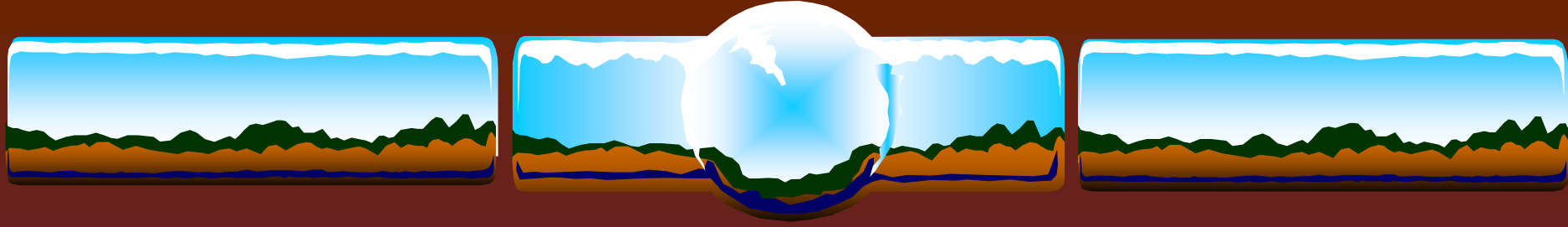


# Paediatric Orthopaedics

## Trauma

Dr Ruan Goller



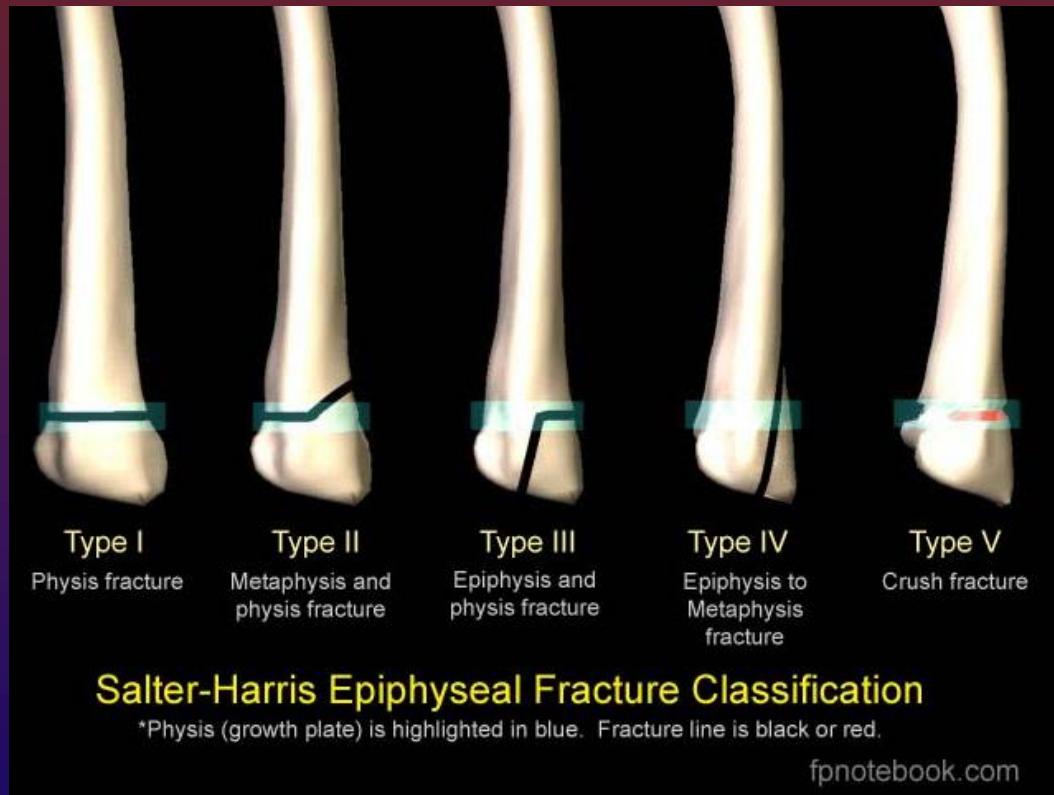


# Fractures in Children

What makes fractures in children unique ?

