

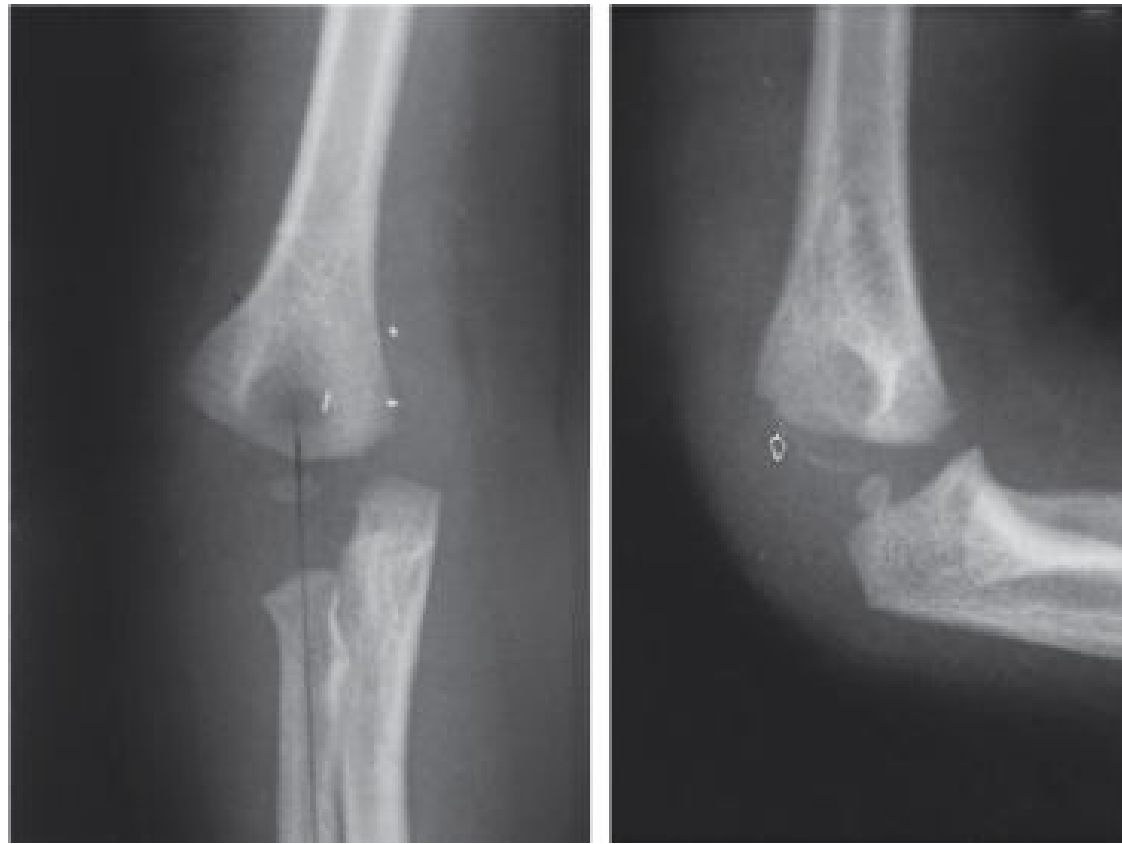
Elbow Injuries

Objectives

- Understand the spectrum of Disease
- Common Paediatric fractures
- Common Adult Injuries
- Develop evaluation of elbow injuries
- Diagnose and choose treatment

Introduction

“Pity the young surgeon whose first case is a fracture around the elbow”



Question 1- Identify this injury in a 3 years old boy



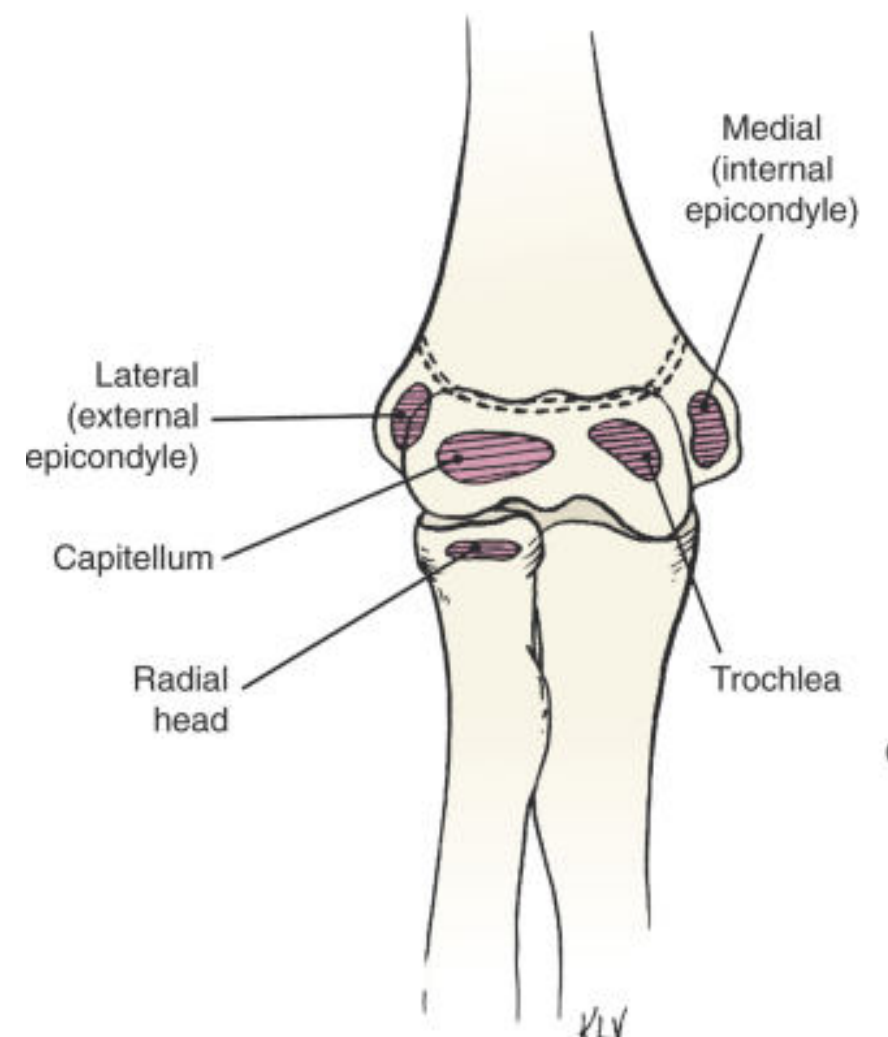
- a) Dislocation elbow
- b) Supracondylar fracture Humerus
- c) Separation distal humeral physis
- d) Lateral condyle Humerus fracture

Introduction- Elbow fractures

- 5% to 10% of all fractures in children are fractures of the elbow.
- High potential for complications-difficult to manage.
- Supracondylar fractures- 50% to 70% of all elbow fractures
- Frequently in children between the ages of 3- 10 years.

CRITOE

- **C**apitellum (2years)
- **R**adius(4years)
- **I**nternal (or medial) epicondyle(6years)
- **T**rochlea(8 years)
- **O**lecranon(10 years)
- **E**xternal (or lateral) epicondyle(12 years)



Common Fractures

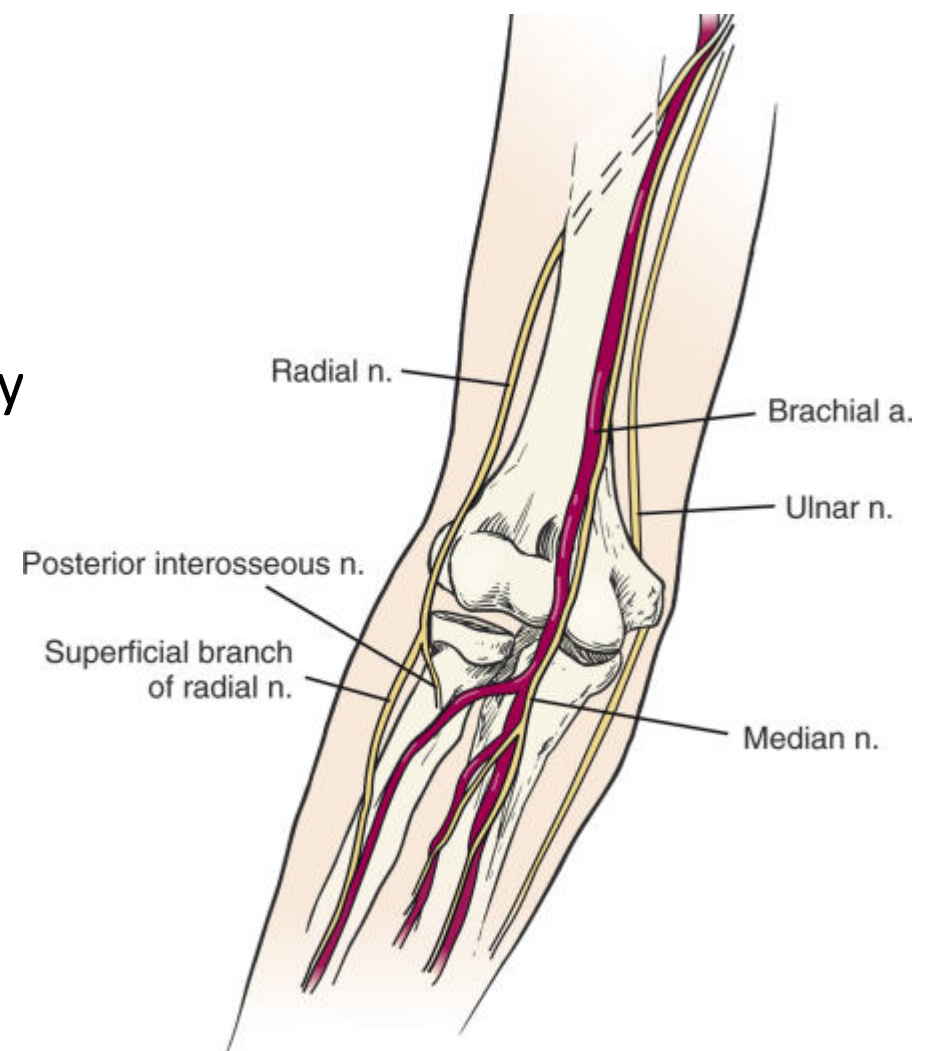
- The supracondylar Humerus
- The transphyseal distal Humerus
- The lateral humeral condyle
- The medial humeral epicondyle (often associated with elbow dislocation)

