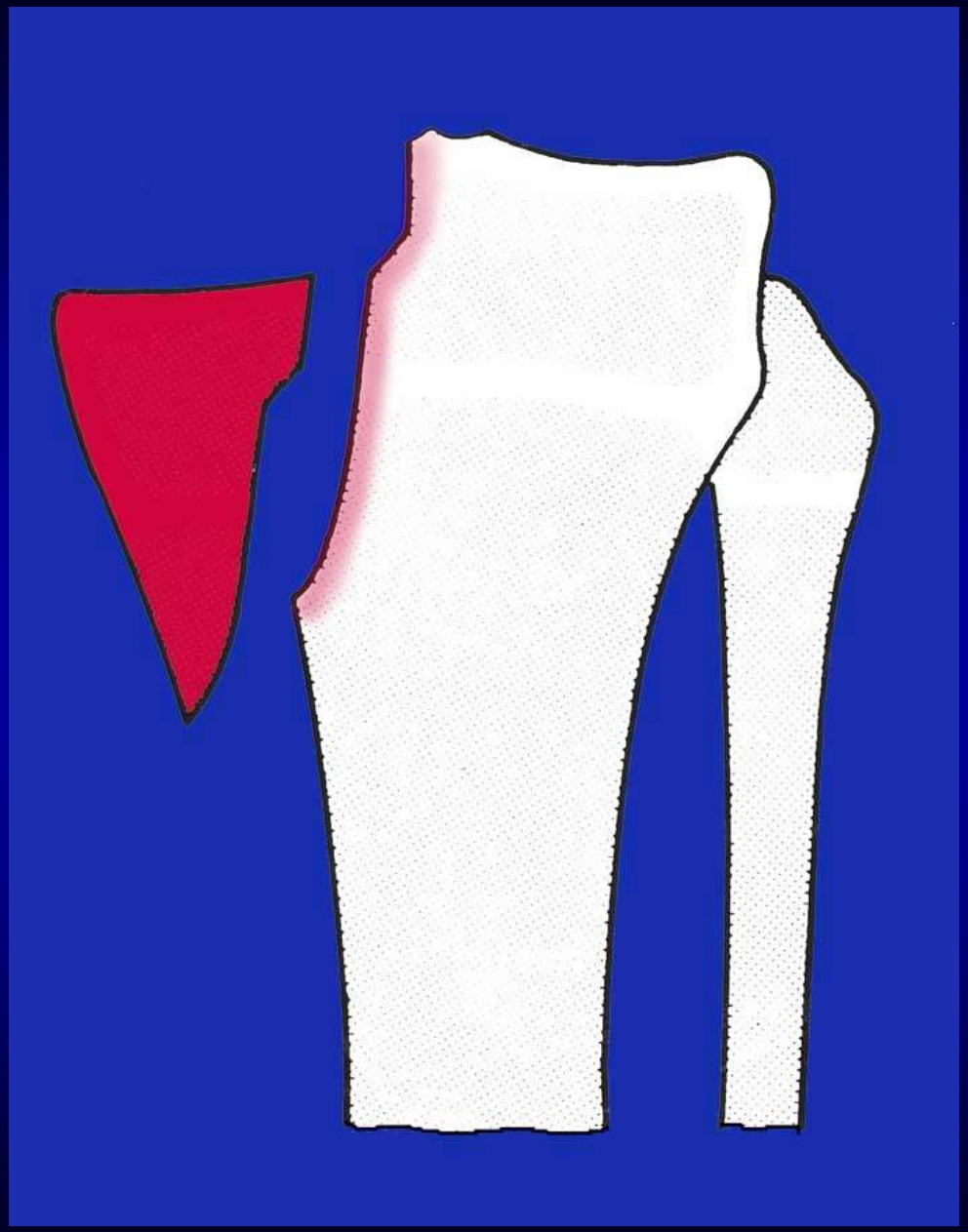
	per cent
leg length discrepancy	24
angular deformity	19
knee stiffness	16
peroneal nerve injury	3
popliteal artery injury	1

Proximal Tibial Epiphysial Separation

Salter-Harris I (15%)….50% undisplaced
II (43%)….30% undisplaced
III (22%)….near maturity:
collateral ligament tear
IV (27%)….angulatory deformity
V (3%)….later growth disturbance

Hyperextension — vascular injury
Hyperflexion — pes anserinus or periosteum entrapped