Anatomy: physis, epiphysis, metaphysis,  
diaphysis

# Growth Plate injuries





# Growth Plate injuries

## ⑩ Salter-Harris I





# Growth Plate injuries

⑩ Salter-Harris II – most common





# Growth Plate injuries

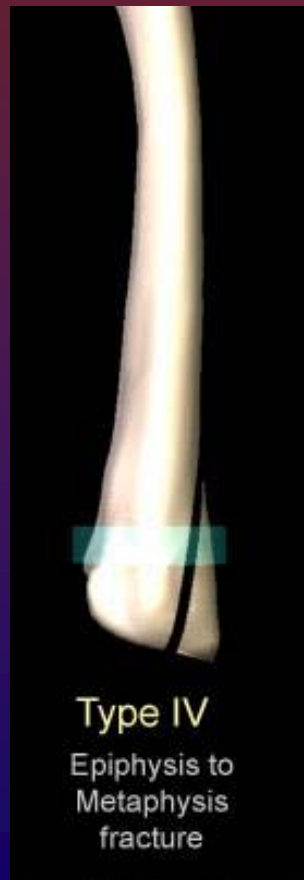
## ⑩ Salter-Harris III





# Growth Plate injuries

## ⑩ Salter-Harris IV





# Growth Plate injuries

## ⑩ Salter-Harris V

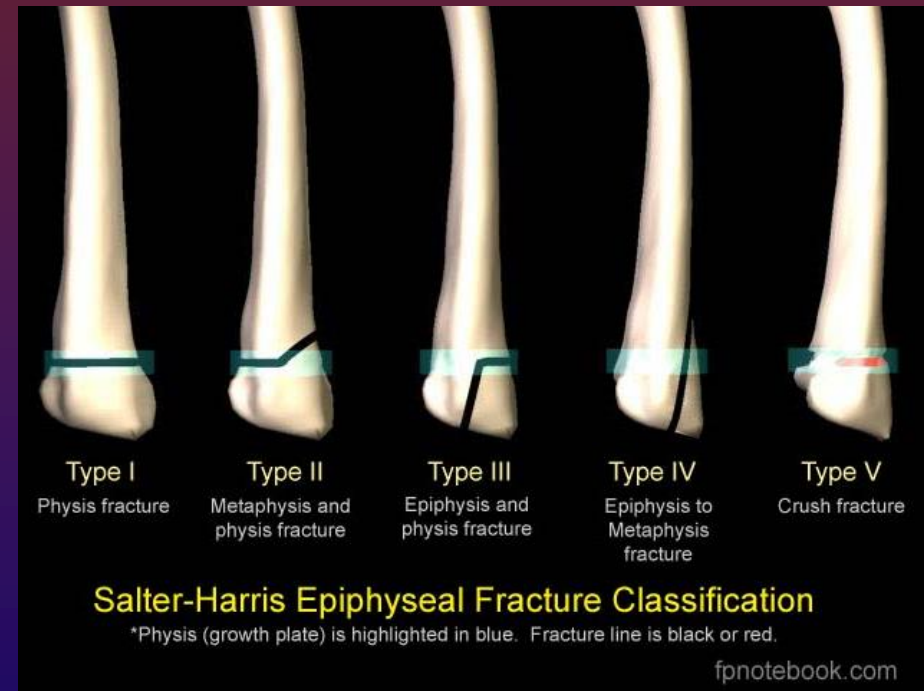






# Growth Plate injuries

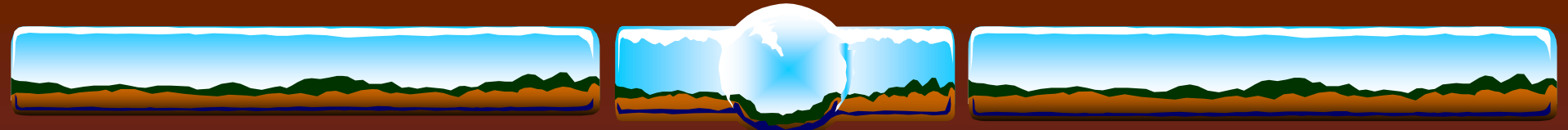
- ⑩ Salter Harris injuries I and II – usually treated with closed reduction and POP
- ⑩ Salter-Harris III and IV usually need surgery.
- ⑩ Type V – rare (treat sequela of growth disturbance)





# Growth Plate injuries

- ⑩ This classification can be remembered as follow:
- ⑩ S: Separated/straight across
- ⑩ A: Above the physis/Away from the joint
- ⑩ L: Lower than the physis
- ⑩ T: Through the metaphysis, physis and epiphysis
- ⑩ R: Rammed/crushed physis



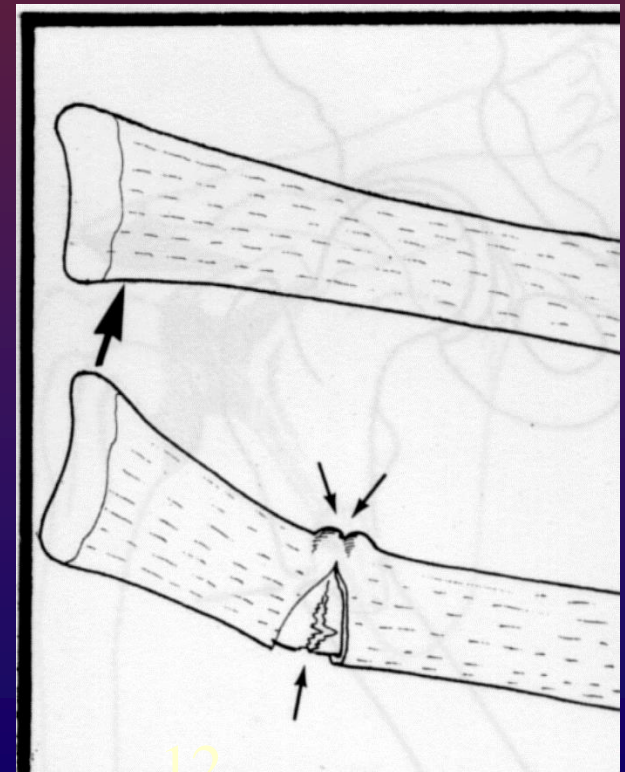
# What makes fractures in children unique ?