Uncommon FRACTURES

- The capitellum
- Coronoid
- Medial condyle
- Lateral epicondyle
- Intracondylar or T-condylar fractures

Supracondylar Fractures of the Humerus

- Devastating long-term complications.
- Anteriorly- the brachial artery and median nerve
- Laterally, the radial nerve crosses
- The ulnar nerve passes behind the medial epicondyle



ANATOMY

Coronoid Fossa



Olecranon Fossa

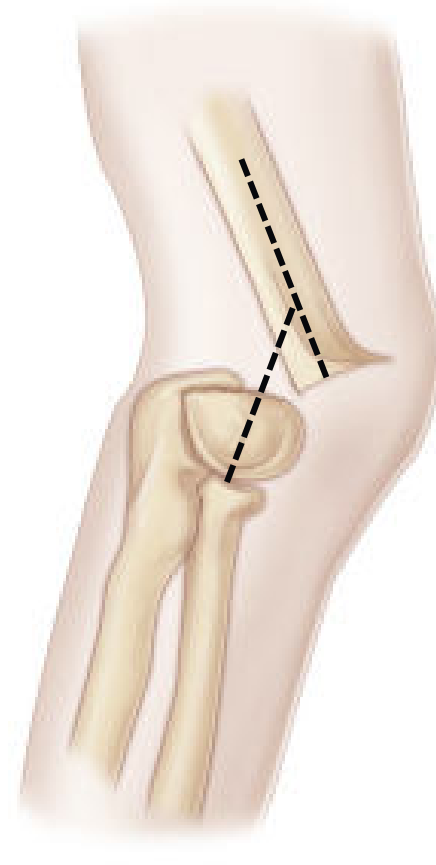
Classification -Supracondylar fracture

- Extension type 97.7%
- Flexion type 2.3%

In extension type fracture line runs upwards and backwards

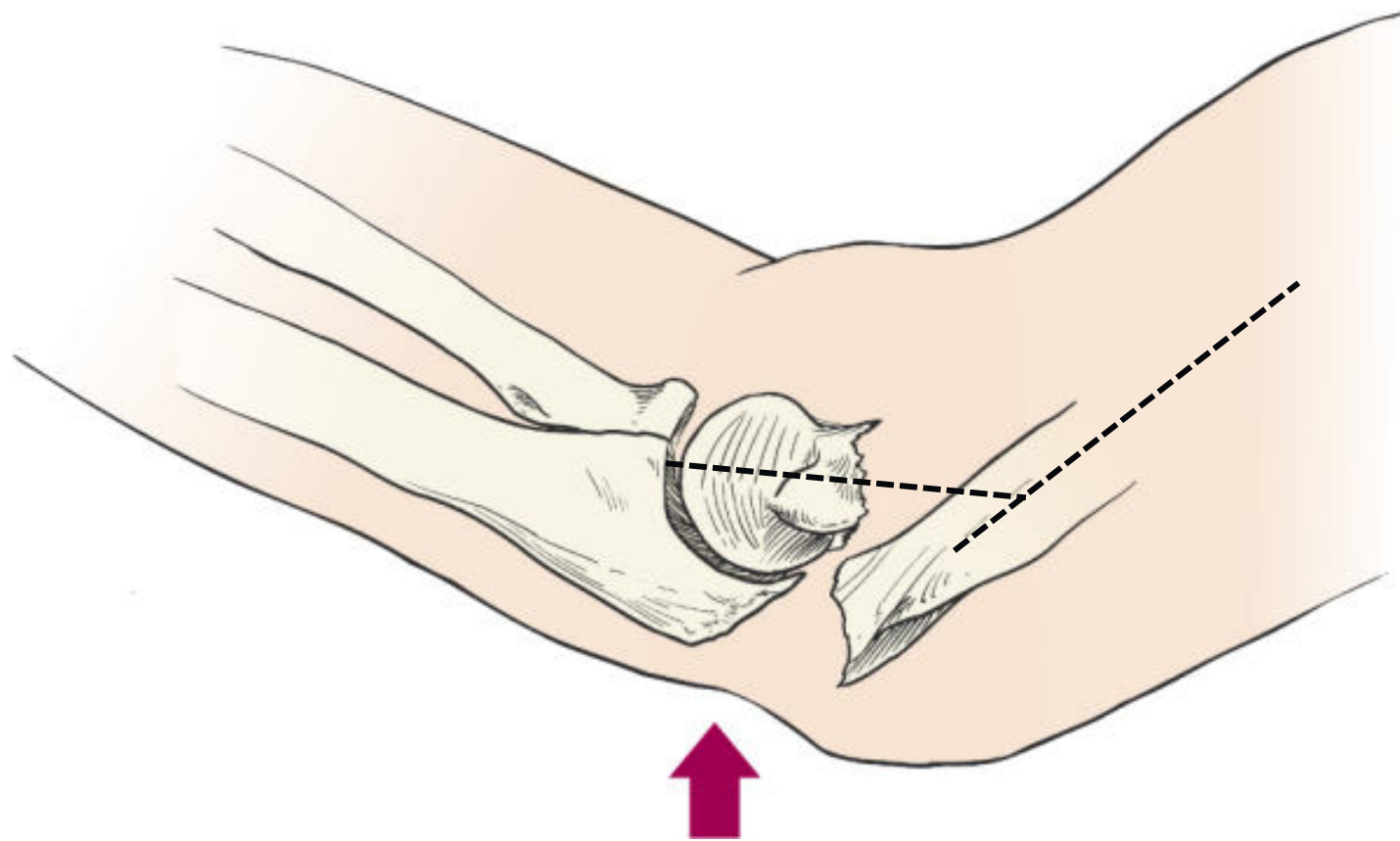
And in flexion type it runs downwards and backwards

Extension Type Fr



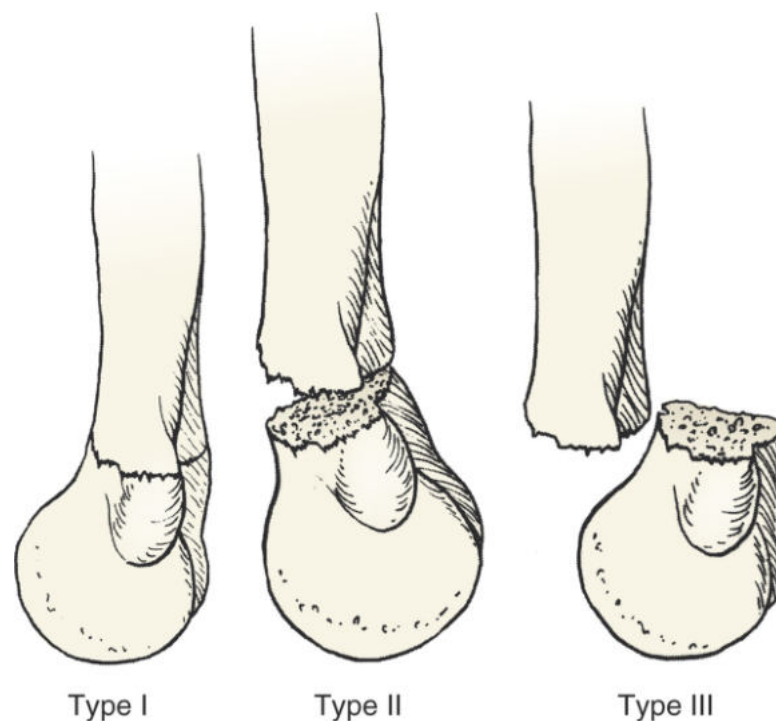
When forced into hyperextension, the olecranon can act as a fulcrum through which an extension force can propagate a fracture across the medial and lateral columns

Flexion Supracondylar Fr



A posteriorly applied force with the elbow in flexion creates a flexion-type supracondylar humeral fracture (*arrow*).

