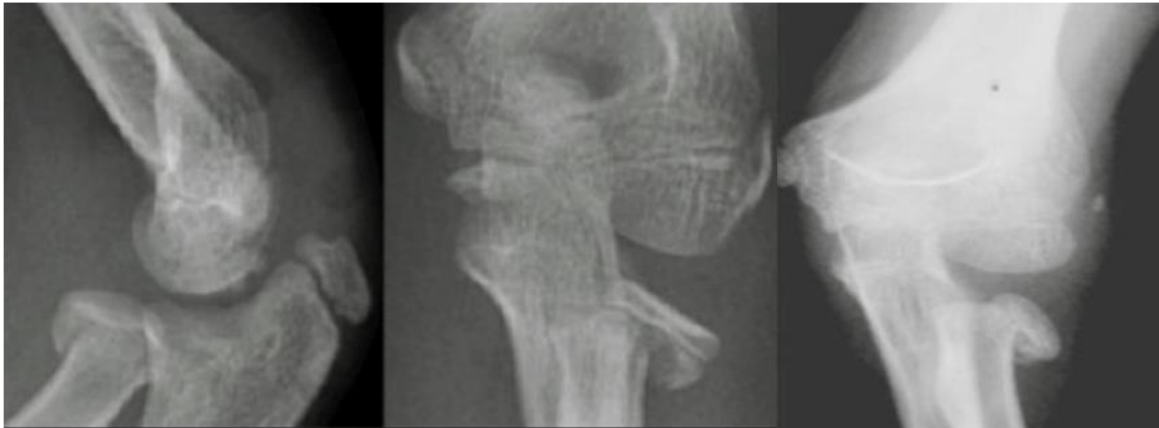
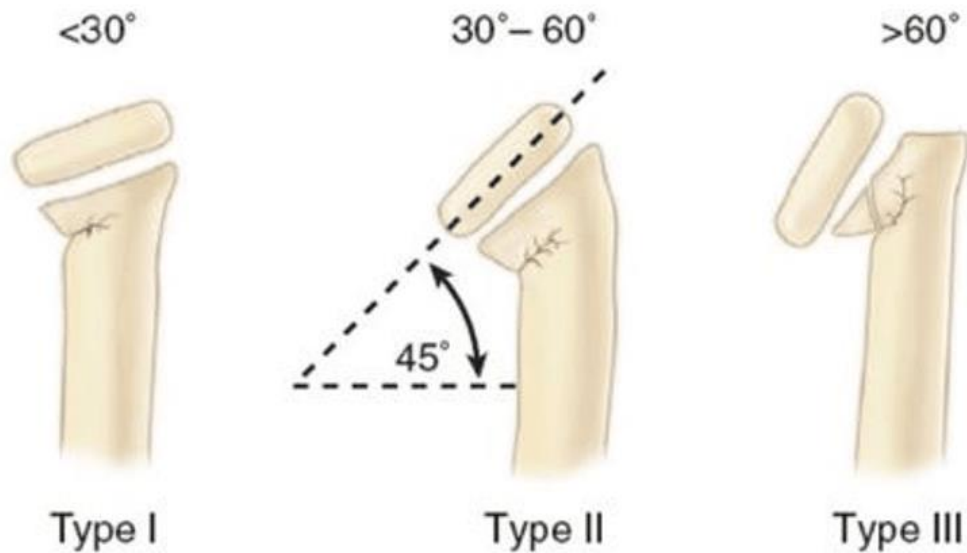




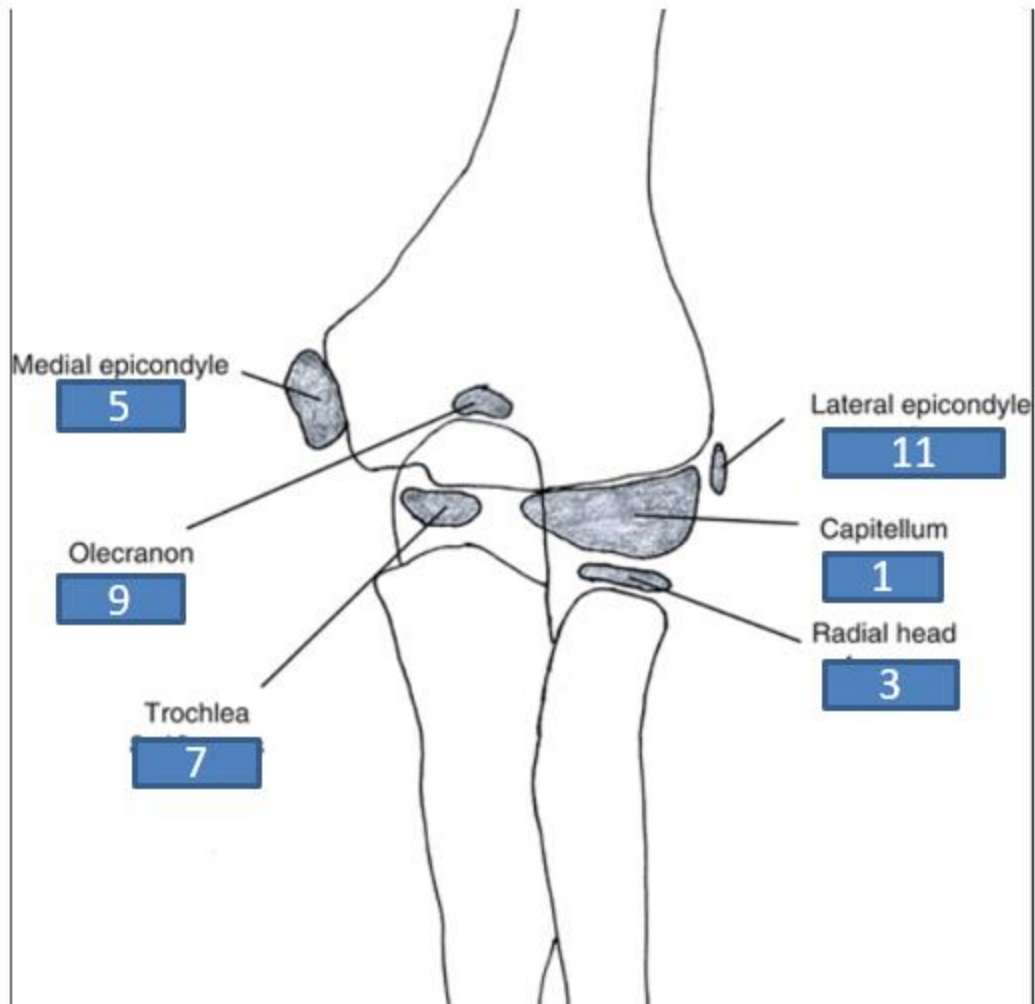
بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



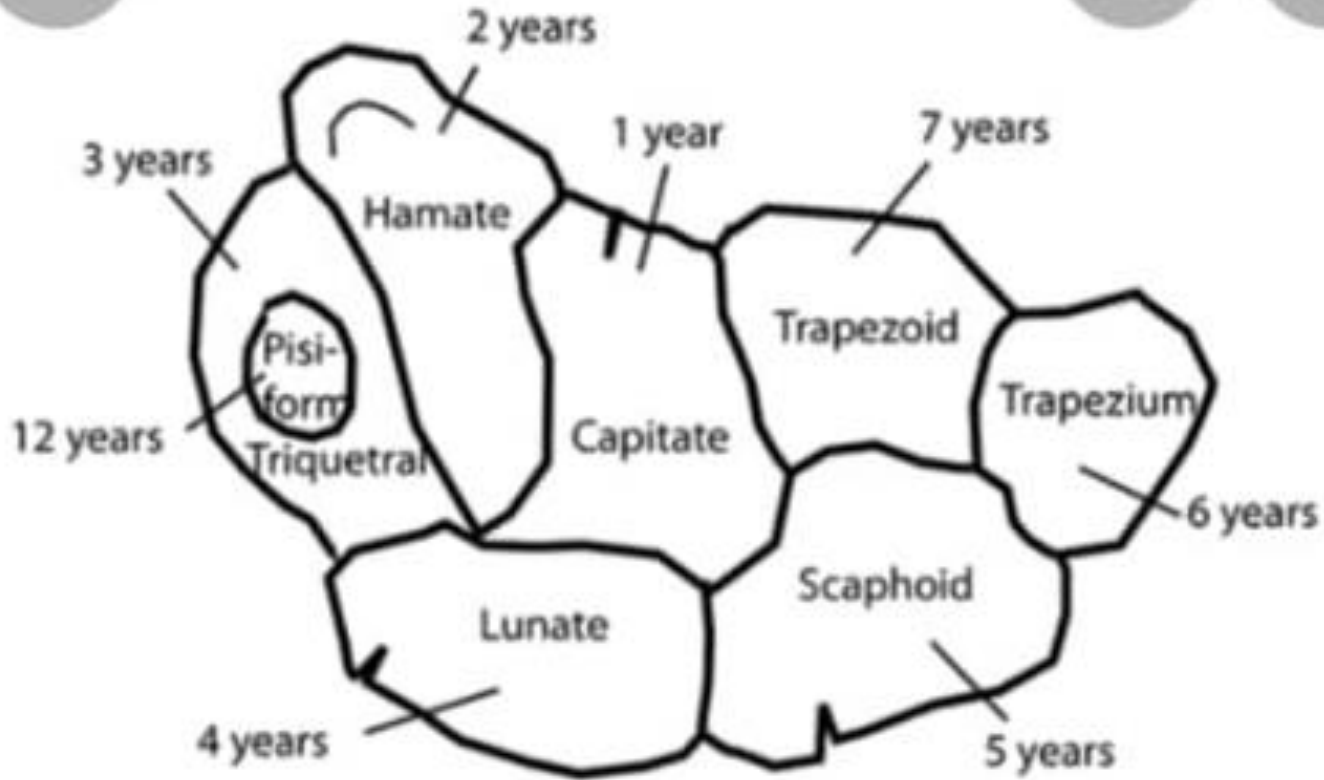
# Pediatric Radial Neck/ Head Fractures



# CRMTOL 1357 911



# CHTLSTTP 1234567 12



Roughly one centre appears per year from the age of 1 year to 7 years, anticlockwise in the right hand looking from the anterior surface

# ***Proximal Radius FX***

- usually involve the metaphysis or physis.
- True isolated radial head fractures are rare
- radial neck 1% to 3% of all children's fractures.  
5% to 10% of elbow fractures
- Radial head fractures are uncommon.. VI SH
- median age at injury is 9 to 10 years