- ⑩ More ductile than adult bone
- ⑩ Bowing – plastic fractures



# What makes fractures in children unique ?

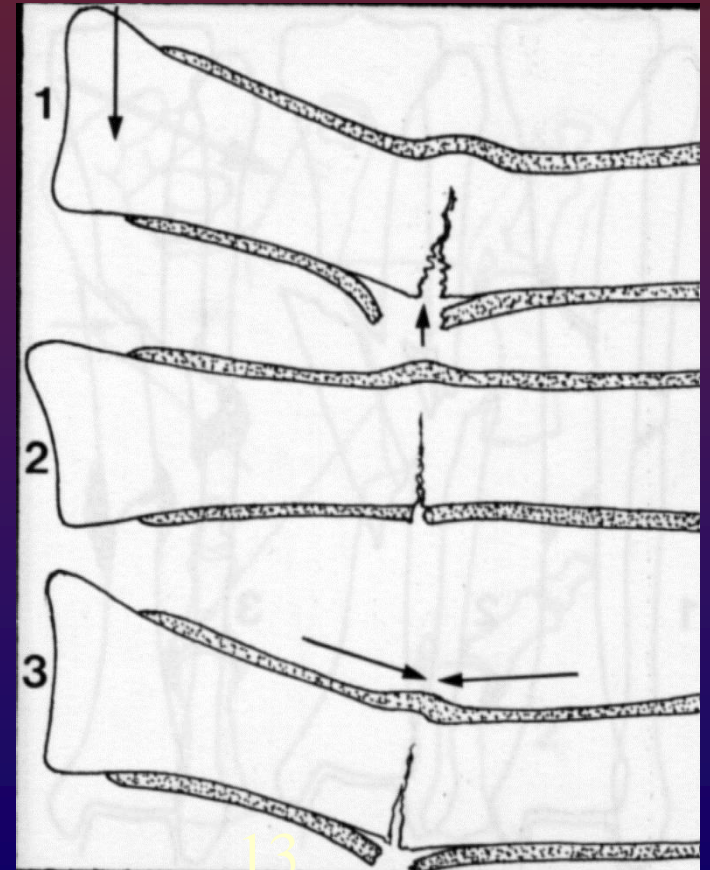
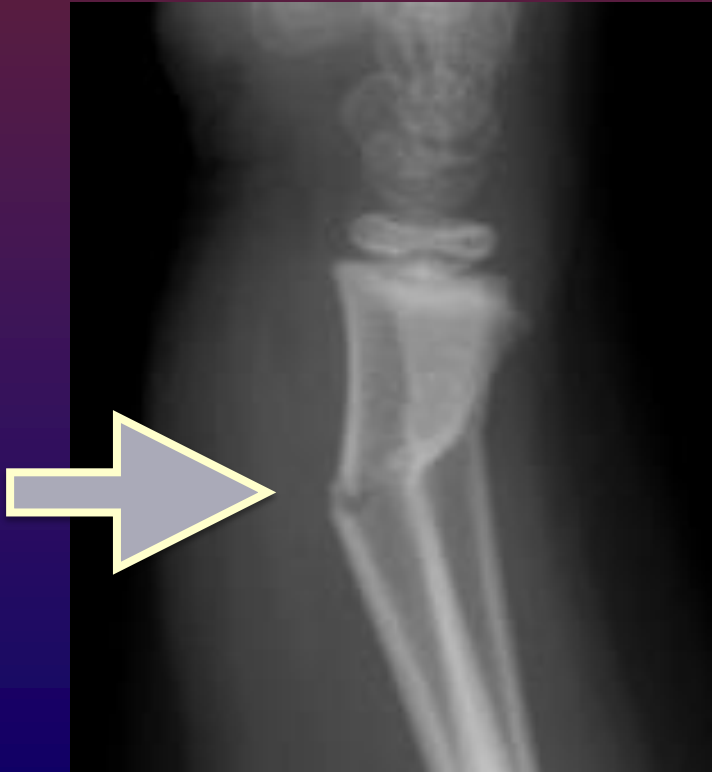
- ⑩ Torus fracture
- ⑩ Latin “tori” swelling
- ⑩ Buckle fracture
- ⑩ Stable fractures
- ⑩ Treat with caused in RSA





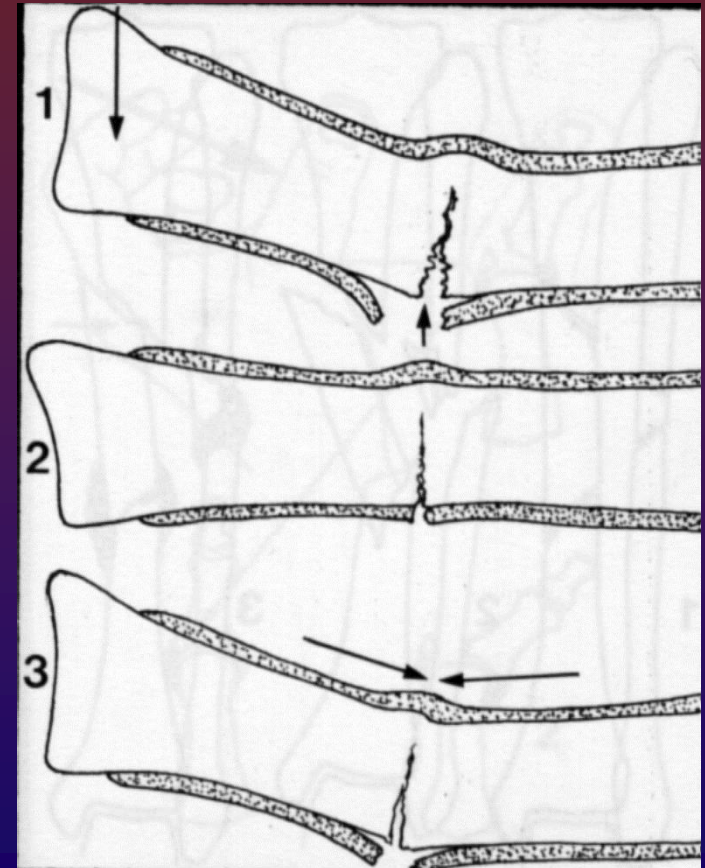
# What makes fractures in children unique ?

## ⑩ Greenstick fracture



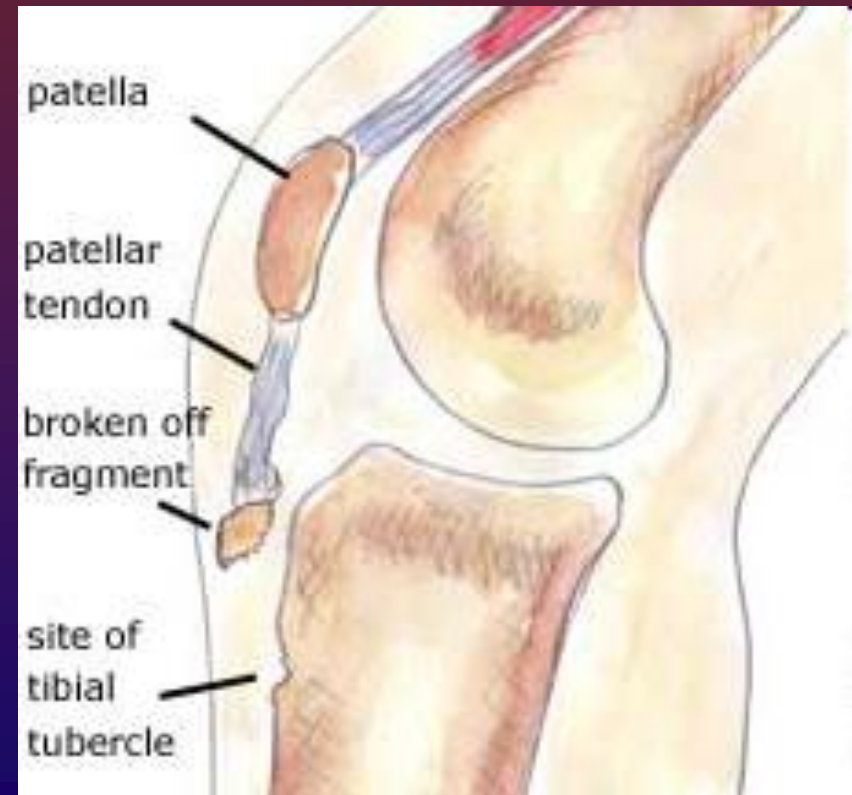
# What makes fractures in children unique ?