CLASSIFICATION-Gartland Classification

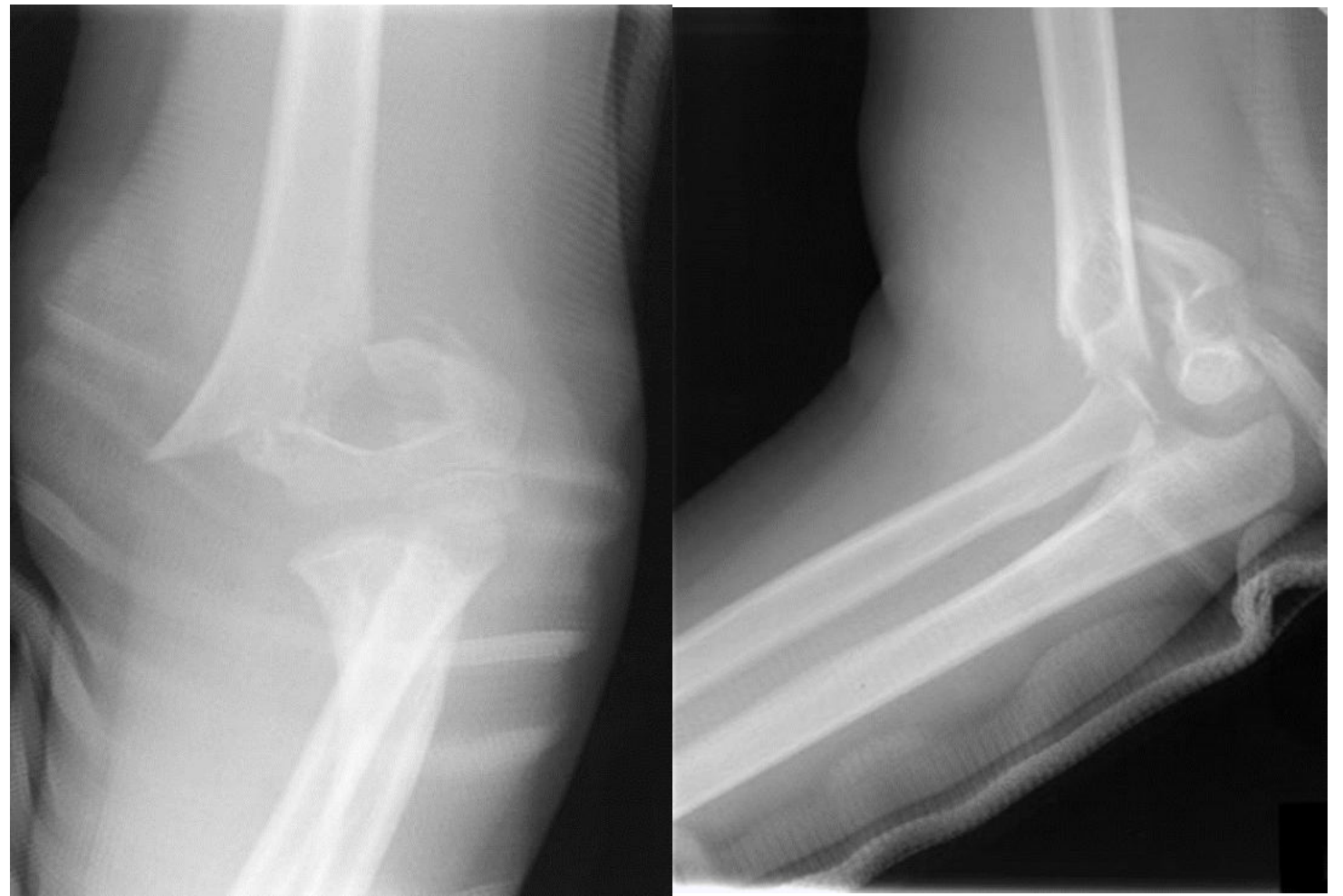


- After initial classification as either extension or flexion injuries.
- Classified according to the amount of radiographic displacement.

Q 2- How Do You Classify?

Flexion/Extension?

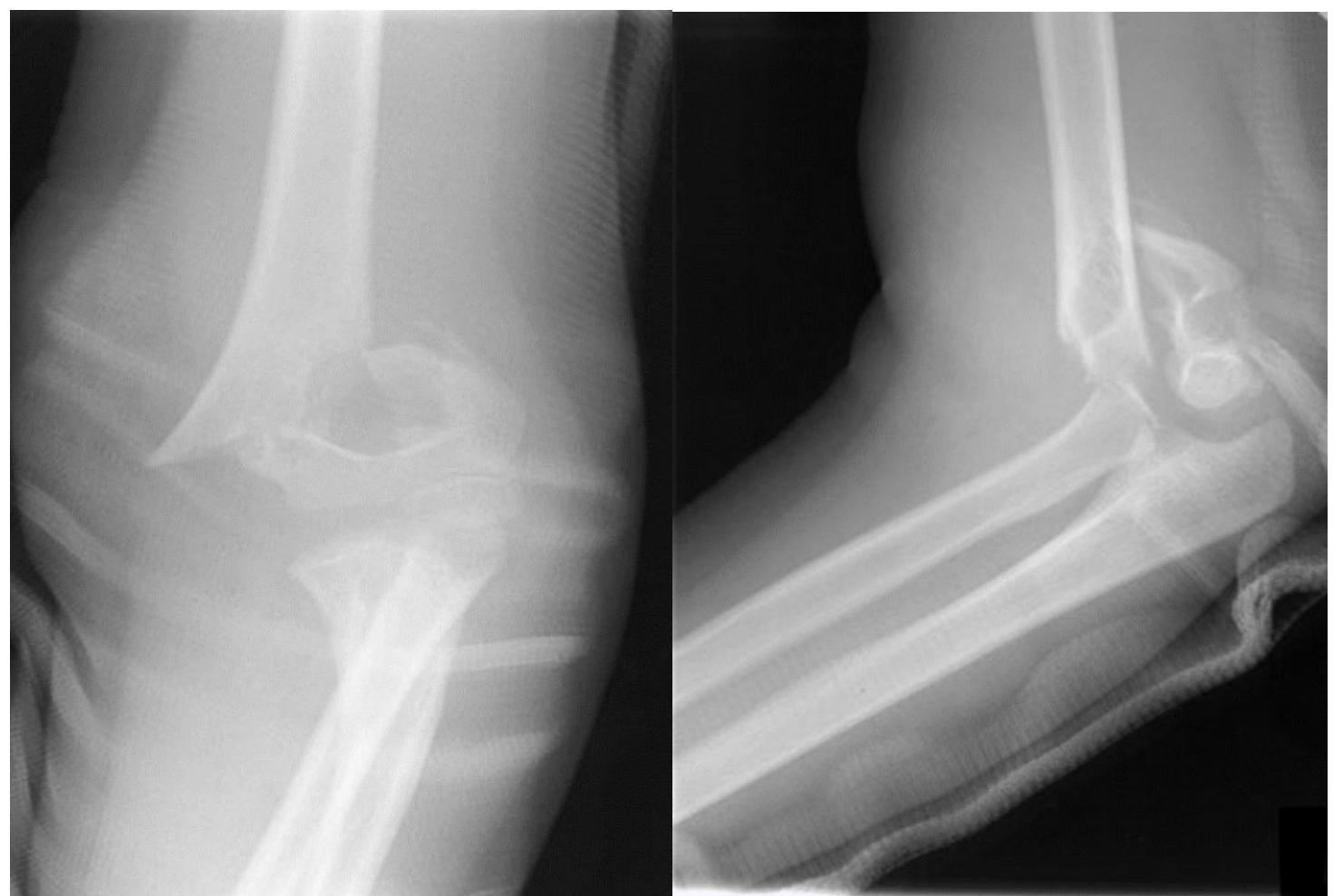
Gartland I,II,III?



How Do You Classify?

Flexion/**Extension**?

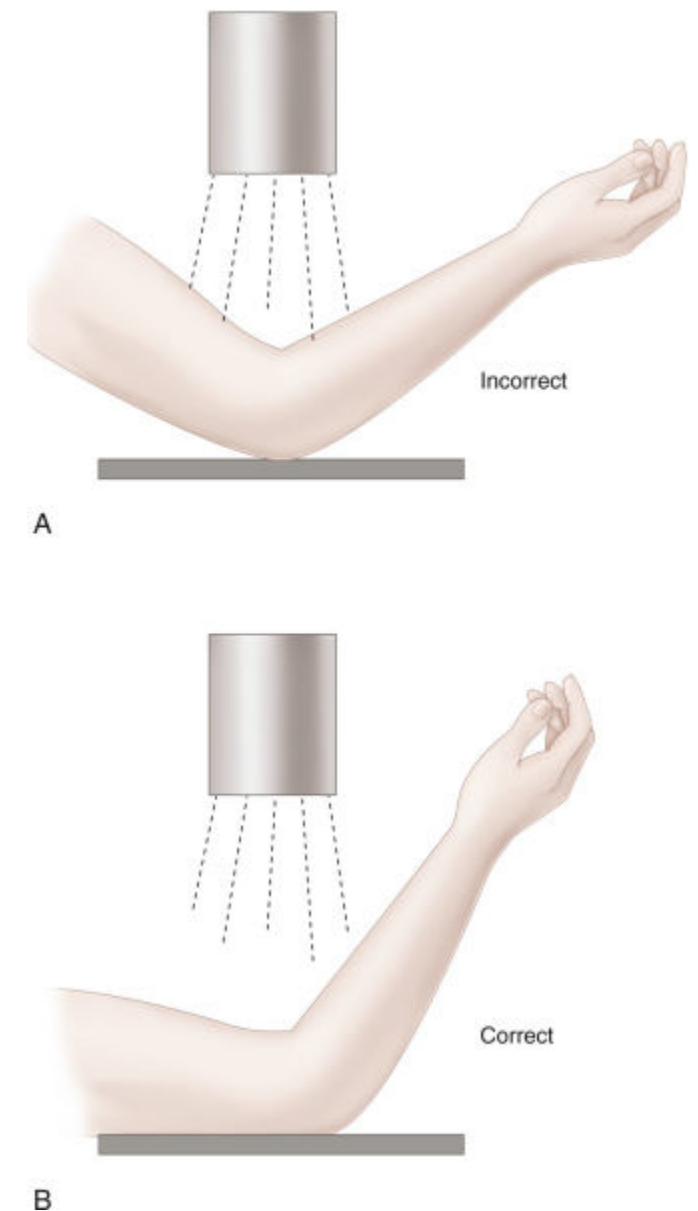
Gartland I,II,**III**?



RADIOGRAPHIC FINDINGS

- The elbow is painful and difficult to move
- True AP and lateral radiographs of fractures are required

“Bad x-rays lead to bad decisions.”