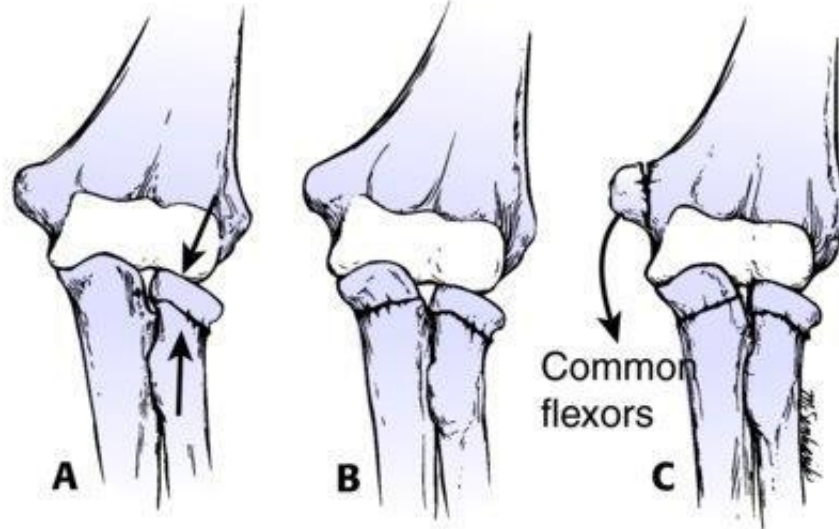
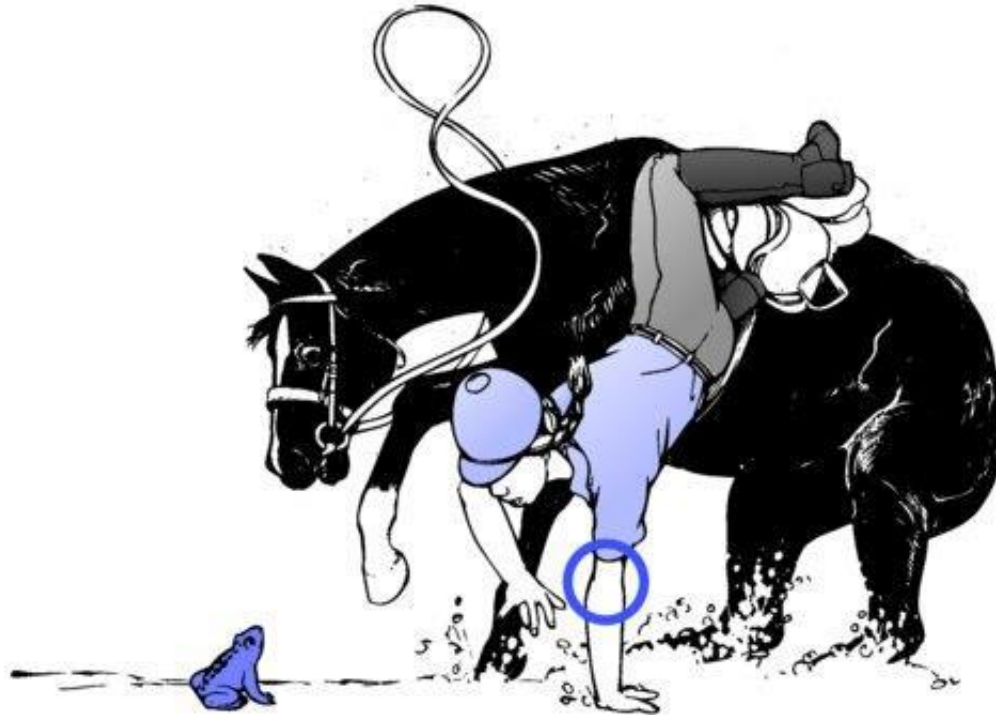
# ***Proximal Radius FX***

- Most at the neck
- fall on an outstretched arm
- elbow extended and valgus stress
- intra-articular radial head fractures are rare
- avascular necrosis and nonunion with significant displacement.
- cartilaginous head absorbs the force and transmits it to the weaker physis or metaphysis of the neck

# angulation direction of radial neck fx?

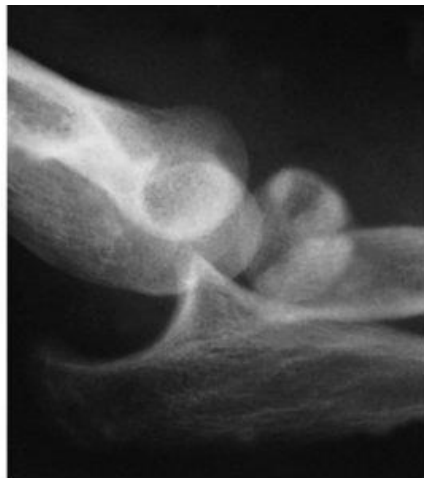
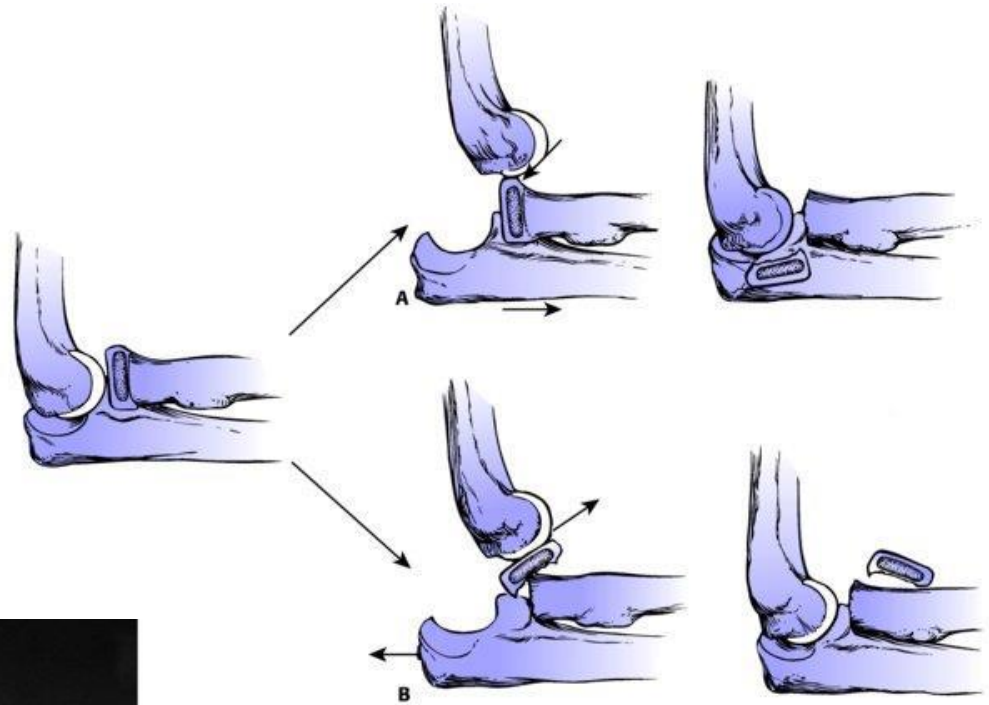
- forearm rotation position. supinated, neutral, or pronated position.
- neutral, lateral angulation
- supination, anterior tilt
- Pronation . Posterior tilt

# Force dependent pattern





# Proximal radial fractures with elbow dislocation



# ***Associated Injuries of the Proximal Radius fx . PP***

- Distal humerus, ulna, radial shaft, or distal radius fractures
- Monteggia L.
- Elbow dislocations
- (PIN) damage ...at risk during closed manipulation or open reduction

# ***Signs and Symptoms of Fractures of the Proximal Radius***

- pain . Swelling. PIN test.
- Occasionally wrist pain, referral p..
- distal radioulnar joint dysfunction.

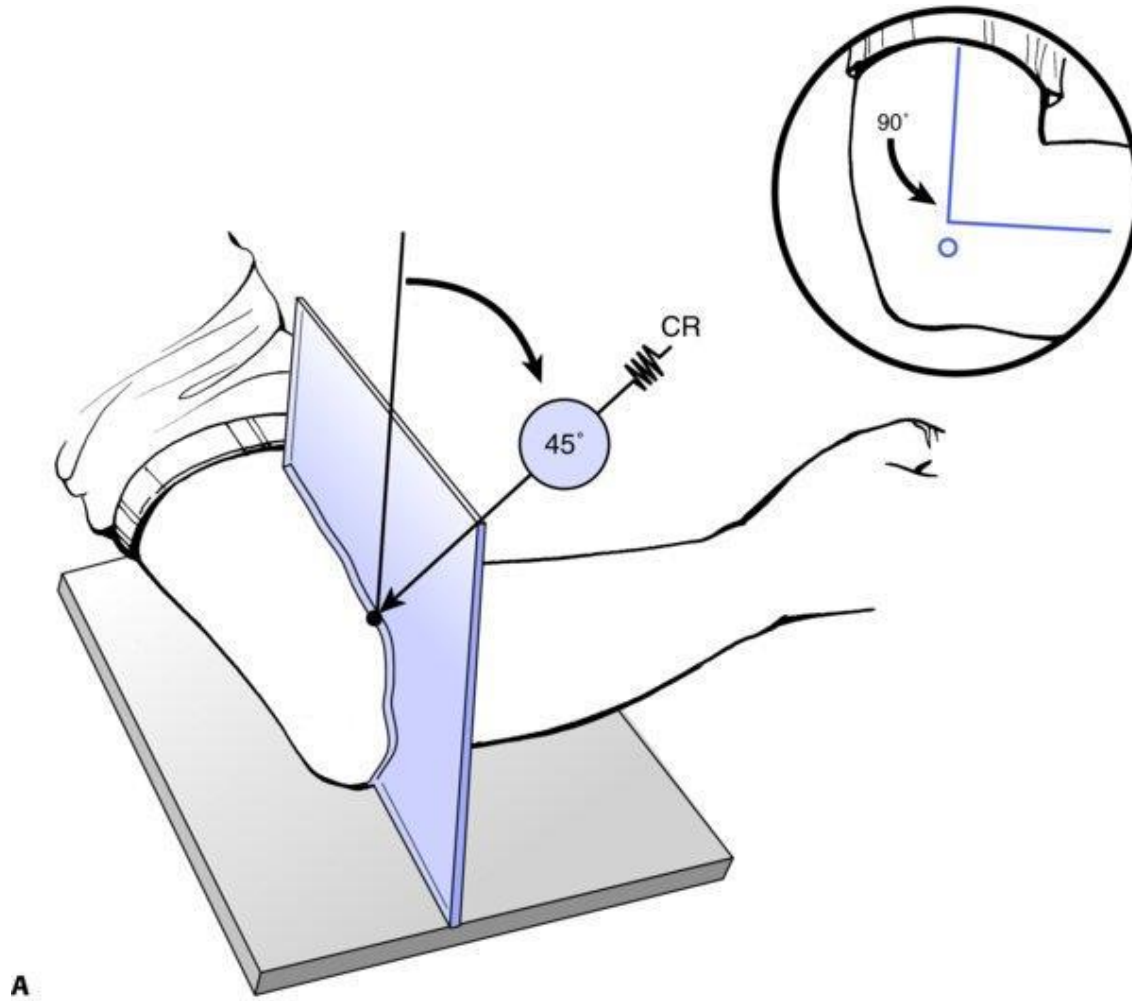
# ***Imaging and Other Diagnostic Studies for Fractures of the Proximal Radius***