- ⑩ Periosteum is thicker
- ⑩ Often stay intact
- ⑩ Allowing less displacement
- ⑩ better reduction of fracture
- ⑩ Redisplacement



# What makes fractures in children unique ?

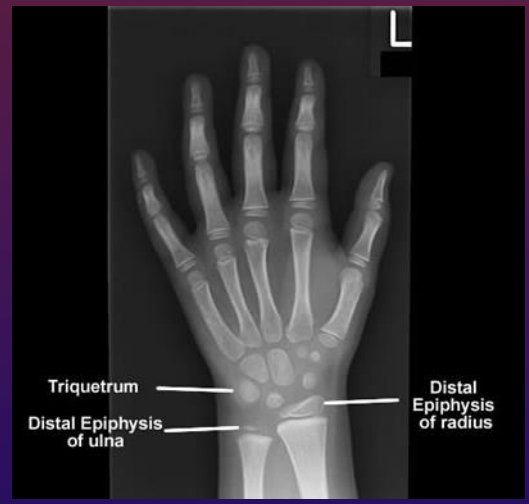
- ⑩ Heal quicker (age in years plus 1 week)
- ⑩ Ligaments are stronger than bone
- ⑩ Pure dislocations are rare





# What makes fractures in children unique ?

⑩ Injury to growth plate results in deformity



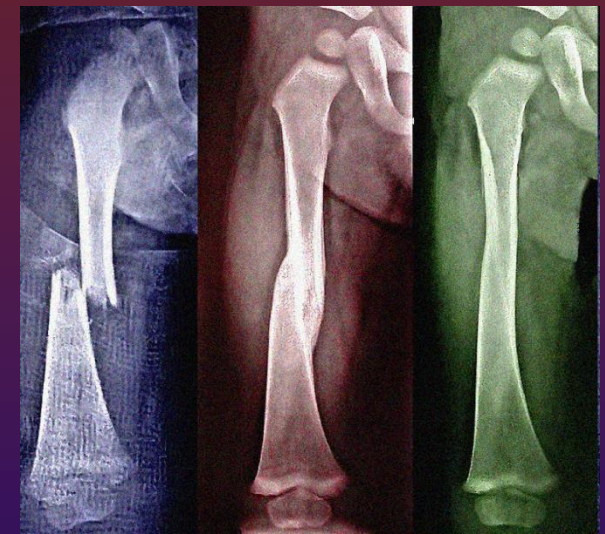
⑩ Xr's with ossification centra can be confusing





# What makes fractures in children unique ?

- ⑩ Remodeling potential
- ⑩ Stiffness and contractures are rare. Children more lax than adults.





# Remodeling potential

- ⑩ Can last months or even or even years
- ⑩ Provisional callous gradually removed and new bone laid down along the line of stress



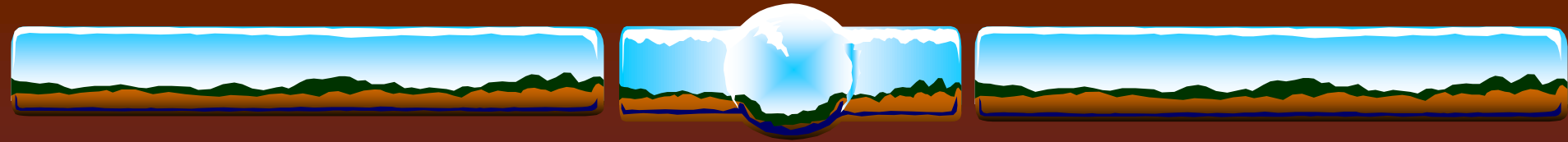
# Location affects remodeling

- ⑩ Metaphysis
- ⑩ Active remodeling area in development of normal bone



# Location affects remodeling

- ⑩ Diaphysis
- ⑩ Relatively dormant osteogenesis



# How does the remodeling process occur?

- ⑩ Angulation
- ⑩ Length
- ⑩ Rotation



# Angulation

- ⑩ Angular remodeling occurs if displacement is in the same plane as normal motion



# Length

## ⑩ Tibial overgrowth:

- ⑩ Max stimulation of 4,2mm occurred in 2-5 years age group
- ⑩ Greater tendency of overgrowth in open fractures

## ⑩ Femoral overgrowth:

- ⑩ Fracture healing stimulates bone growth
- ⑩ Shapiro found overgrowth of 0,92cm (0,4-2,7)
- ⑩ Growth stimulation for as long as 3years post injury

The top of the slide features three horizontal panels, each showing a landscape with a blue sky, green hills, and brown ground. The middle panel is centered around a white globe, illustrating the Earth's rotation.

# Rotation

⑩ For practical purposes does not occur





# Rule out

⑩ Congenital diseases

⑩ Child abuse



# Upper limb trauma





# Supracondylar fractures

- ⑩ Most common fracture around the elbow
- ⑩ Displaced or undisplaced



# Supracondylar fractures

⑩ “flag sign”



# Supracondylar fractures

⑩ .COMPARTMENT SYNDROME !!!!!!!!!!!!!



