Everything about Supracondylar Humerus

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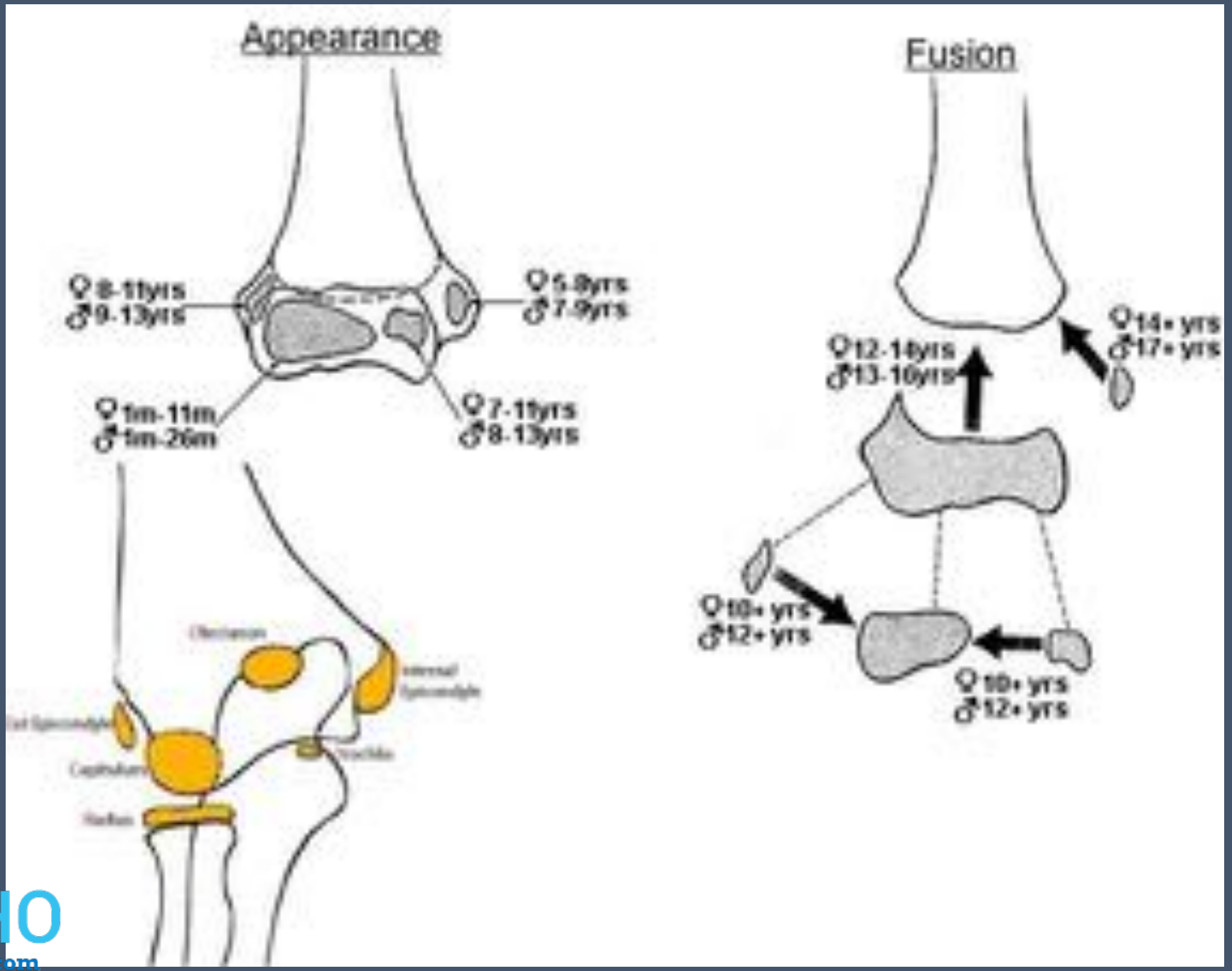
Orthokids A’bad