- standard (AP) and lateral radiographs.
- ossification process can resemble a fracture of radial head, step-off NV  
secondary ossification centers

Contra lat Comparison views

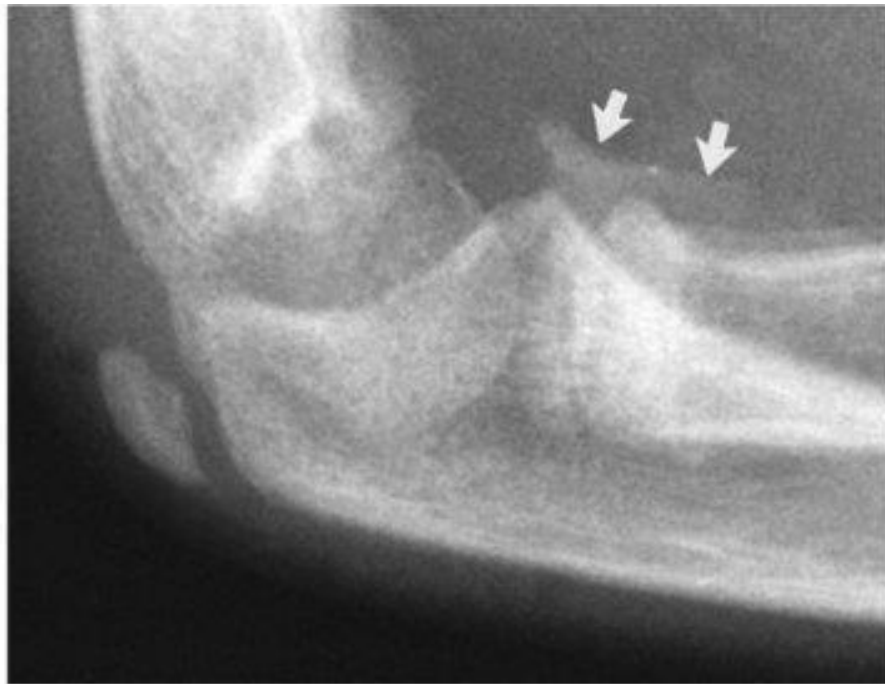
Elbow cannot be extended. 2perpendicular ap v

# radiocapitellar view suggested by Greenspan and Hall-Craggs



With a minimally displaced fracture

if full supination and pronation views are difficult to obtain



**A**



2y old

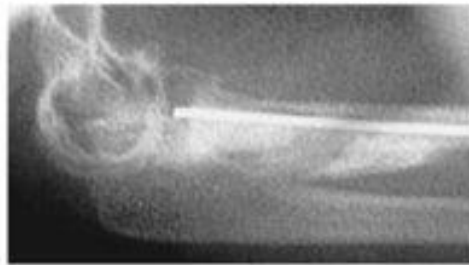
A



B



D



C, E



F



# ***Chambers' Classification of Proximal Radial Fractures***

- ***Group I: Primary displacement of the radial head (most common)***
- *Valgus fractures*
- Type A—Salter–Harris type I and II injuries
- Type B—Salter–Harris type IV injuries
- Type C—Fractures involving only the proximal radial metaphysis

Fractures associated with elbow dislocation

- Type D—Reduction injuries
- Type E—Dislocation injuries



- ***Group II: Primary displacement of the radial neck***
- Angular injuries (Monteggia type III variant)
- Torsional injuries
- ***Group III: Stress injuries***
- Osteochondritis dissecans or osteochondrosis of the radial head
- Physeal injuries with neck angulation

**TABLE 13-2**

## **Classification of Fractures Involving the Proximal Radius**

### *Group I: Primary Displacement of the Radial Head*

#### A. Valgus fractures

1. Type A—Salter–Harris type I and II injuries of the proximal radial physis
2. Type B—Salter–Harris type IV injuries of the proximal radial physis
3. Type C—Fractures involving only the proximal radial metaphysis