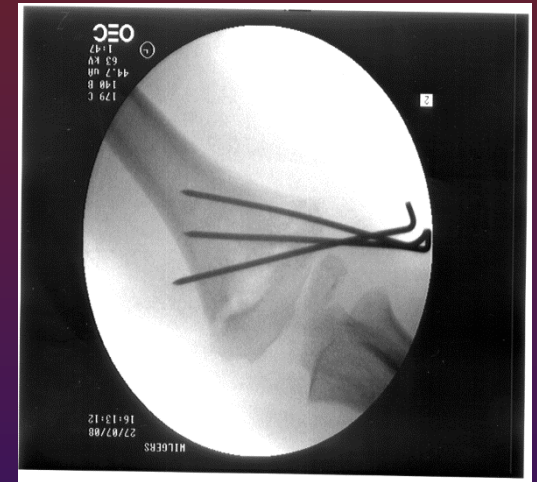
⑩ COMPARTMENT SYNDROME!!!!!!!!!!!!

# COMPARTMENT SYNDROME!!!!!!!!!!!!

- ⑩ Pain out of proportion!!
- ⑩ Tight compartments
- ⑩ Passive stretch positive
- ⑩ THEN
  - ⑩ Paresthesiae
  - ⑩ Pallor
  - ⑩ Poor refill
- ⑩ THEN
  - ⑩ Pulselessness



# Supracondylar fractures Mx



Back slab  
Modified Dunlop traction  
Surgical reduction



# Supracondylar fractures

- ⑩ If left untreated may lead to gunstock deformity
- ⑩ Post surgery ROM almost normal at 6-12 weeks





# Forearm fractures

- ⑩ Unstable fractures
- ⑩ Can be treated with P.O.P
- ⑩ If unstable – refer
- ⑩ Rotation and length difficult
- ⑩ IF STABLE – HEALS WELL





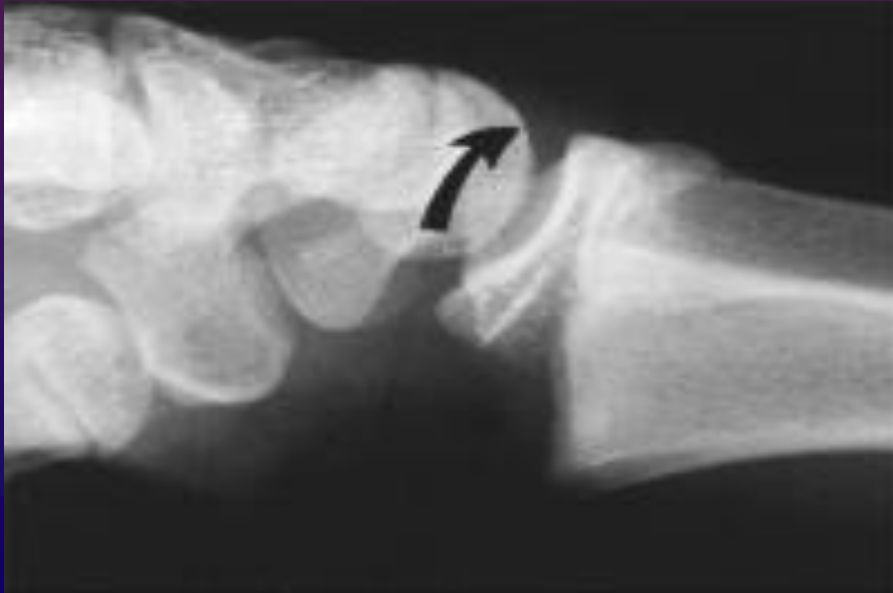
# Forearm fractures

- ⑩ Unacceptable/Unstable reduction
- ⑩ TENs nailing
- ⑩ Plating should not be done
- ⑩ Remove hardware 3-4 months



# Distal radius fractures

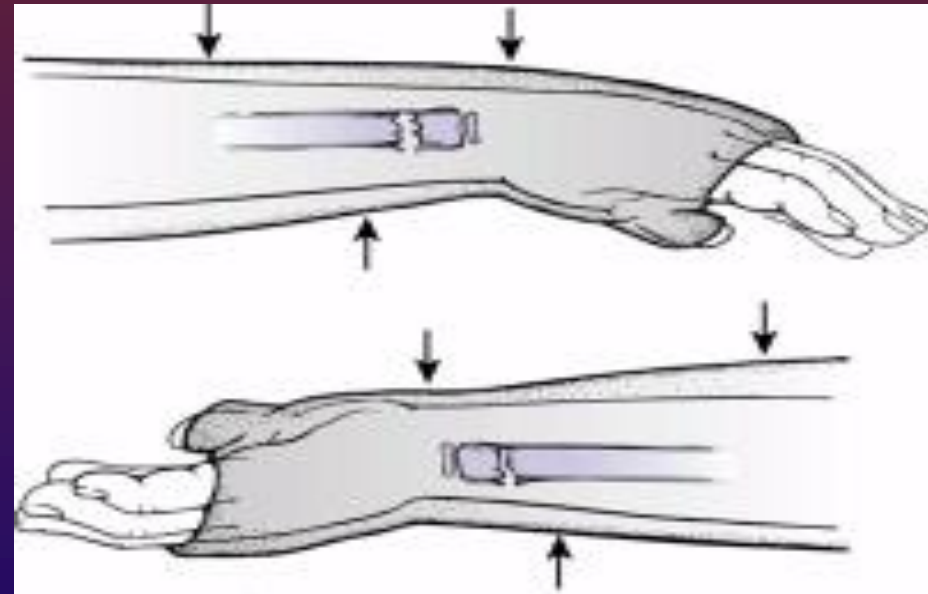
- ⑩ Common fracture
- ⑩ Especially SH II fractures
- ⑩ Need reduction < 72hrs !!