TREATMENT - Goal

- “Avoid catastrophes”
 - Vascular compromise
 - Compartment syndrome
- “minimize embarrassments”
 - cubitus varus,
 - iatrogenic nerve palsies

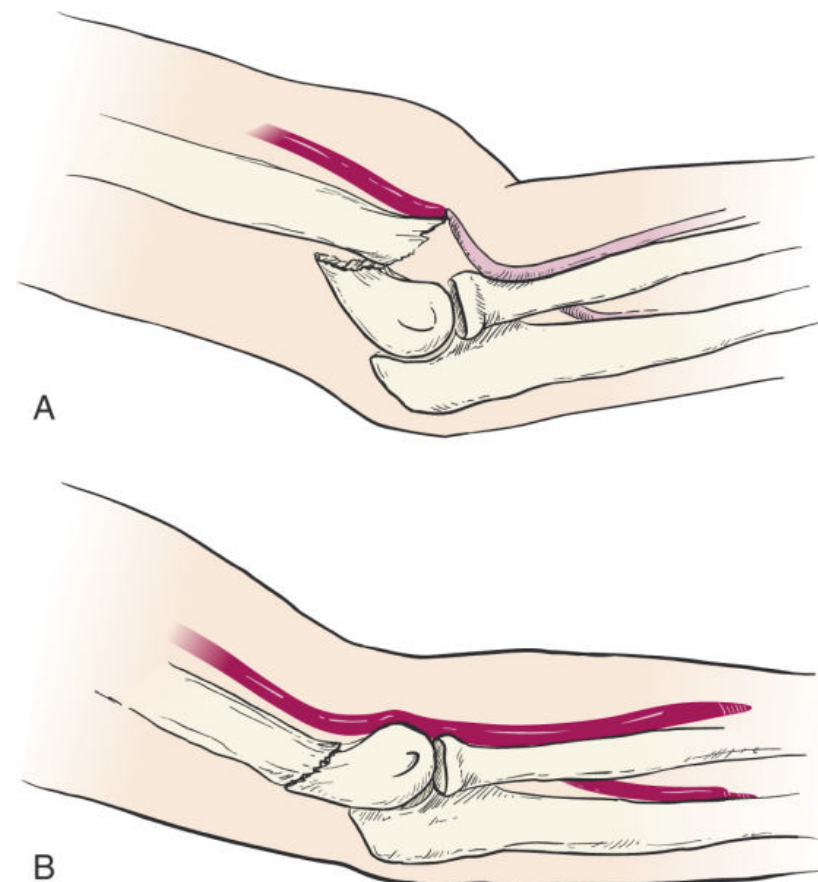
Emergency Treatment

- Immobilized - simple splint (radiolucent splint).
- Contraindication- Ischemic hand or tented skin,
- Radiographs should be obtained before splinting, or should be used.



If distal extremity is initially ischemic?

- Align the fracture fragments
- Re evaluate vascularity
- Avoid Flexion >90 degrees



Treatment of Nondisplaced Fractures ?

- Long-arm cast immobilization for 3 weeks .
- Radiographs are repeated at one week –Check

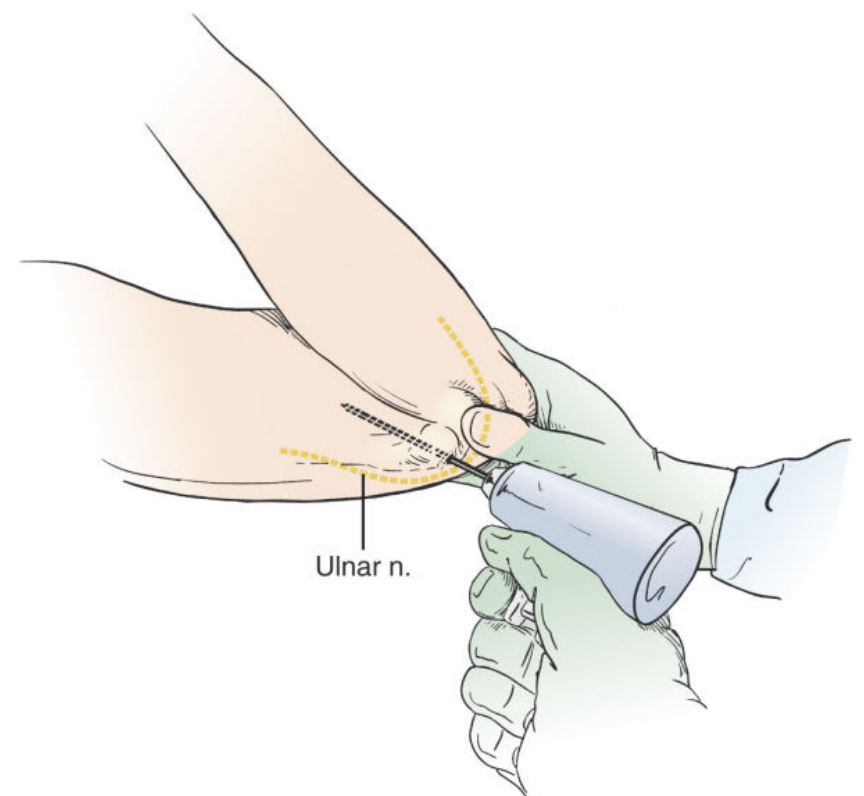
Extension Gartland III- Treatment?



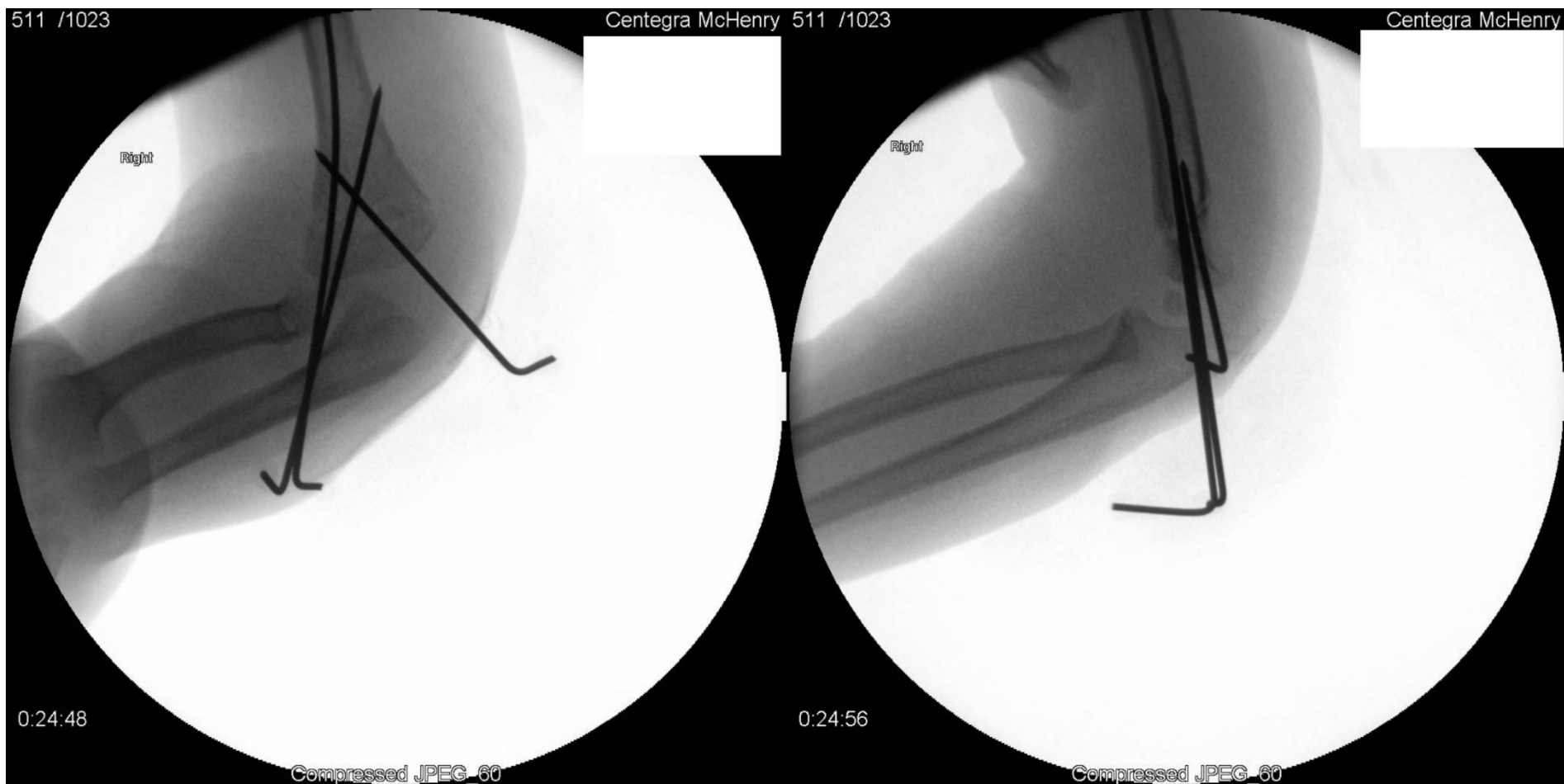
Treatment of Displaced Fractures (types II and III).