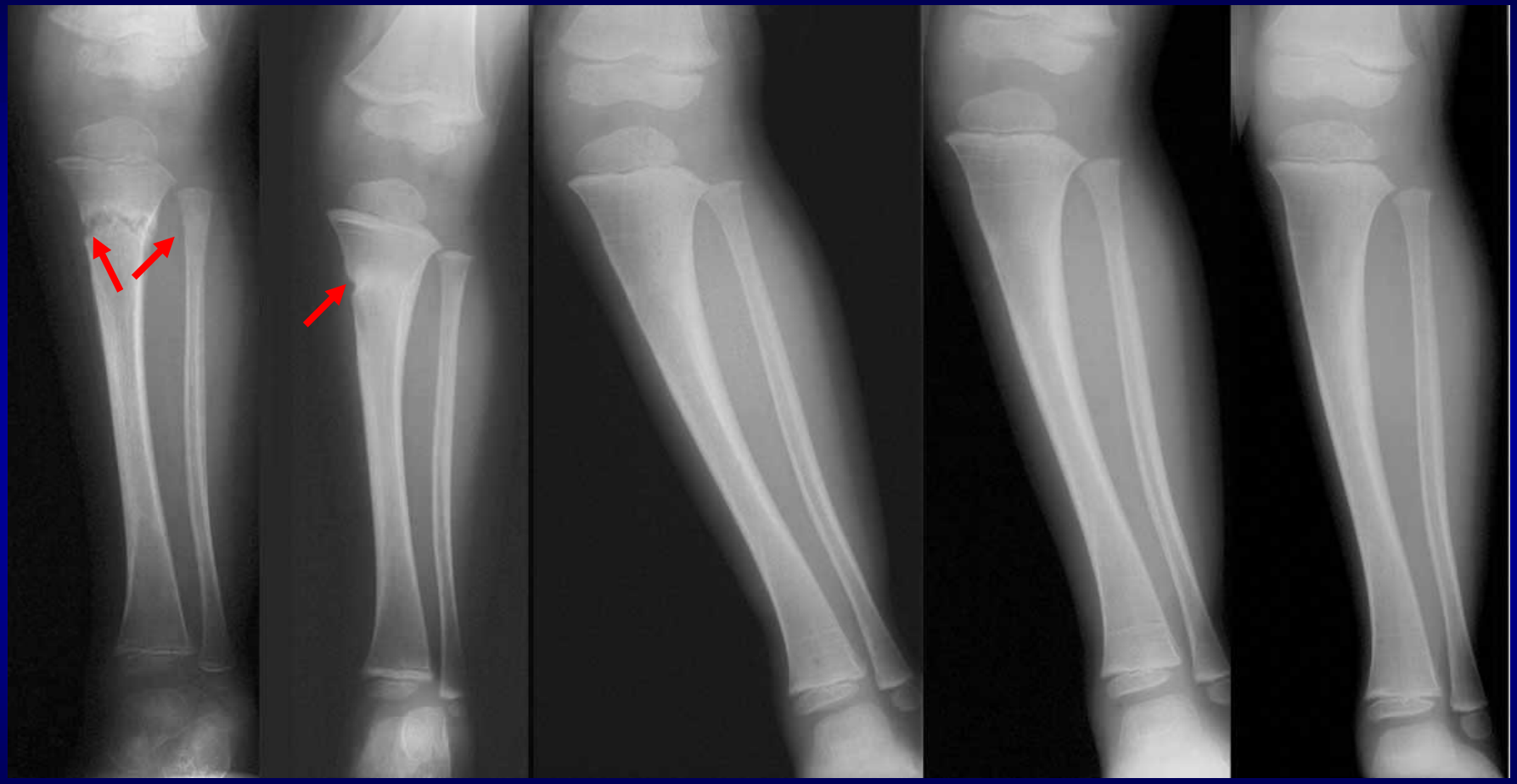


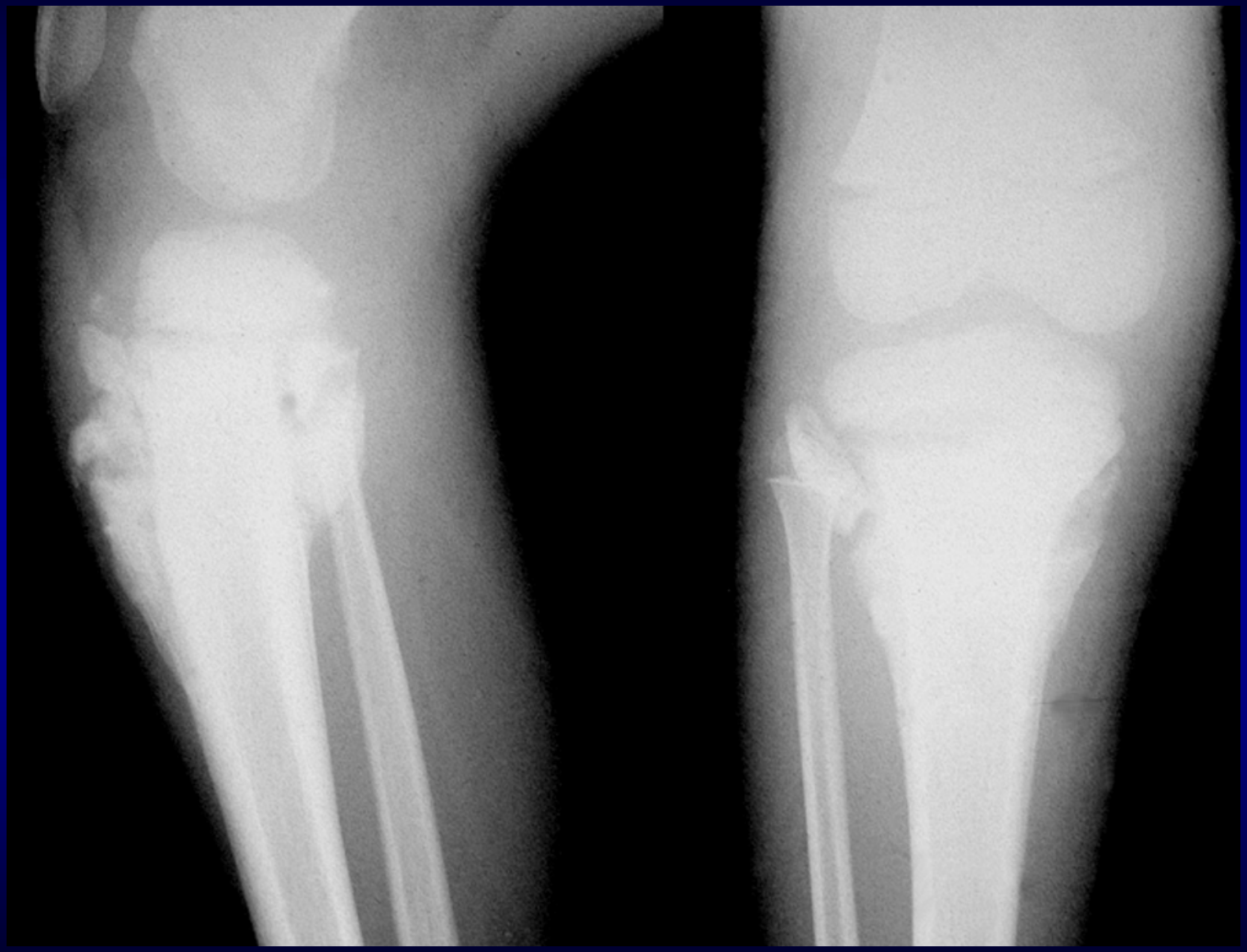
Proximal Tibial Epiphysial Separation Complications

	per cent
knee laxity/stiffness (OA)	33
growth disturbance	20
vascular injury/impairment	10
peroneal nerve injury	3

Complications

Early	Late
meniscal tear	refracture
compartment syndrome	genu recurvatum
infection	loss of flexion





Congenital Dislocation of the Patella

knee hyperextended in the neonate

knee flexed and in valgus with externally rotated tibia in childhood

Operative Treatment of Congenital Patellar Dislocation

(Goa et al1990)

extensive lateral release
vastus lateralis proximal slide
quadricepsplasty or rectus femoris release
medial (VMO) plication ± Campbell sling
Roux-Goldthwaite procedure
pesplasty to controlexternal tibial rotation

Patellar Instability in Children/Adolescence

Surgical principles :

i. patella alta - quadriceplasty

ii. lateral tilt - lateral release

iii. lateral shift - in flexion - lateral release
+ medial plication
in extension* - distal realignment

iv. deficient sulcus or lateral condylar buttress
- condylar osteotomy

(*knee extension test against gravity)

Acute Patellar Dislocation

traumatic

habitual

recurrent

Acute Patellar Dislocation

Treatment:

i. conservative (successful in 50-80 percent)
ii. operative - acute repair of:
medial retinacular fibres
medial patellofemoral ligament
patellar avulsion fracture

Repeated Patellar Dislocation

Operate if:

recurrence despite disciplined conservative approach

episodes of prolonged pain and swelling
(articular damage)

gross laxity/
abnormality anatomically/
syndrome

Patellar Dislocation Operative choices

lateral patellar release
(neither patella nor tuberosity deviated)

proximal realignment (patellar deviation - in flexion)

proximal and distal realignmnet
(patella and tuberosity deviation)

(Kobayashi & Fujikawa 2003)

Distal Realignment

Roux Goldthwaite (adolescent)

Elmslie-Trillat

Slot-block

Hauser (Hampton & Hill 1975)

Medial Reinforcement

VMO advancement (Green)

patello femoral ligament repair

tubeplasty (Insall)

semitendinosis tenodesis (Baker)

HAMSTRING STRETCHING !


IF MUM
Says
NO
ASK DAD!