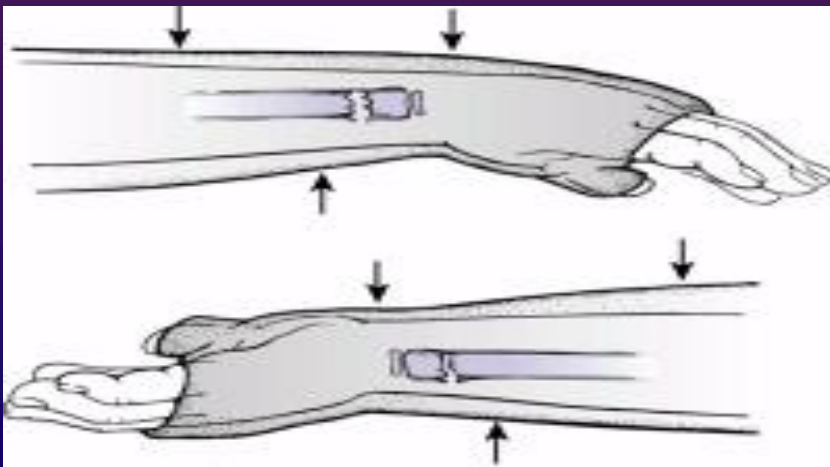
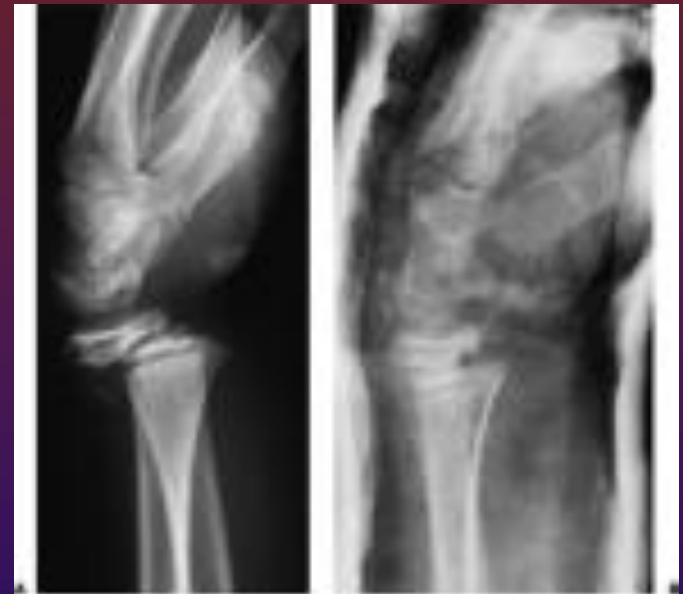
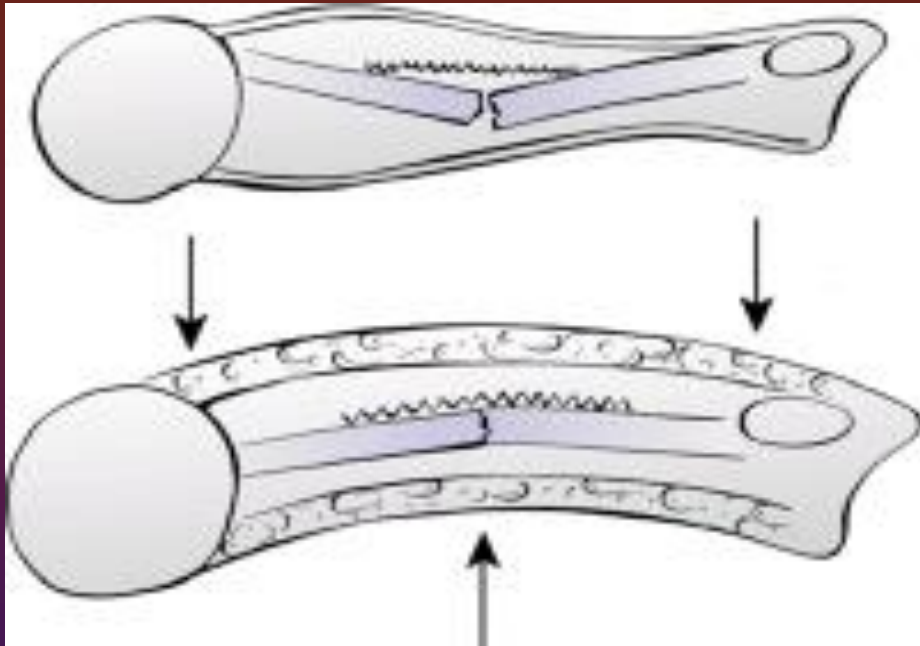
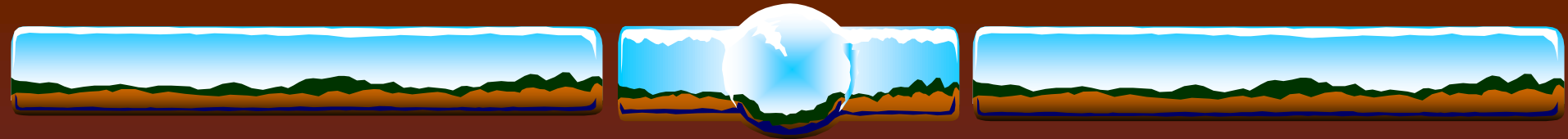