- Require reduction.
- Reduction can be accomplished in closed fashion.
- Maintaining the reduction?
 - Cast immobilization, traction, and percutaneous pin fixation.
- Adequate closed reduction cannot be achieved- open reduction pinning

CR and K-wire fixation



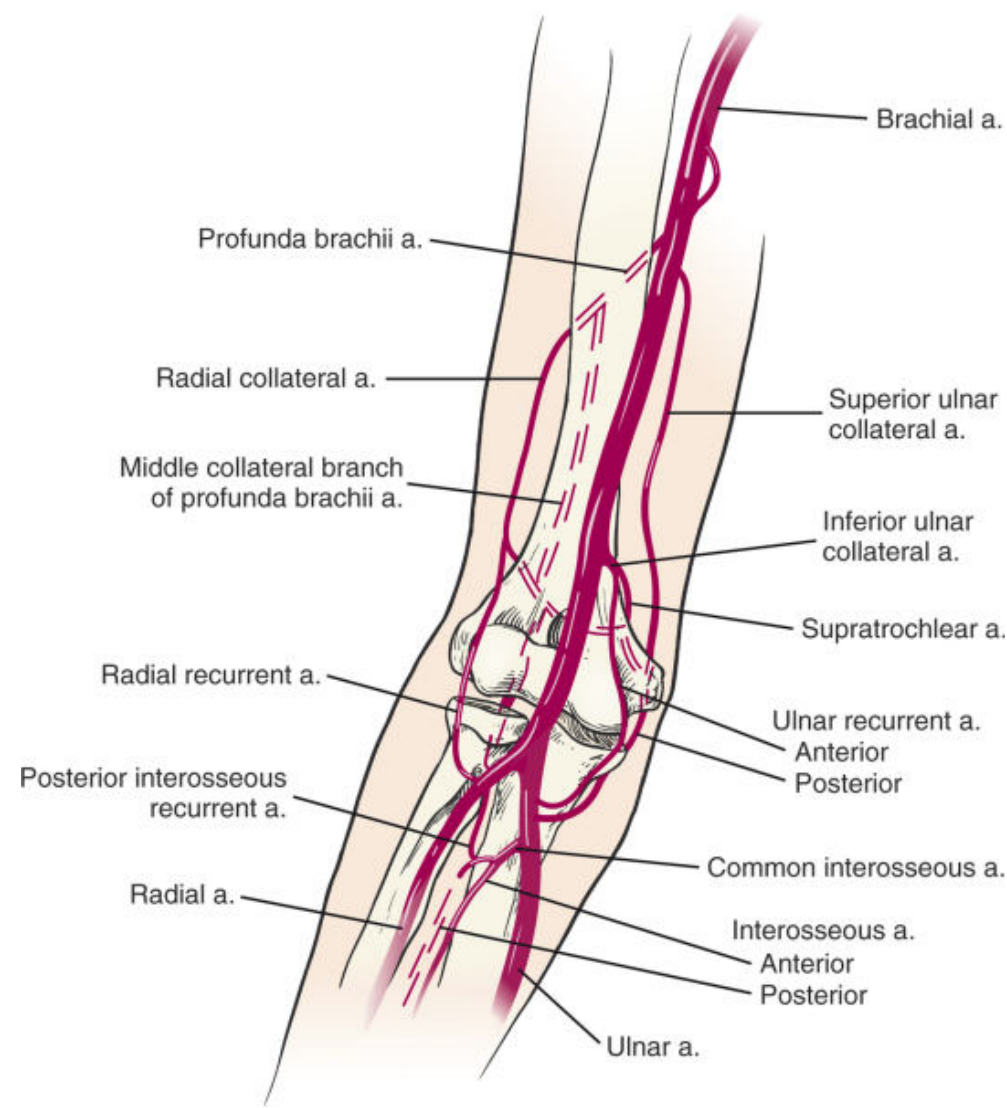
Per op Images



Healed fracture at 4 weeks



Collateral circulation



Viable hand with abnormal pulses ?

- Close observation.
- Unidentified vascular pathology-thrombus formation- **an ischemic limb.**
- Pulse oximetry- valuable tool after closed reduction and pinning.
- Pulseless, viable limb-ischemic- **arteriography and thrombolytic therapy**

COMPLICATIONS

Early complications

- Vascular injury
- Peripheral nerve palsies
- Volkmann's ischemia (compartment syndrome).

Late complications

- Malunion
- Stiffness
- Myositis ossificans.

Vascular Injury-Spectrum?

- A diminished pulse/Without a pulse/With an ischemic limb.
- Complete transection of the brachial artery
- An intimal tear
- Compression either between the fracture fragments or over the anteriorly displaced fragment.
- Indirect injury is usually the result of compression due to the swelling.

Management

Thorough assessment of the skin and neurologic status



If ischemic- manipulated into an extended position.



If fails to provide distal circulation



Closed reduction and pinning



Reduction of the fracture frequently restores the circulation

Peripheral Nerve Injury

- 10% to 15% of supracondylar humeral fractures.
- The anterior interosseous nerve is the most commonly injured nerve with extension-type supracondylar fractures
- Usually recover spontaneously
- If within 8 to 12 weeks function is not returning-NCV/EMG nerve has not been transected.
- Transected- reanastomosis with grafting or tendon transfers

Compartment Syndrome?

- Best managed by closed reduction and pinning.
- A fasciotomy is essential to decompress the increased pressure
- Splinting and active and passive range-of-motion exercises -essential to maintain joint mobility until function returns.

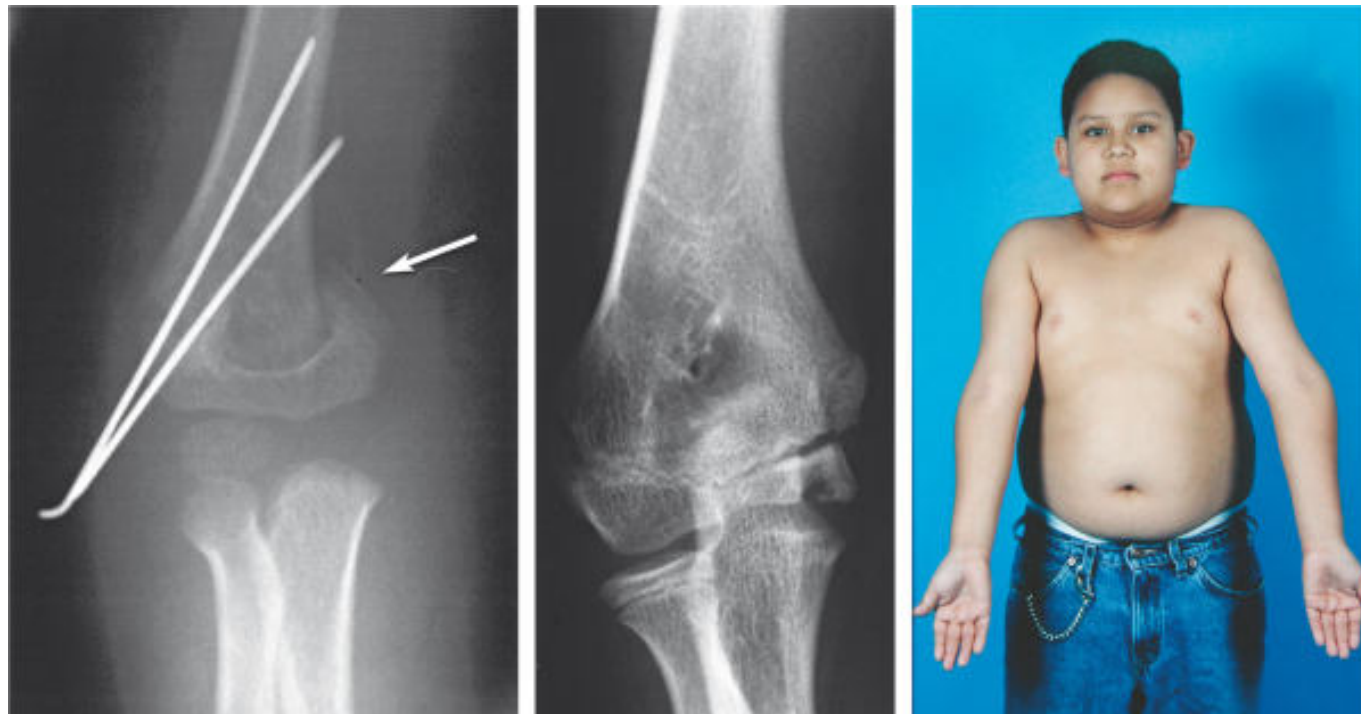


Volkmann's Ischemic Contracture (Chr Compartment Syndrome)

- Ischemic paralysis and contracture of the muscles of the forearm and hand
- Primarily resulted from obstruction of arterial blood flow, resulting in death of the muscles which get replaced by fibrous tissue