#### B. Fractures associated with elbow dislocation

1. Type D—Reduction injuries
2. Type E—Dislocation injuries

### *Group II: Primary Displacement of the Radial Neck*

#### A. Angular injuries (Monteggia type III variant)

#### B. Torsional injuries

### *Group III: Stress Injuries*

#### A. Osteochondritis dissecans or osteochondrosis of the radial head

#### B. Physeal injuries with neck angulation

# ***Head-Displaced Fractures (Group I)***



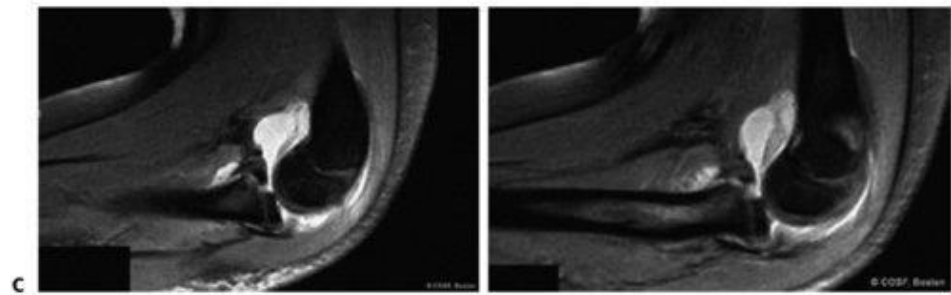
**A**



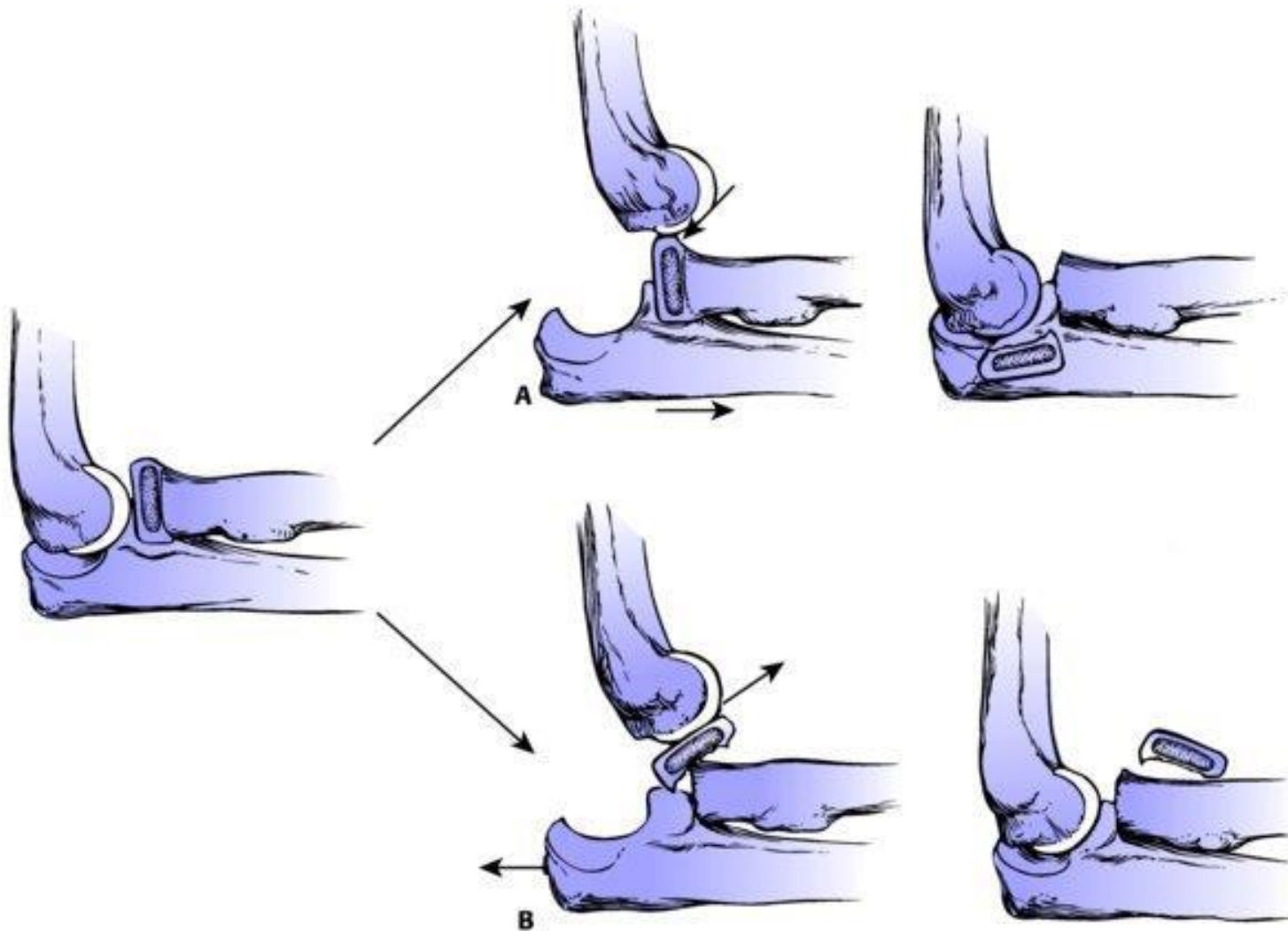
**B**



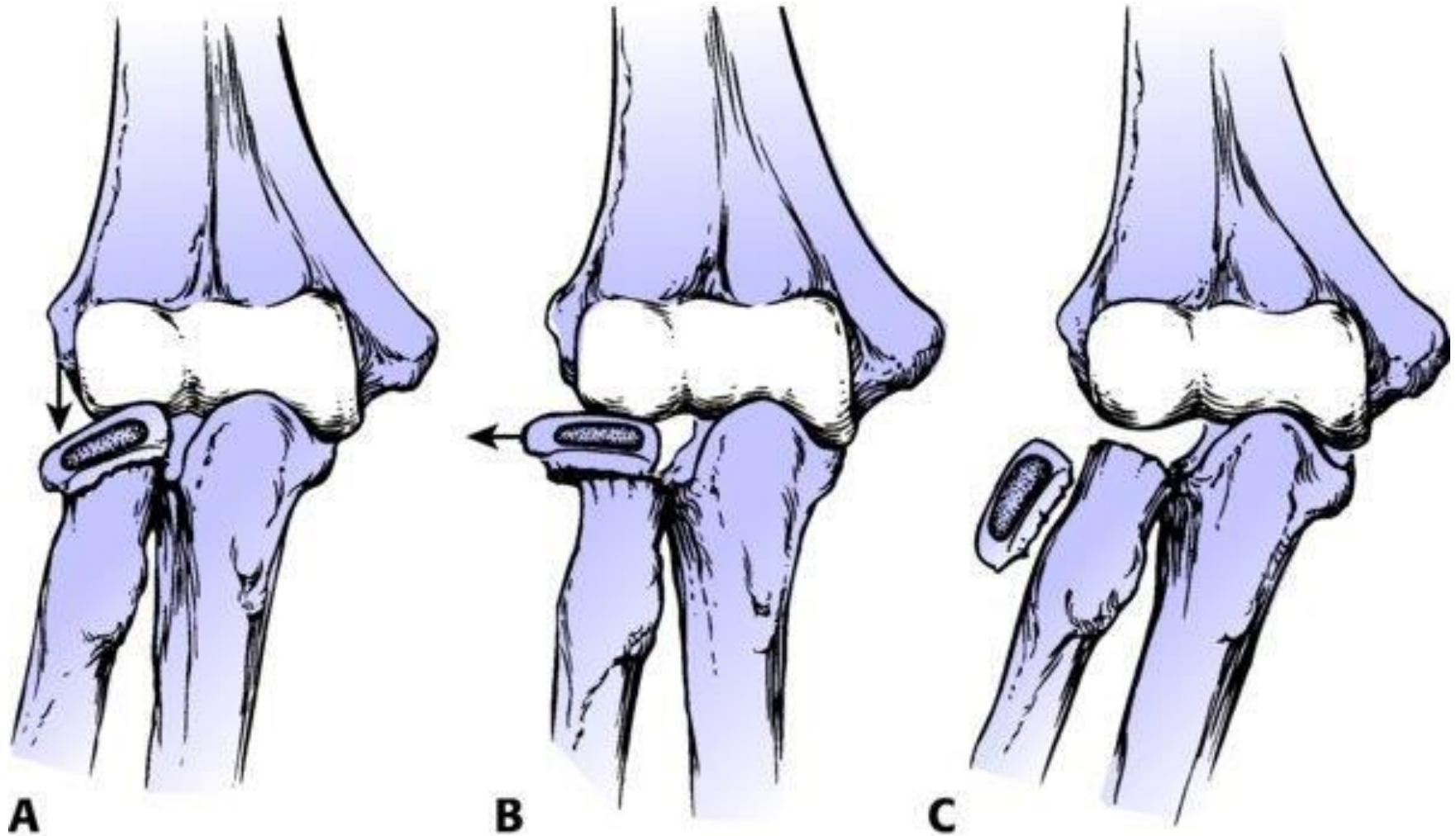
# *Head-Displaced Fractures (Group I)*



# ***(Group I) ... D E***



# ***head-Displaced Fractures (Group I)***





# Neck displaced GROUP II



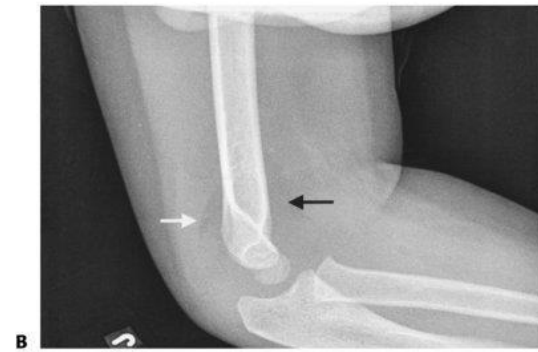
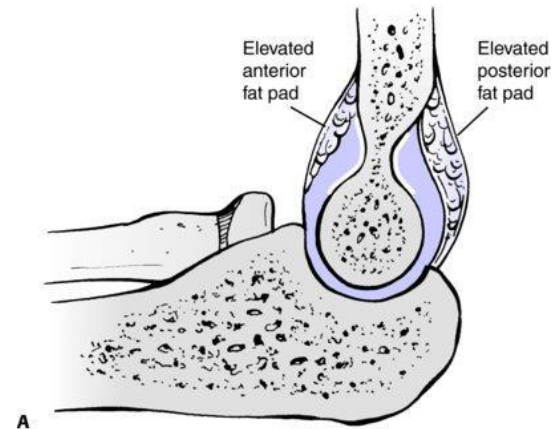
(b)



# Chronic T S .Group III



Unique in children  
Throwing sports  
Baseball  
Little league  
Medial epicondylitis  
Upper ext WB Gym... WREST...

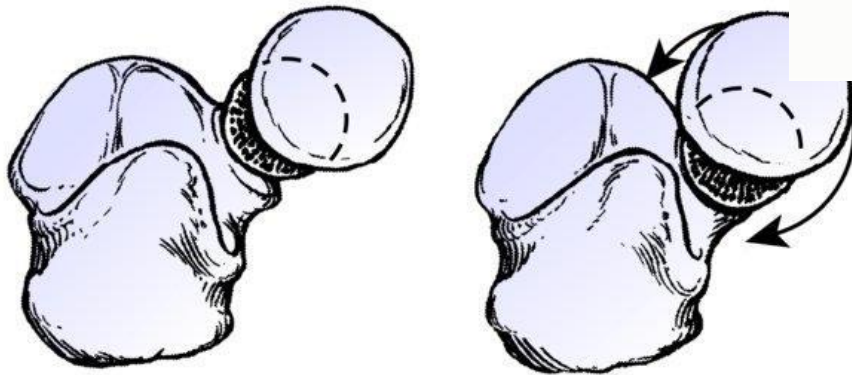
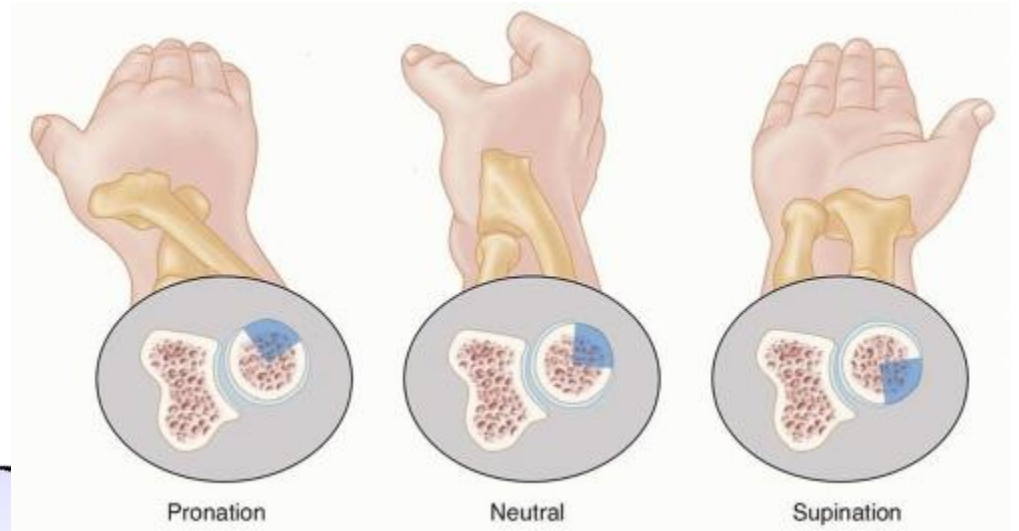
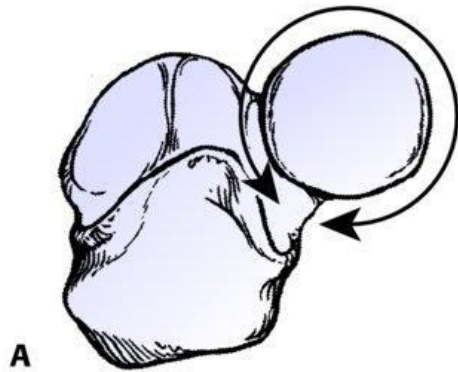




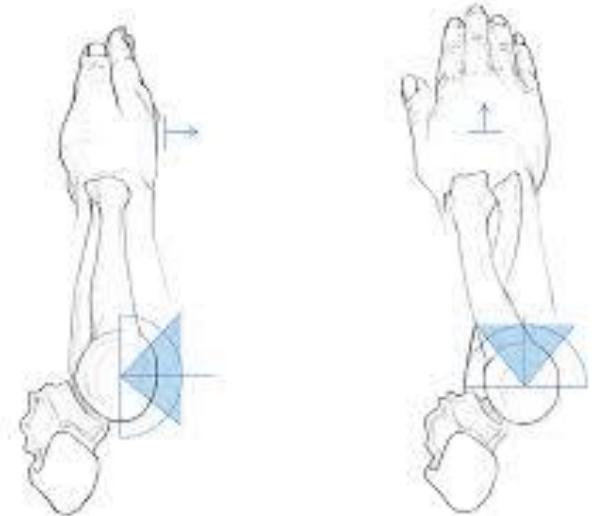
# ***Radial Neck Fractures***

- Most common type of proximal radius fracture (Groups IA and IC)
- Type A—Salter–Harris type I and II injuries
- Type B—Salter–Harris type IV injuries
- Type C—Fractures involving only the proximal radial metaphysis
- ***Judet Classification***
  - Type I: Nondisplaced
  - Type II: <30 degrees of angulation
  - Type III: 30 to 60 degrees of angulation
  - Type IVa: 60 to 80 degrees of angulation
  - Type IVb: >80 degrees of angulation

Normal rotation of the forearm causes the radial head to circumscribe an exact circle within the proximal radioulnar joint. B: Any translocation of the radial head limits rotation because of the “cam” effect described by Wedge and Robertson



- "safe zone" plating 90 deg arc directly lateral with the forearm in neutral rotation



# ***Treatment Options For Fractures of the Proximal Radius***

**TABLE 13-5**

## **Proximal Radius Fractures: Nonoperative Treatment**

### **Indications**

<2 mm displacement of the radial head or neck

<30–45-degree angulation of the radial neck (<30 degrees age greater than 10, <45 degrees age less than 10)