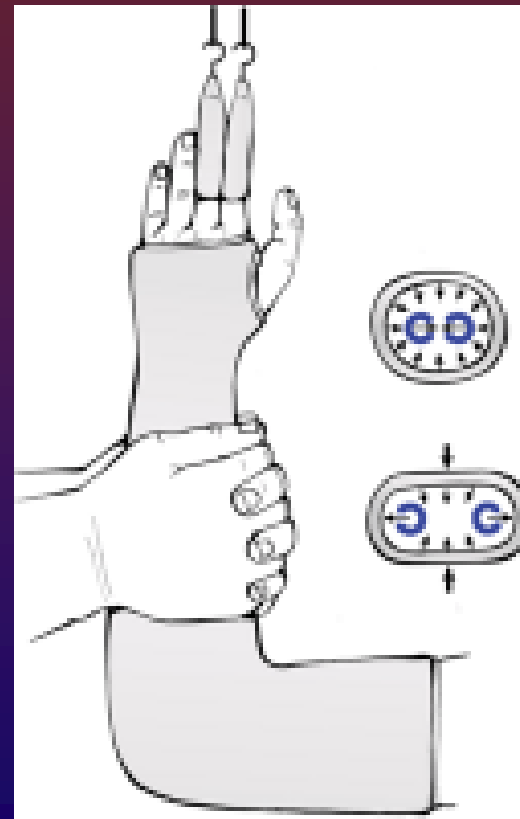
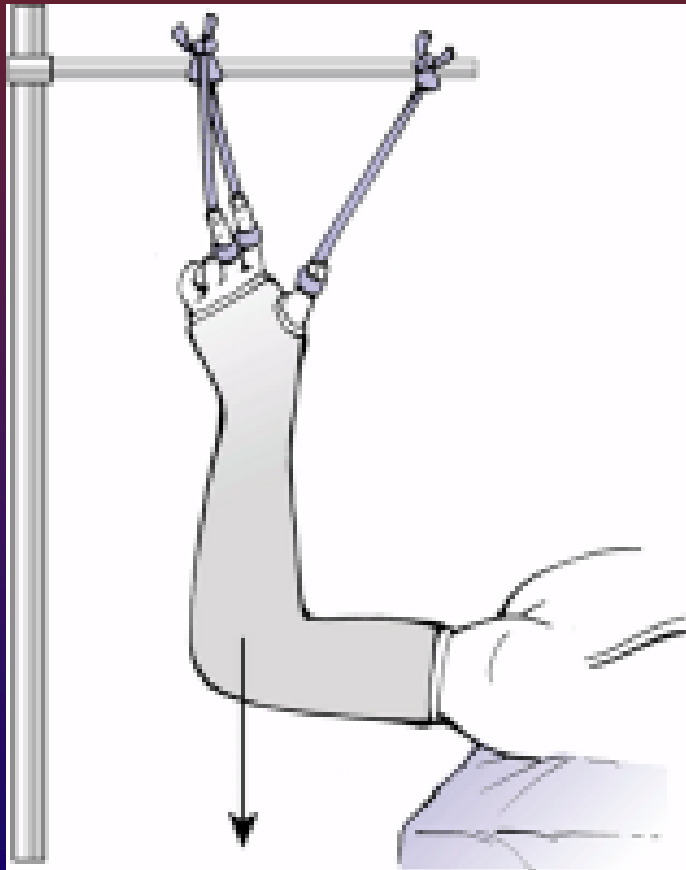
# 3 Point pressure

- ⑩ Thick periosteum  
redisplaces fractures
- ⑩ Acts as ‘tether’ on fracture
- ⑩ Must use cast to keep  
fracture reduced
- ⑩ 3point pressure – Charnley
- ⑩ “ Straight bone = curved  
cast”



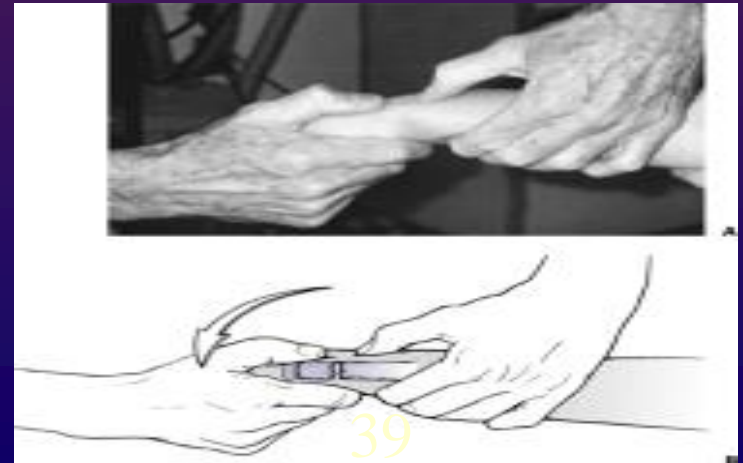
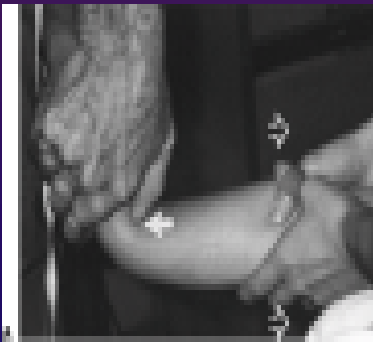


# Tricks in moulding



# Bayonet fracture

- ⑩ Elastic periosteum
- ⑩ Dorsal periosteum intact
- ⑩ Hyper angulate fracture and then reduce
- ⑩ Do not pull!



# Lower limb trauma







# Pelvis fracture

- ⑩ Luckily rare
- ⑩ Usually minimally displaced – bedrest
- ⑩ Associated injury !!!!
  - ⑩ Renal
  - ⑩ Spleen
  - ⑩ Liver
  - ⑩ Bowel
  - ⑩ Bladder



# Femur fracture

- ⑩ Waddell's triad !!!
  - ⑩ Femur fracture
  - ⑩ Head injury
  - ⑩ Thoracic/abdominal injury
- ⑩ Polytrauma patient
- ⑩ Heavily injured until proven otherwise!!
- ⑩ Kids – compensate
- ⑩ Hkt <30 – not femur alone!!!

DON'T LET  
OUR KIDS DIE  
!!!!!!!



# Femur fracture

- ⑩ 0-24 months
  - ⑩ NAI ?
  - ⑩ Remodel well



# Femur fracture

- ⑩ Gallows traction
  - ⑩ Max 12kg
  - ⑩ 4 hourly pressure point monitoring
  - ⑩ Nerve and vascular monitoring!!