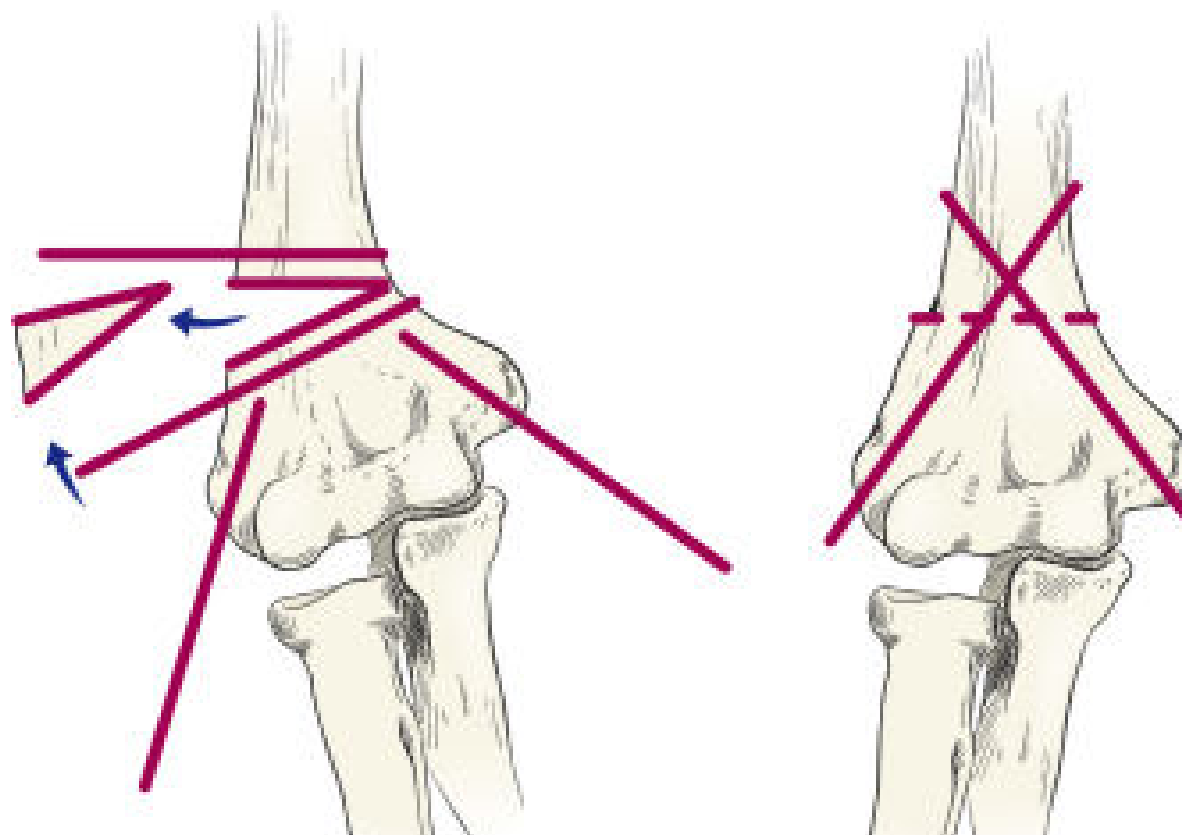


Malunion: Cubitus Varus and Cubitus Valgus



- Posteromedially displaced fractures tend to develop Cubitus varus angulation-more common
- Posterolaterally displaced fractures tend to develop valgus deviation.

T/T -Osteotomy and k-wire fixation



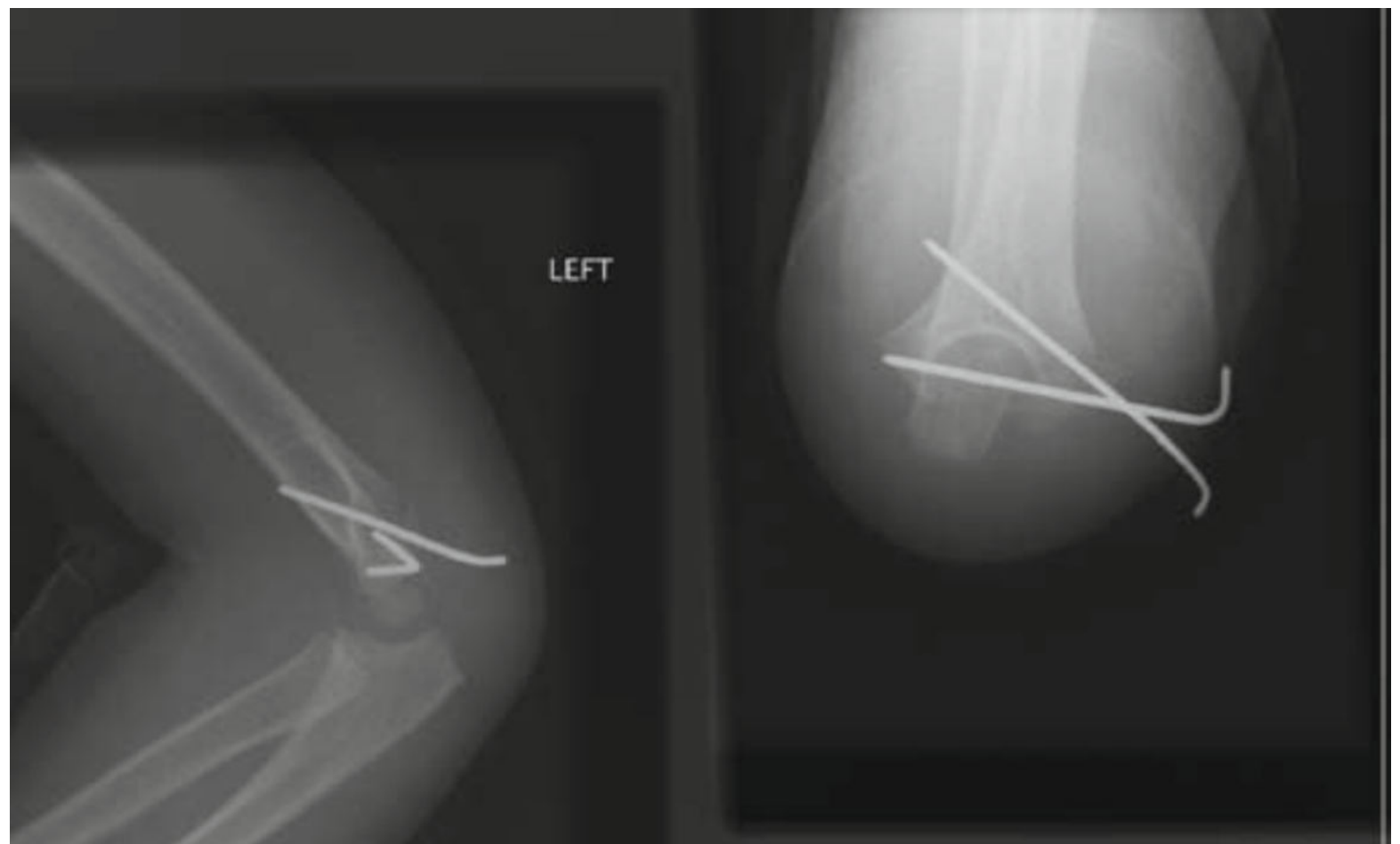
Lateral Condyle Fractures

These fractures are the second most common children's elbow fracture to need operative treatment

- (1) The fracture heals slowly.
- (2) Late deformity can occur.
- (3) Non-union is a recognized complication.