Full forearm pronation and supination

### **Relative Contraindications**

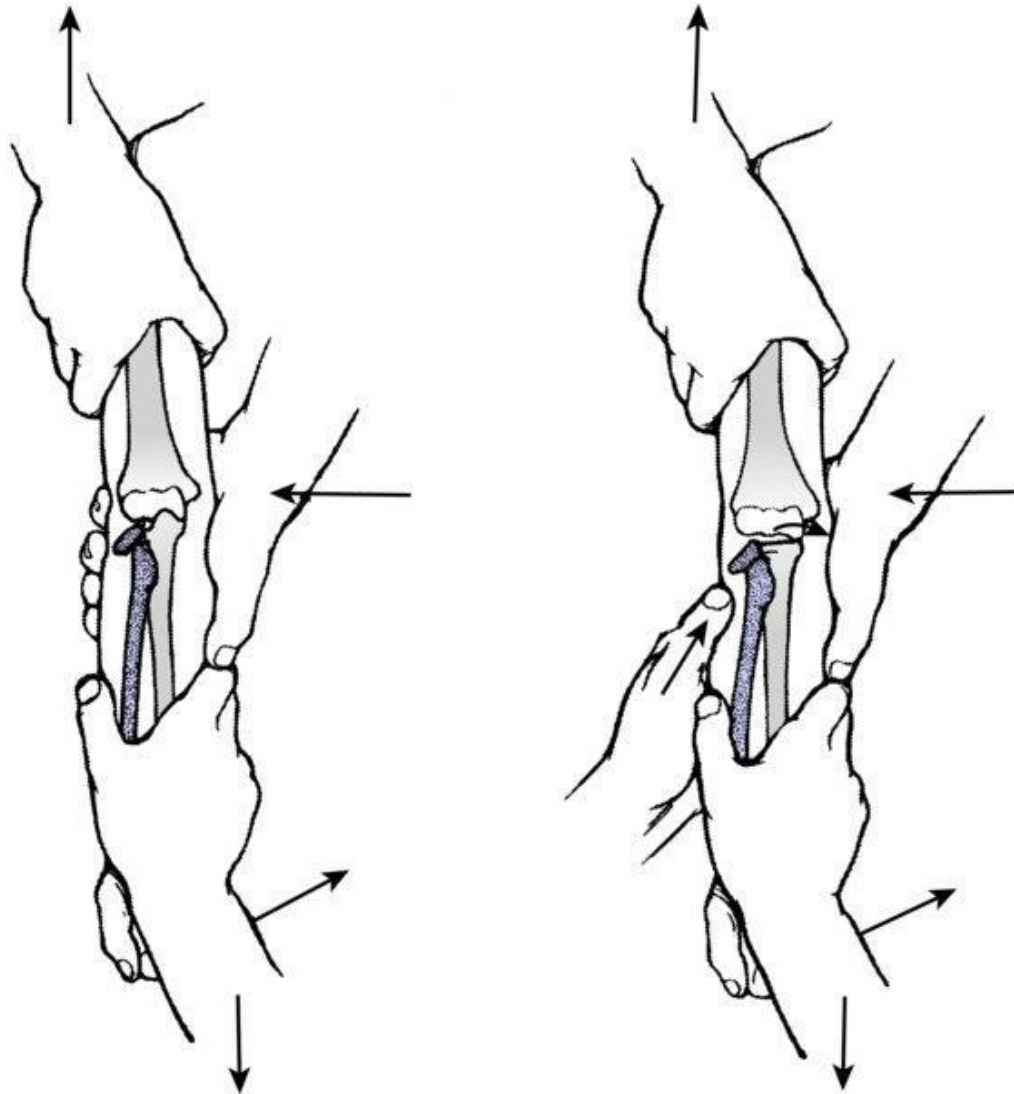
Open fracture

Incongruent elbow joint

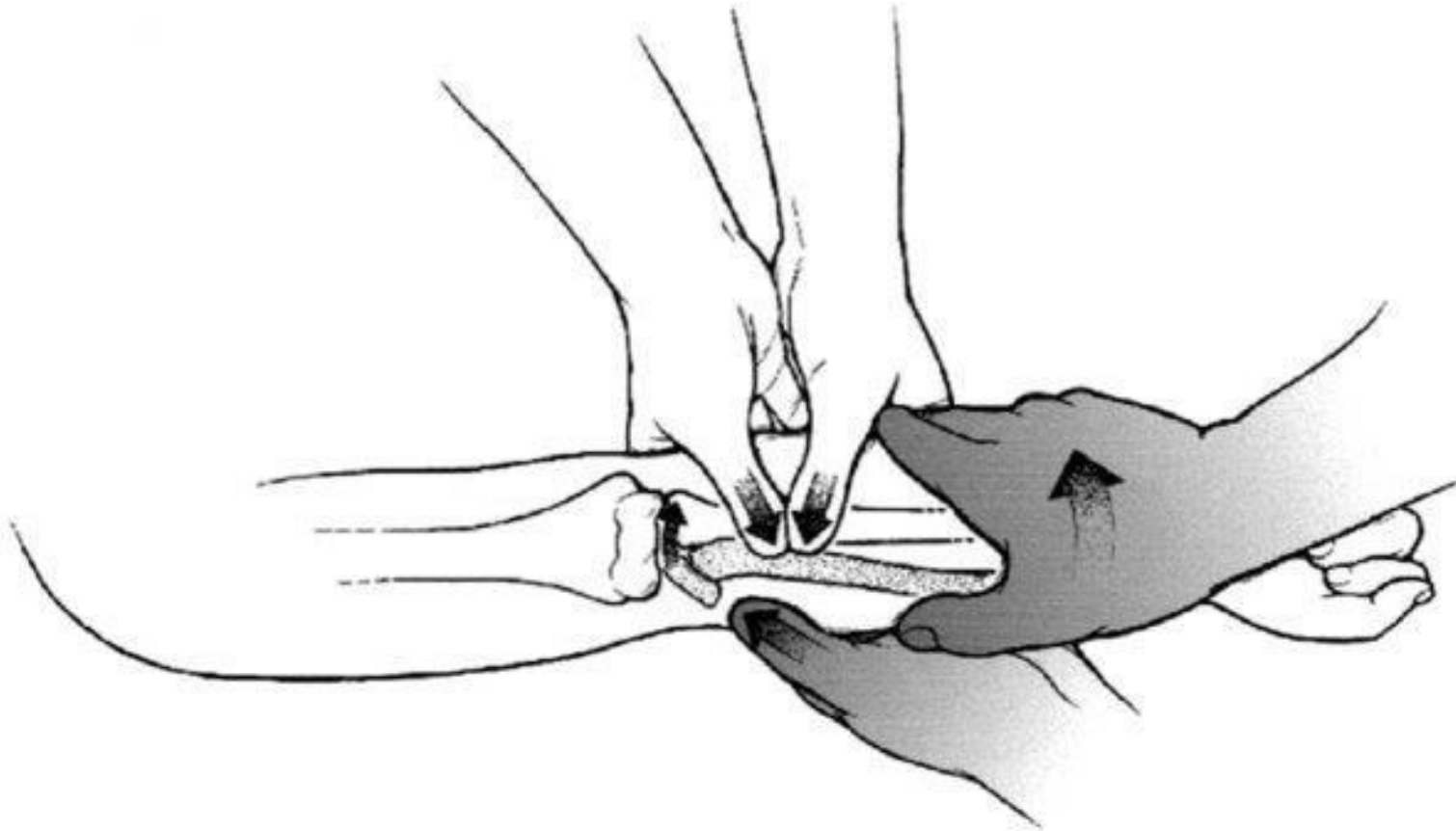
# ***Closed Reduction Techniques***

- Familiarity with multiple techniques
- No technique has yet been demonstrated to have superiority over another
- manipulating the proximal fragment
- manipulating the radial shaft
- Both fragment manipulation