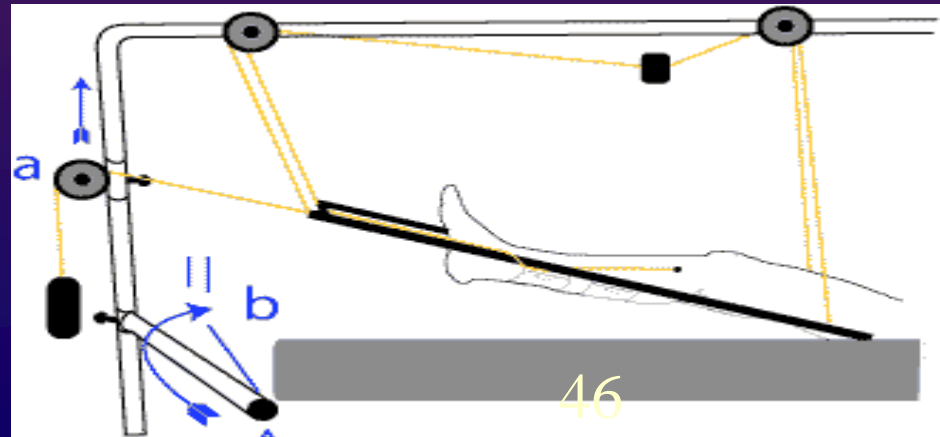
# Femur fracture

- ⑩ Pavlik harness < 3/12
- ⑩ Spica cast – pressure points



# Femur fracture

- ⑩ 18/12 – 12 years
- ⑩ Femur heals well
- ⑩ Traction
- ⑩ Check position and adjust as necessary





# Femur fracture

⑩ (Not for studying purposes)

AGE	VARUS/VALGUS	SAGGITAL
Birth—2 yrs	30°	30°
2—5 yrs.	15°	20°
6—10 yrs.	10°	15°
11 yrs+	5°	10°

# Femur fracture

- ⑩ Unable to keep reduced in traction – refer for surgery

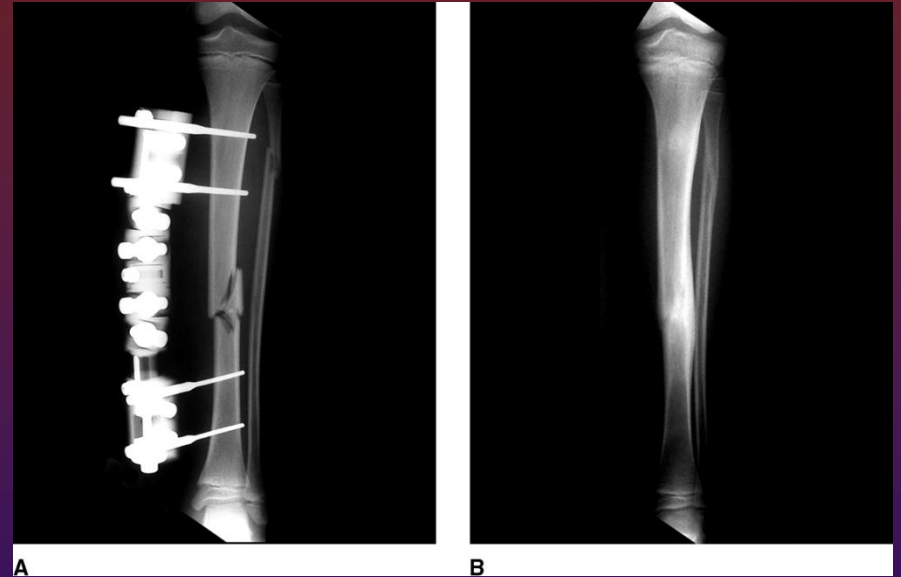






# Tibia fracture

- ⑩ Rule out Compartment syndrome!!
- ⑩ Mainstay conservative treatment
- ⑩ Above knee cast
- ⑩ Rarely surgery
  - ⑩ Ex fix
  - ⑩ TENs





# Ankle Fractures

- ⑩ Usually requires open/percutaneous reduction and fixation



# Indications for ORIF

Intra-articular fractures - Salter  
Harris III and IV

Failure to achieve a reduction

Failure to maintain a reduction

⑩neck of femur

⑩lateral condyle of humerus

⑩supracondylar fracture

⑩avulsion fractures



# Indications for ORIF

Polytrauma

Multiple fractures

⊗ bilateral femur fractures

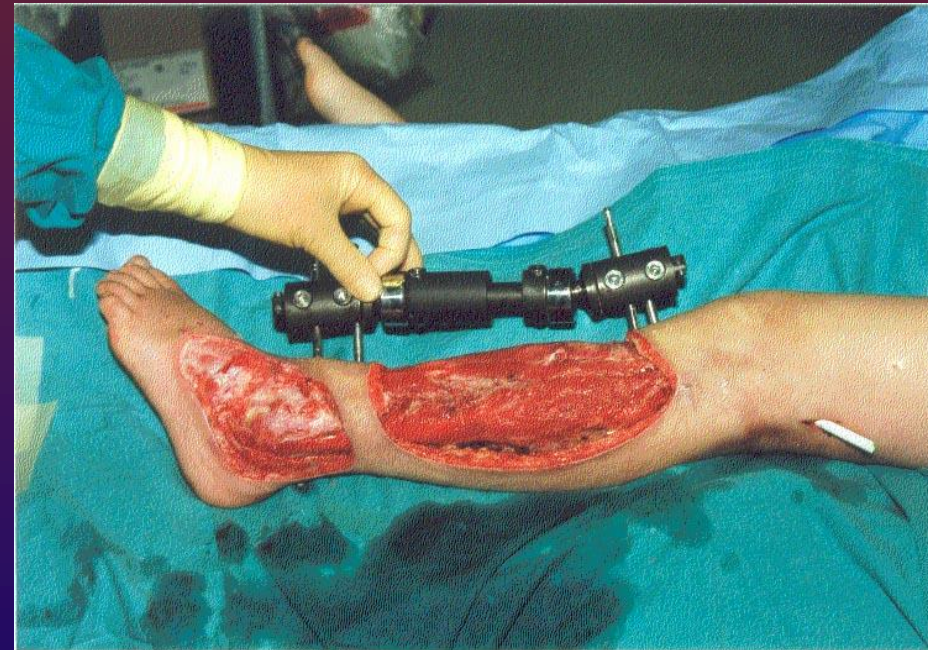
⊗ floating knee

⊗ humerus and forearm

Compound Fractures

Neurovascular compromise or injury

Pathological fractures



# The End