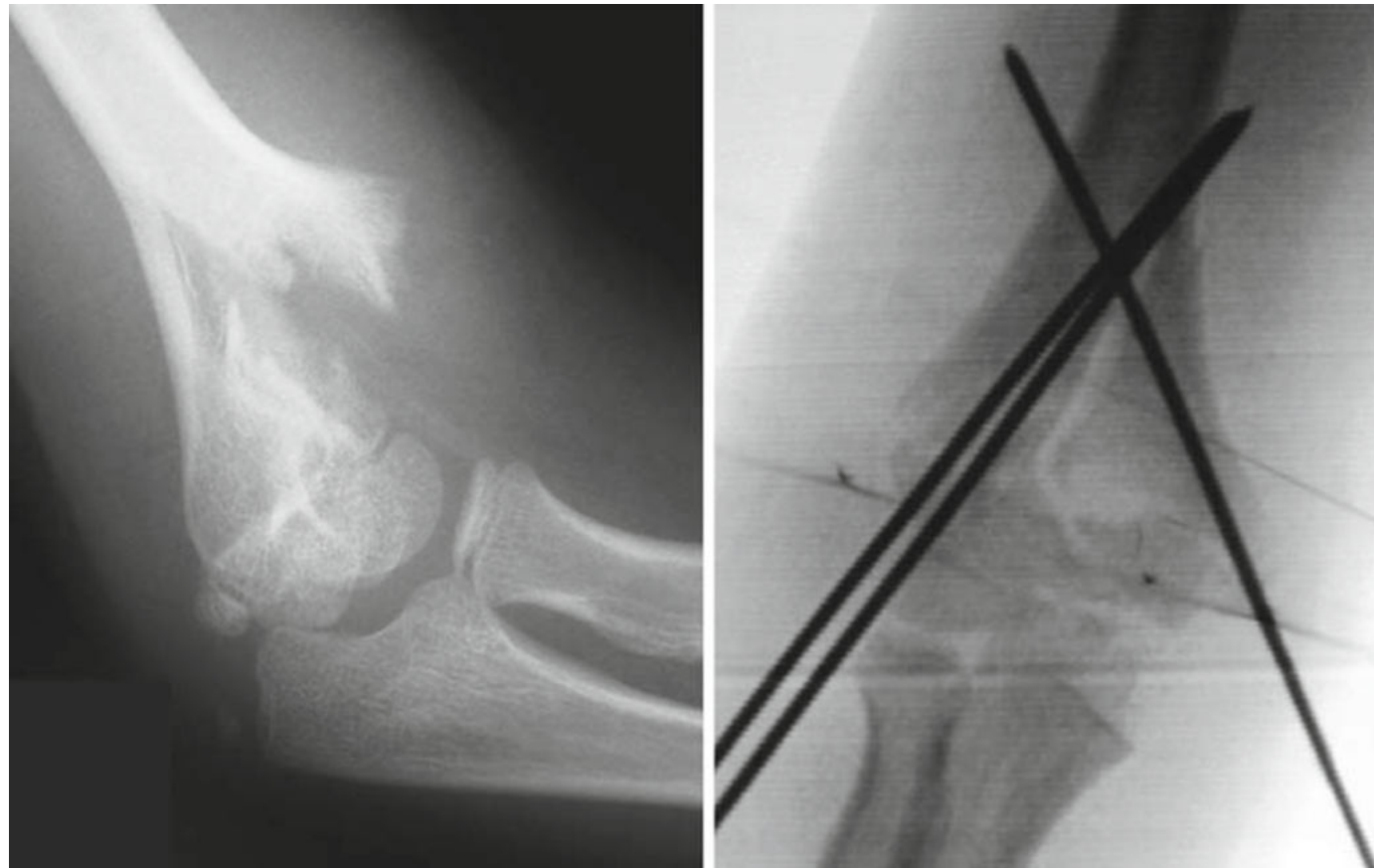


Treatment

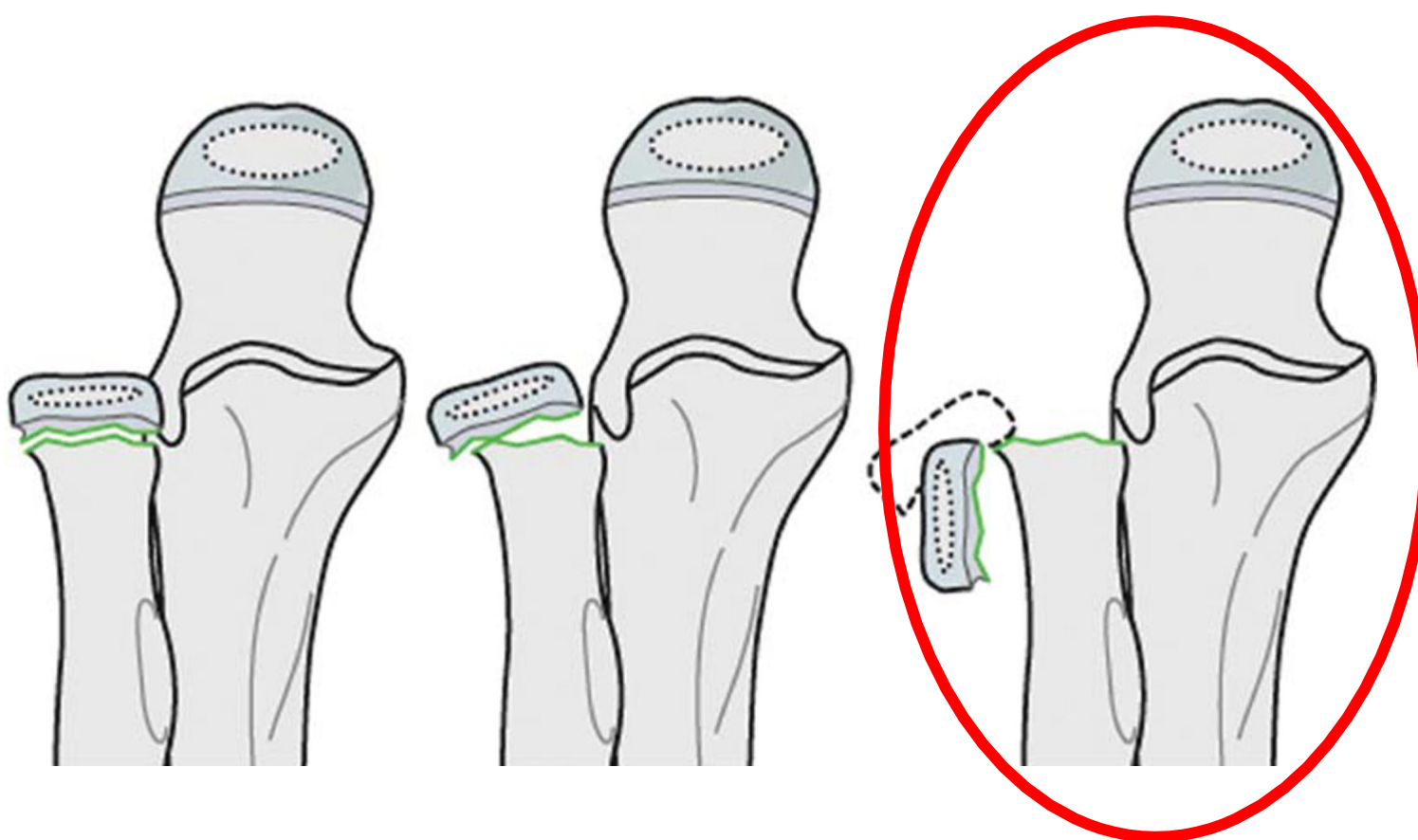


- *Undisplaced lateral condyle*- Long arm cast.
- *Displaced fractures* – stabilized by Open reduction K-wire fixation.

Complete Articular Fractures of the Distal Humerus—T-Fracture

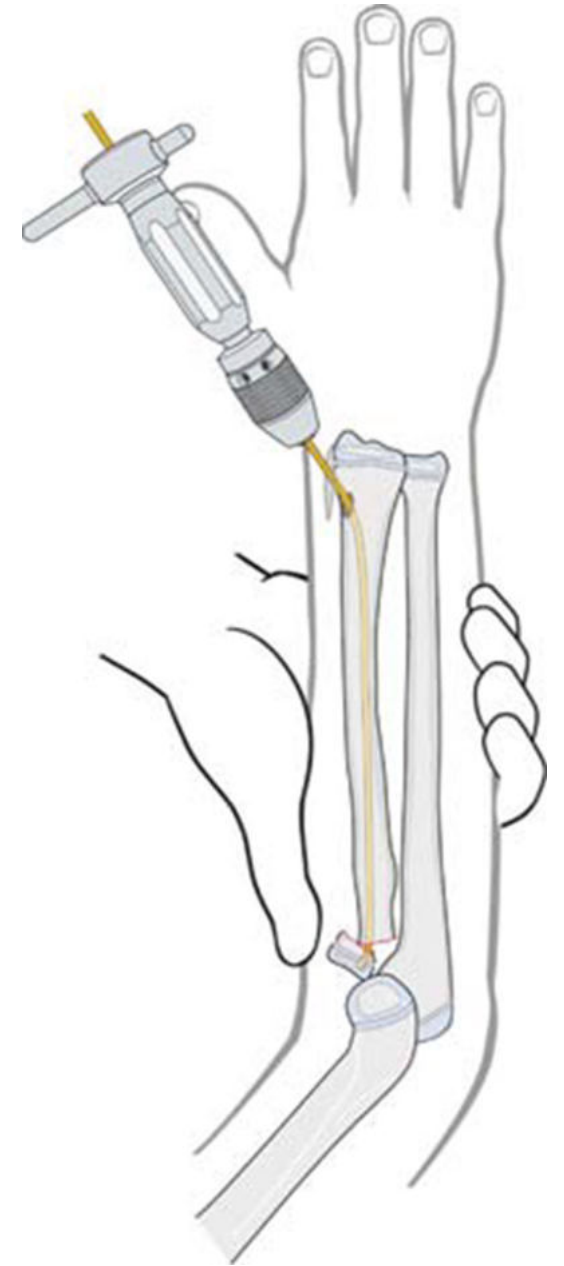


Radial Neck



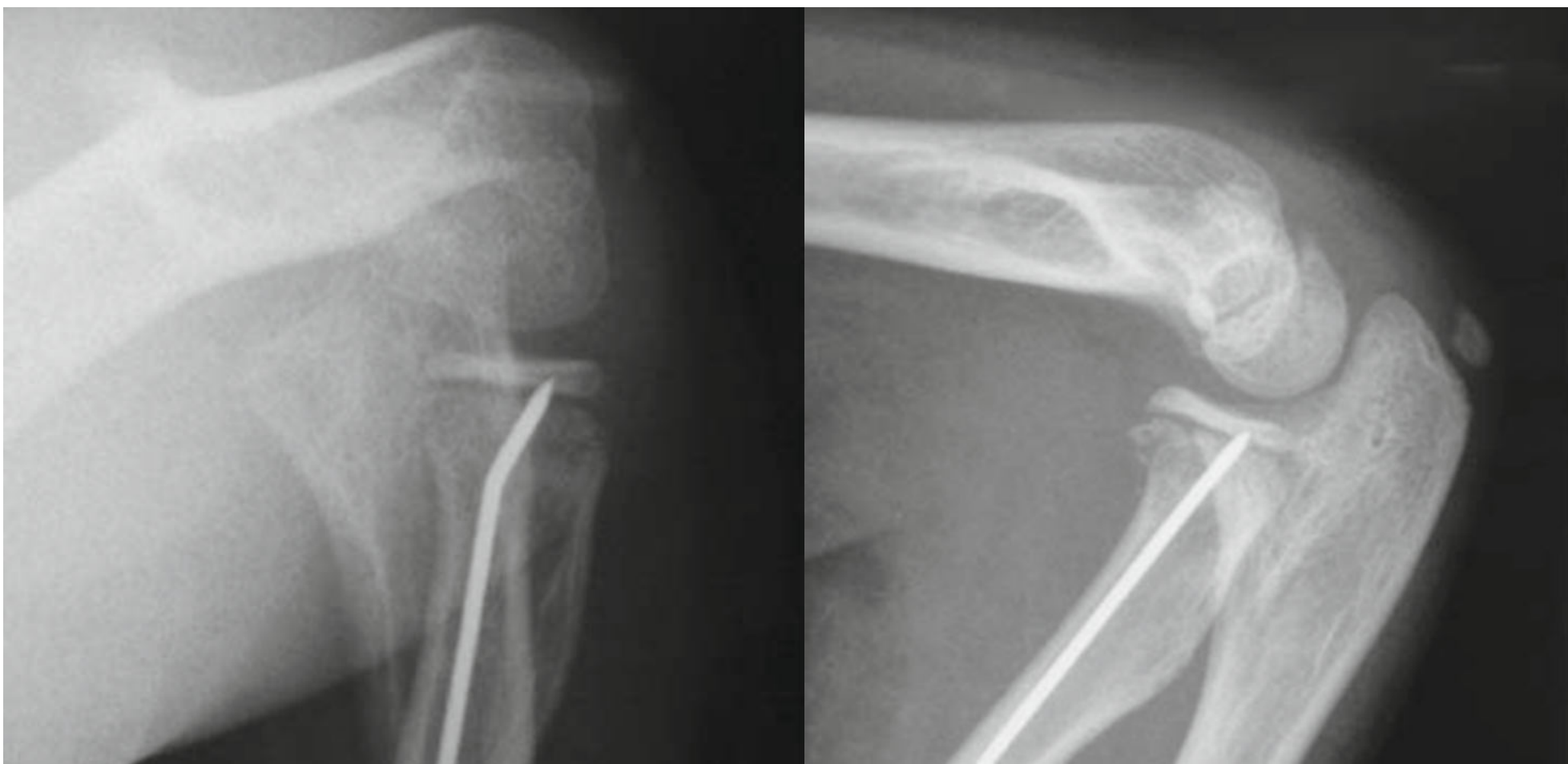
- 30° of angulation can be treated conservatively provided there is no displacement- Long arm cast

Displaced fractures ?