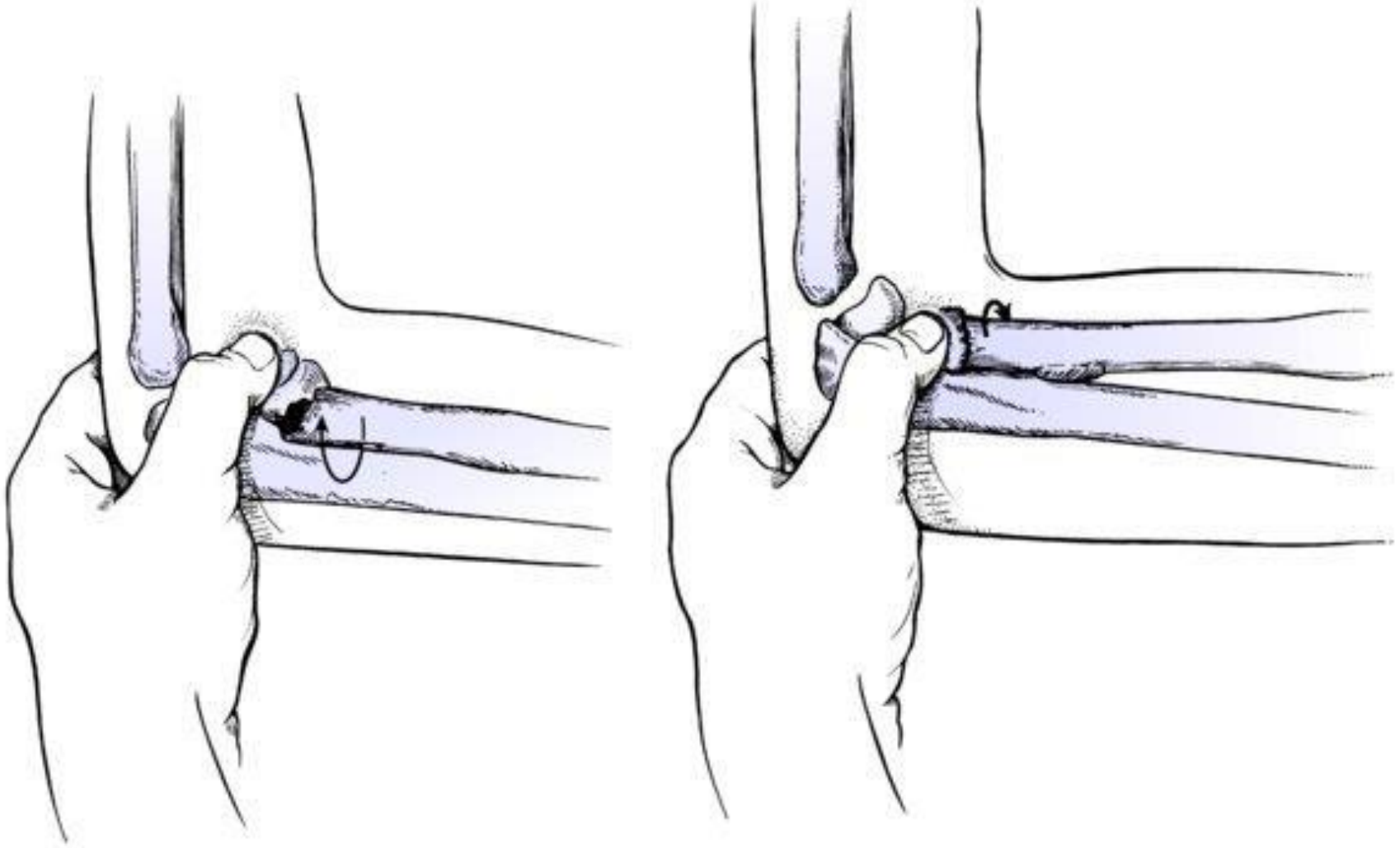
# Patterson 1934



# Neher CG, Torch MA. New reduction technique 2003



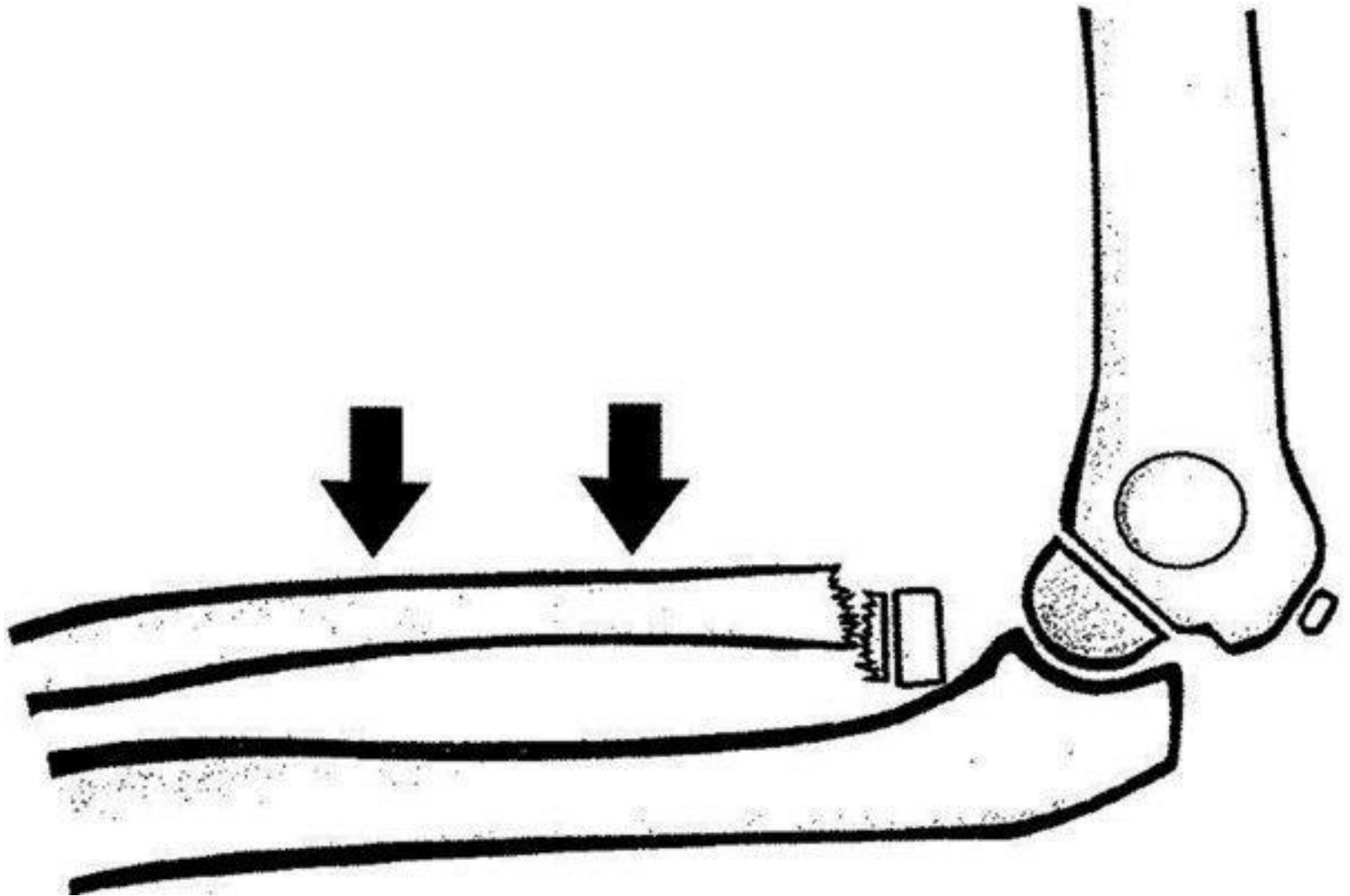
# Flexion-pronation (Israeli) reduction technique



A

B

# Monson 2009





# Operative treatment

**TABLE 13-5**

## **Proximal Radius Fractures: Nonoperative Treatment**

### **Indications**

<2 mm displacement of the radial head or neck

<30–45-degree angulation of the radial neck (<30 degrees age greater than 10, <45 degrees age less than 10)

Full forearm pronation and supination

### **Relative Contraindications**

Open fracture

Incongruent elbow joint

# Operative treatment

- ***Indications***

- •

- Displacement remains over 2 mm following closed alignment

- Angulation is greater than 45 degrees (age <10)

- Angulation is greater than 30 degrees (age >10)

- ***Contraindications***

- •

- Acceptable alignment can be achieved with closed means

- No persistent elbow instability

- Unrestricted range of motion after closed treatment



# ***Instrument-Assisted Closed Reduction of Proximal Radius Fractures: Key Surgical Steps***

- Attempt closed reduction
- Percutaneous insertion of blunt end K-wire lateral forearm
- Reduce fracture by pushing on proximal fragment
- • Assess stability and range of motion
- If stable: Immobilize in long-arm cast
- If unstable: Antegrade K-wire fixation
- Alternatively—use leverage technique





A



A



B



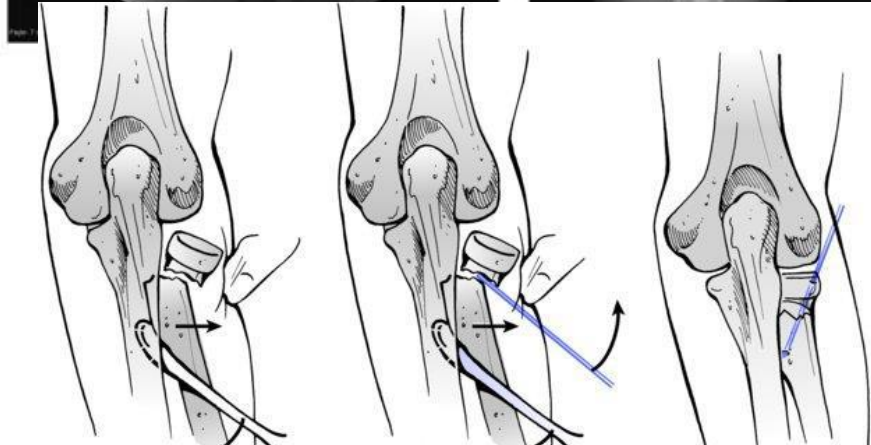
B



C



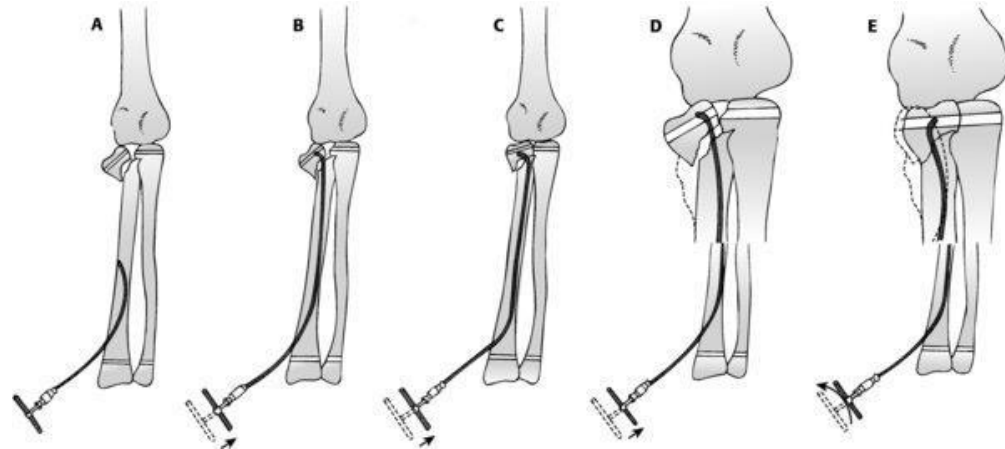
D



# ***Intramedullary Nail***

## ***Reduction/Fixation of Proximal Radius Fractures: Key Surgical Steps***

- Pre-bend implant at distal end
- ▪ Open distal radial cortex via radial or dorsal approach
- ▪ Advance implant to the fracture site
- ▪ Closed manipulation of fracture to allow implant to enter distal fragment
- ▪ Advance implant into distal fragment
- ▪ Rotate implant as needed to reduce fracture
- ▪ Assess stability and range of motion
- ▪ Cut implant distally under the skin
- ▪ Close surgical wound
- ▪ Immobilize to allow for soft tissue healing





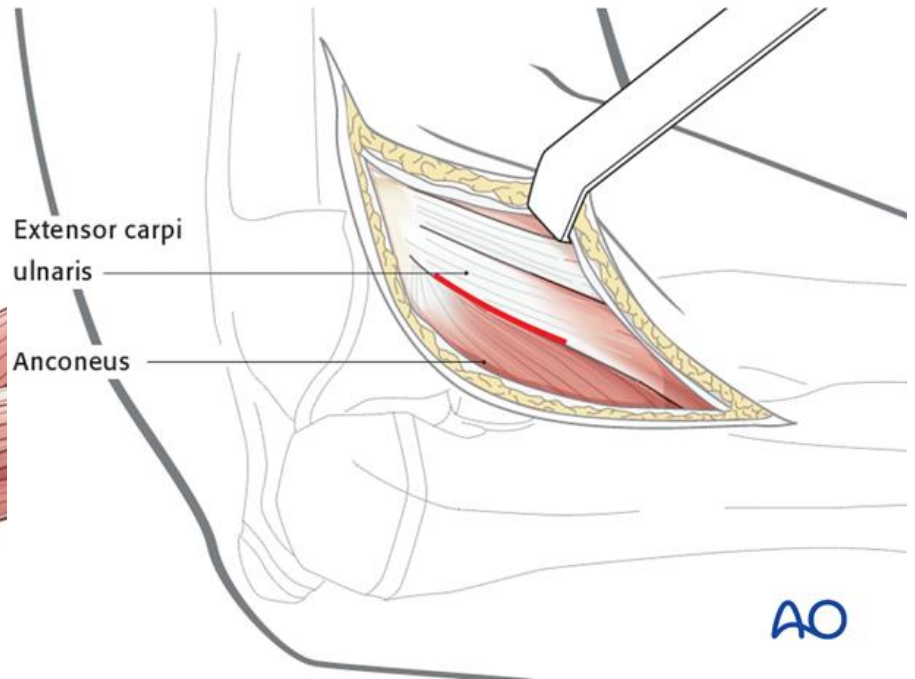
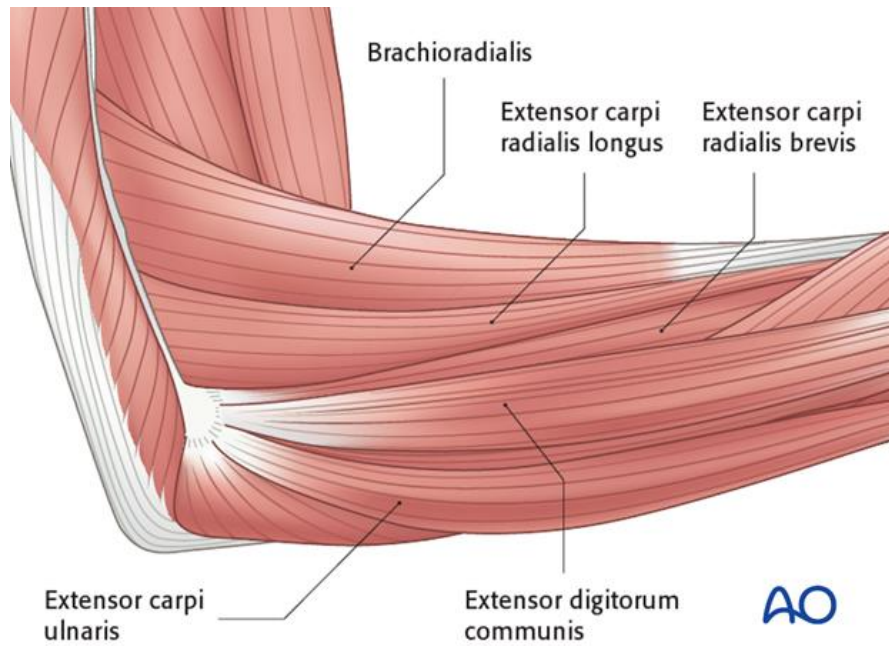
# ***ORIF of Proximal Radius Fractures: Preoperative Planning Checklist***

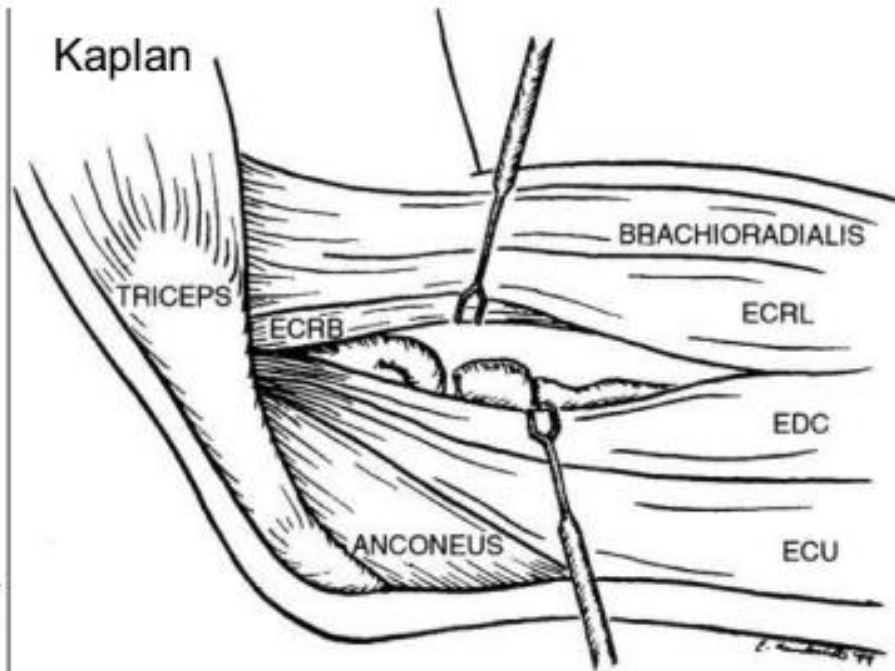
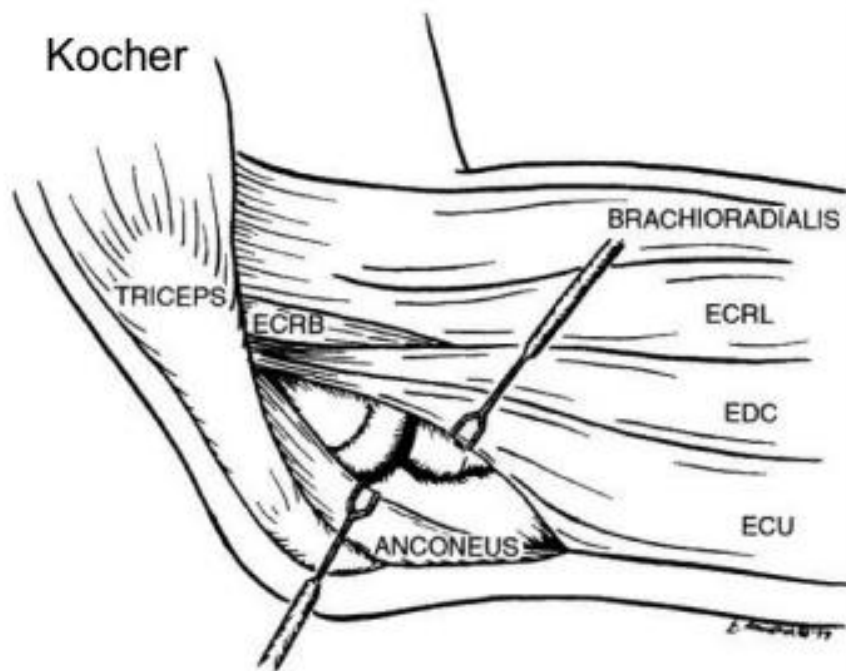
- ☐ Standard with radiolucent hand table
- ☐ Turn table 90 degrees, bring patient to  
In line with affected extremity,
- ☐ 2- to 2.7-mm screws; mini-fragment plates  
versus fracture-specific plates (radial neck, radial  
head)
- ☐ Esmarch bandage

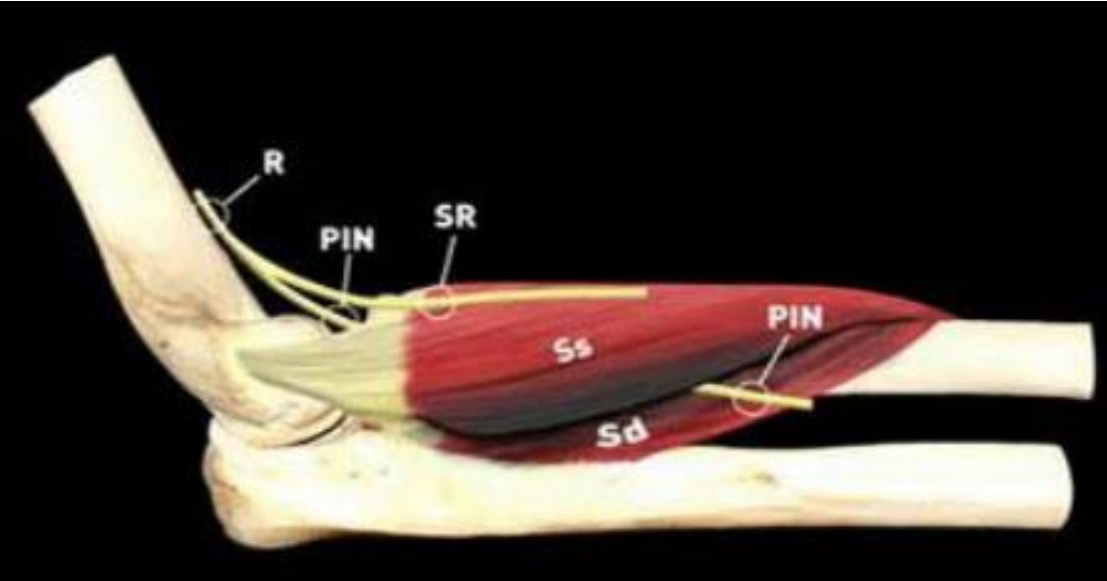
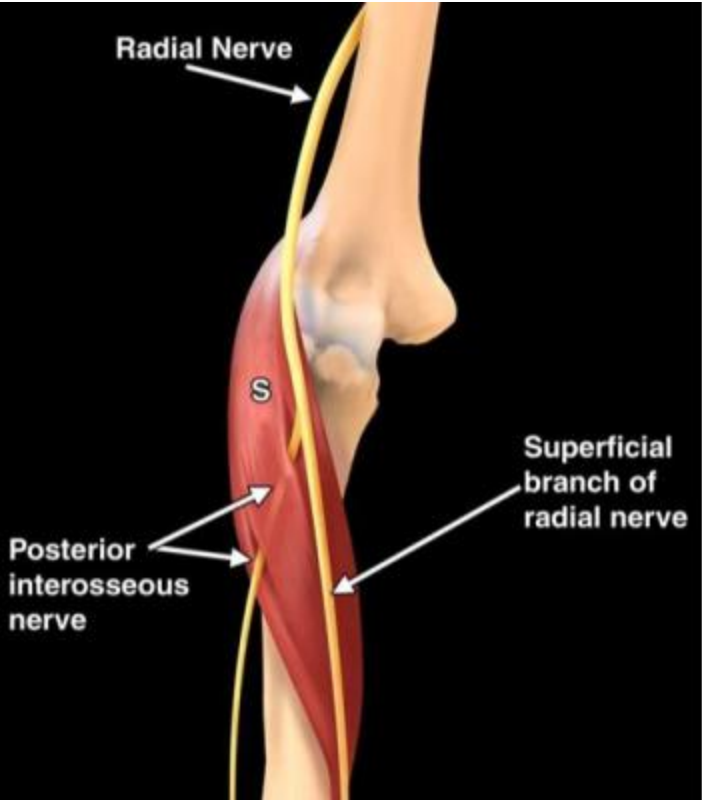
# ***Surgical Approach(es)*** Kocher or Kaplan lat approach