- Need to be reduced but closed reduction can be difficult

Post Op



Injuries of Adult Elbow

Spectrum

- Olecranon & Proximal Ulnar Fractures
- Radial Head Fractures
- Elbow Dislocations

Anatomy-Olecranon Fractures-

- The triceps attaches to the olecranon
- Principle force which displaces the fracture.

Symptoms

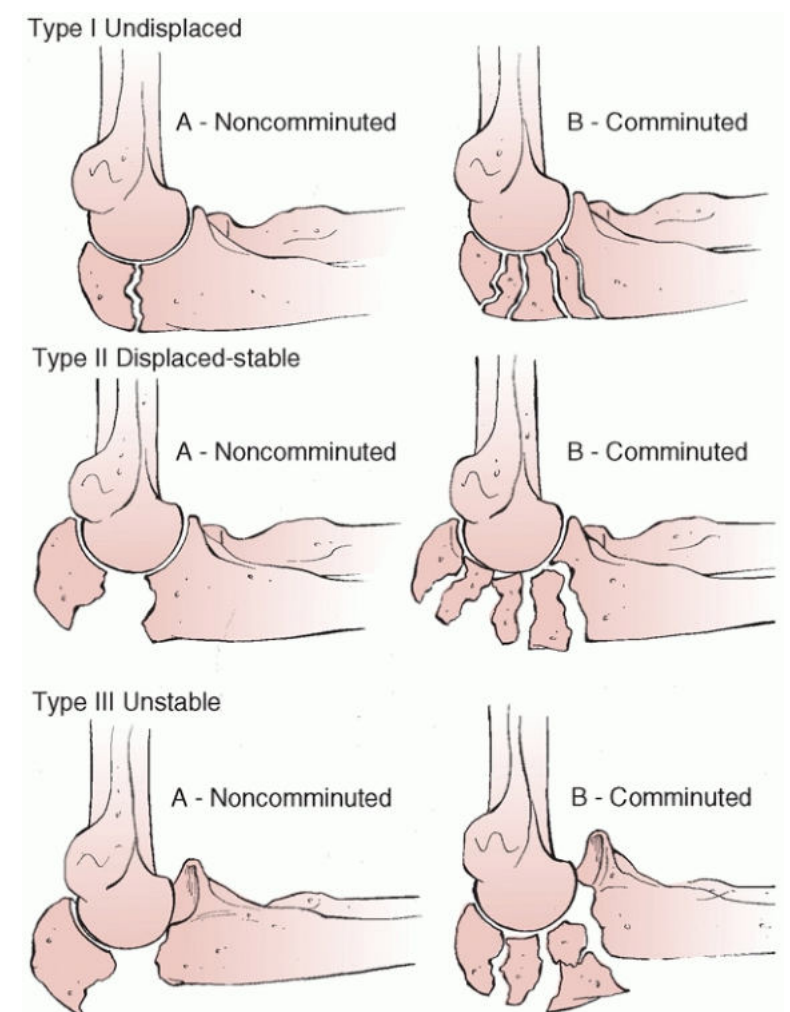
- H/O Trauma: Direct/Indirect
- Pain
- Swelling
- Inability to extend against gravity
- Tenderness

Signs

- Swelling
- Contusion
- Gap at fracture site
- Extension lag

Mayo Classification

- Type 1: Minimally displaced-Nonoperative
- Type 2: Displaced without ulnohumeral instability-Surgery
- Type 3: Displaced with ulnohumeral instability-Surgery



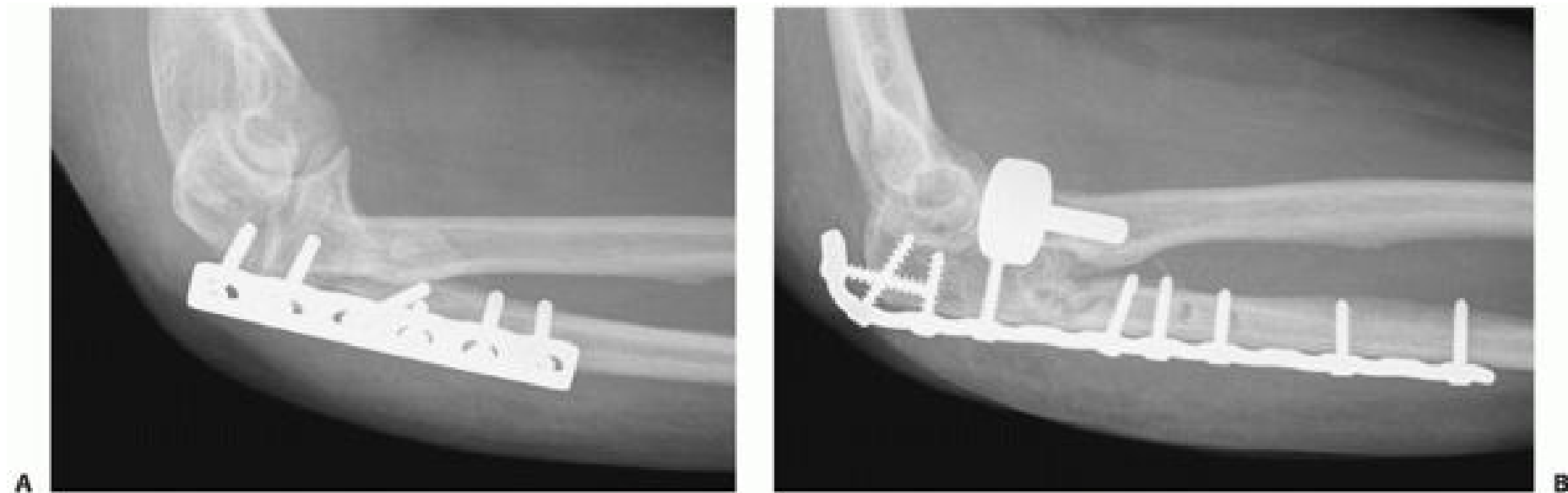
OR&IF- Tension band wiring



Post Op



Complex fractures or fracture-dislocations

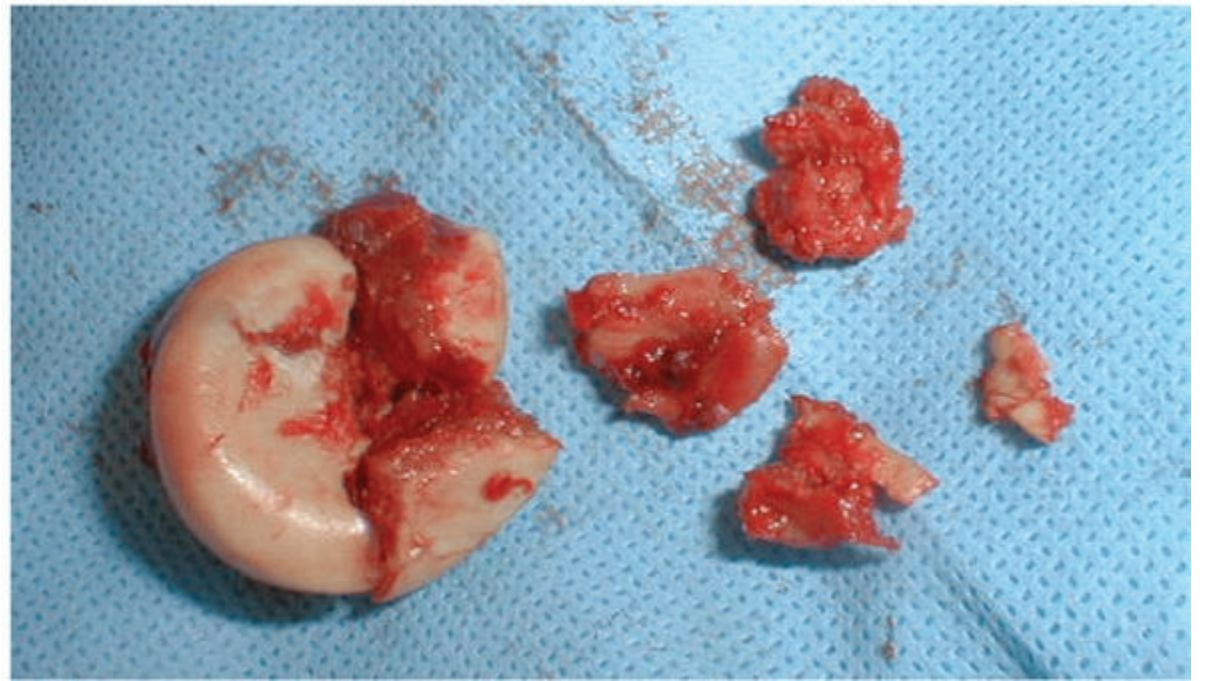


- Tension band wire constructs can fail- Plating is the choice

RADIAL HEAD FRACTURES-Mechanism

- Fractures when it collides with the capitellum
- Fall onto the outstretched hand

Classification- Mason



- Type 1- Nondisplaced fractures- nonoperative treatment
- Type 2- Displaced fractures involving part of the radial head- Screws
- Type 3- comminuted fractures -excision

Type 2



SIMPLE ELBOW DISLOCATIONS



- Stable after manipulative reduction.
- Acute redislocations and chronic recurrent dislocations are uncommon.
- Mobilization of the elbow within 2 weeks results in less stiffness and pain

Question 1- Identify this injury in a 3 years old boy?



- a) Dislocation elbow
- b) Supracondylar fracture Humerus
- c) Separation distal humeral physis
- d) Lateral condyle Humerus fracture