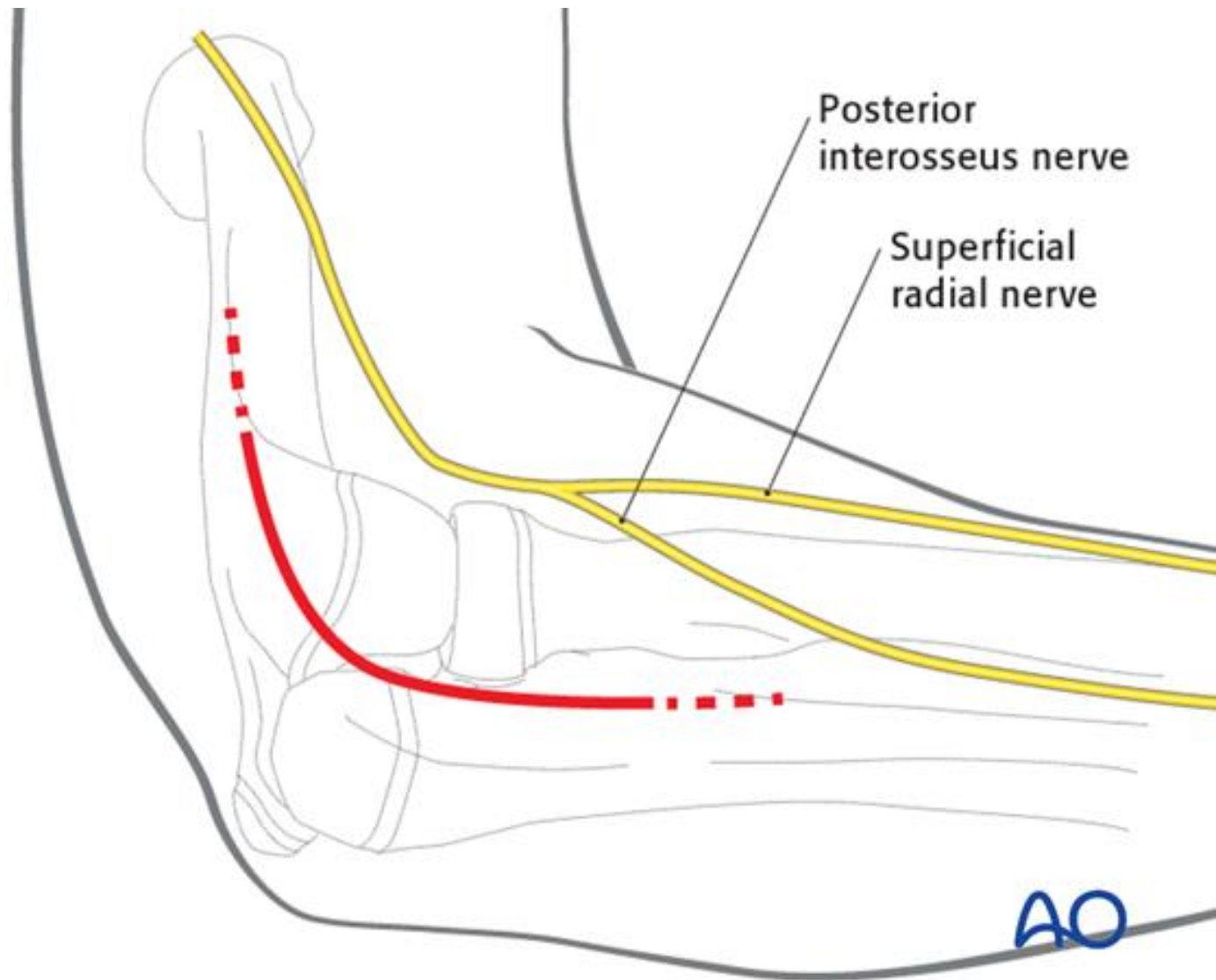
- Keep forearm pronated during exposure
- Protect lateral collateral ligament
- • Provisional reduction of proximal radius fracture
- Stabilize with small K-wires or clamps
- ▪ Internal fixation with mini- or modular-fragment screws (bioabsorbable pins can be considered)
- ▪ If plate fixation is utilized, identify “safe zone” and apply plate
- ▪ Wound closure—repair annular ligament
- ▪ Posterior arm splint

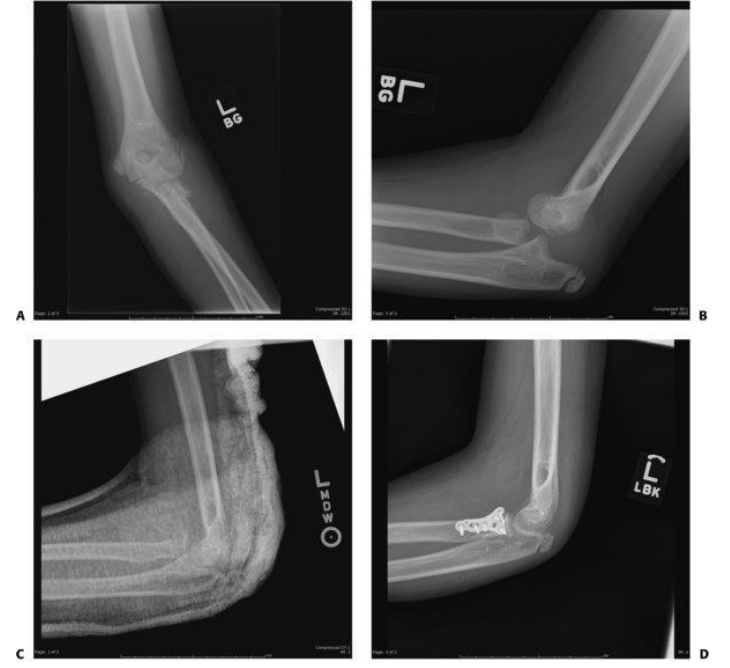


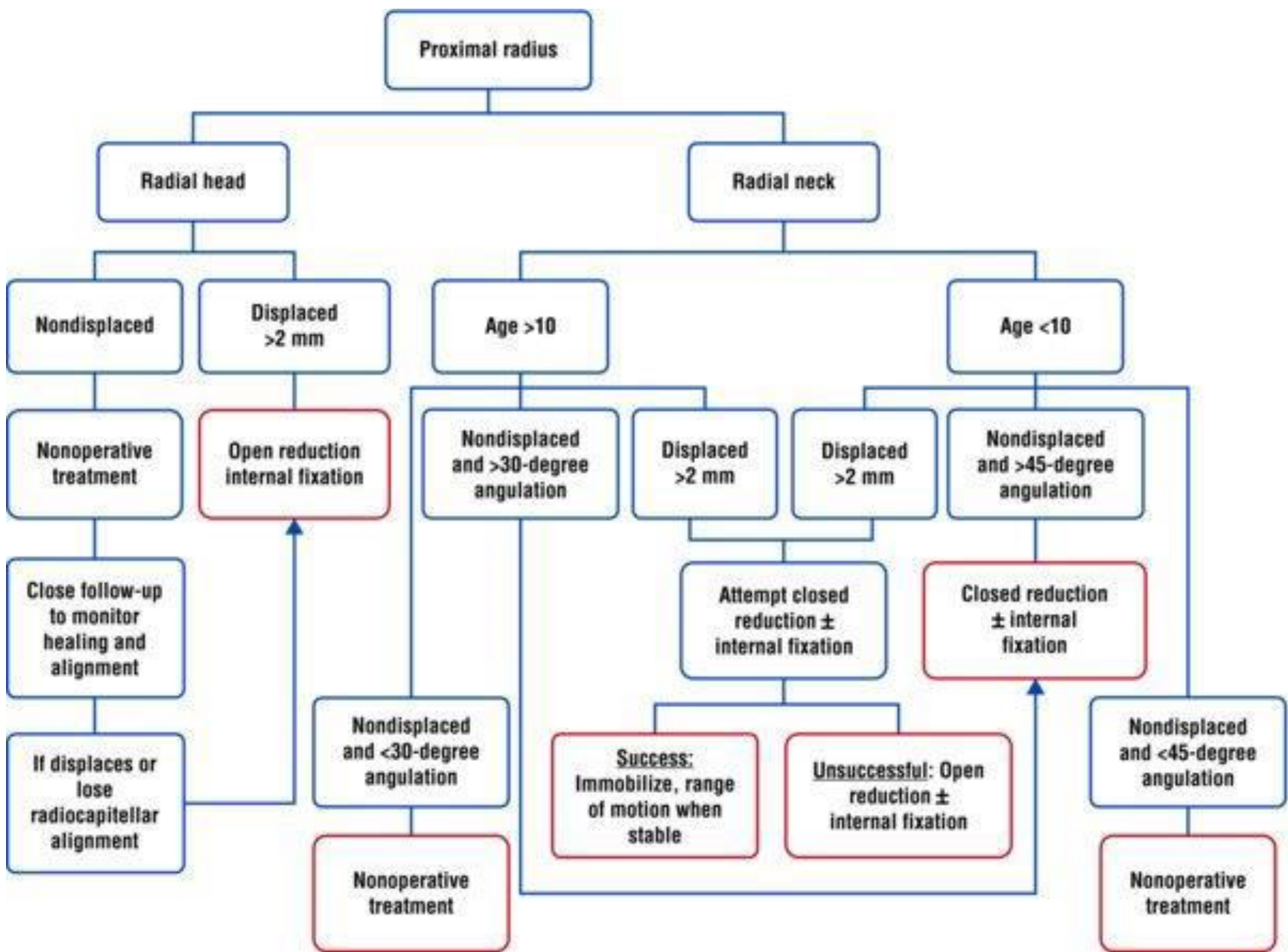
















ISNA

PHOTO: RECEIVED