SCH

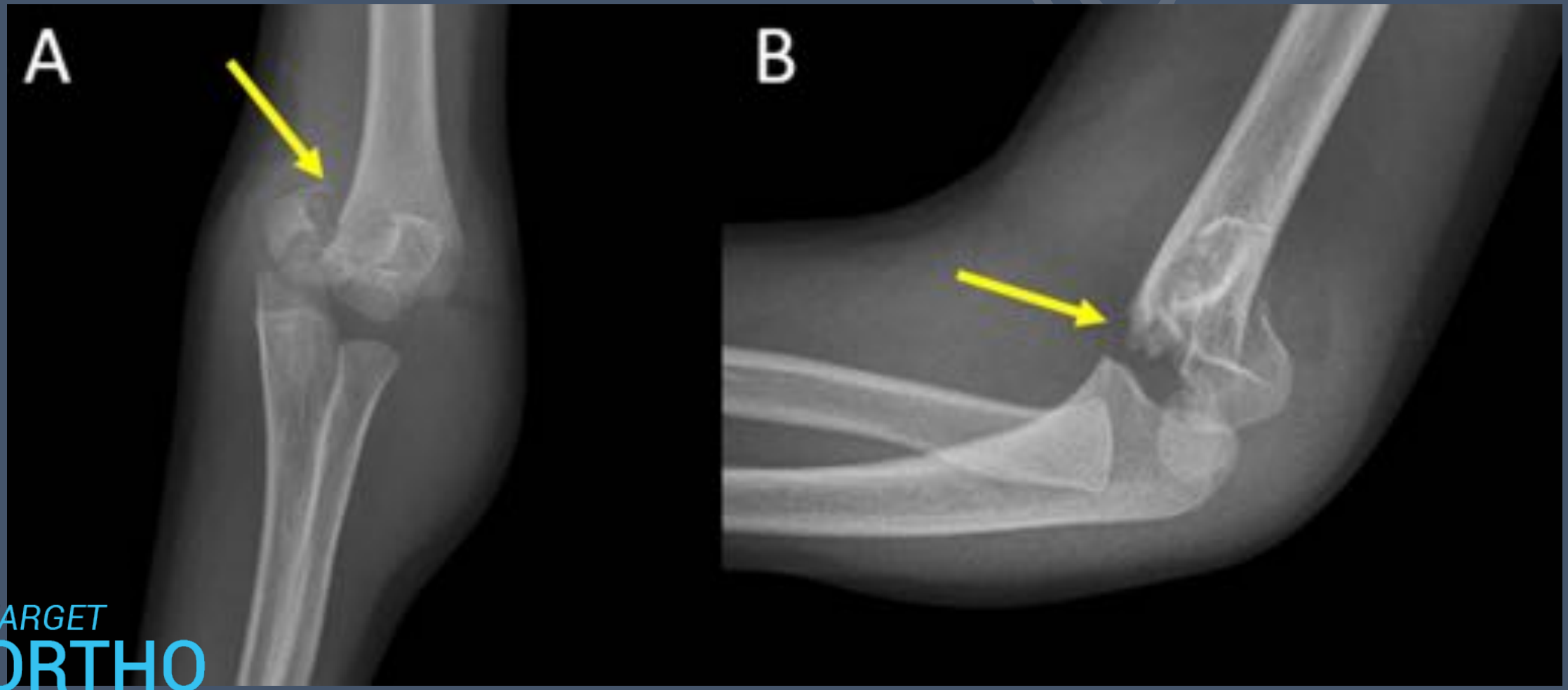
- Etiology
- Examination
- Radiology
- Classification
- Surgical Management

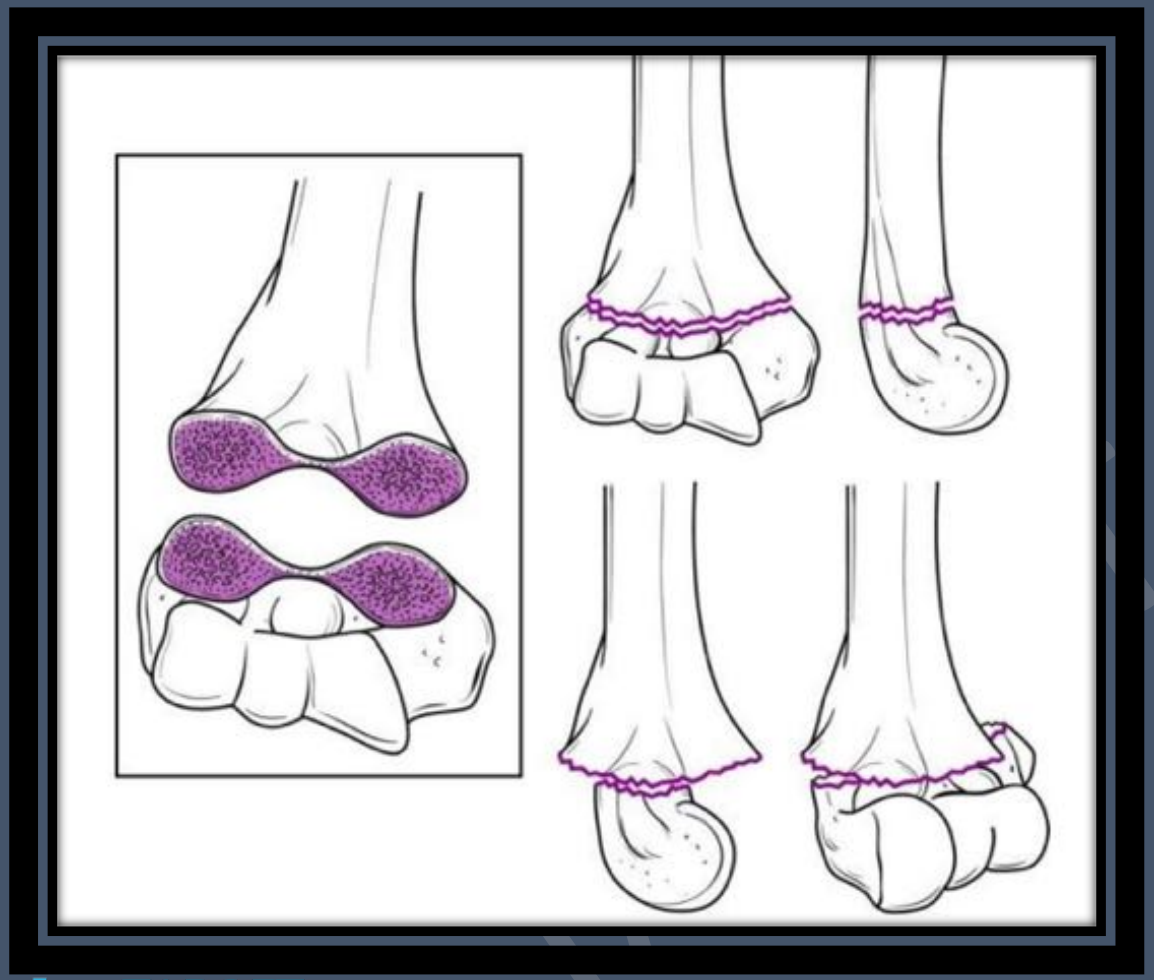
INTRO

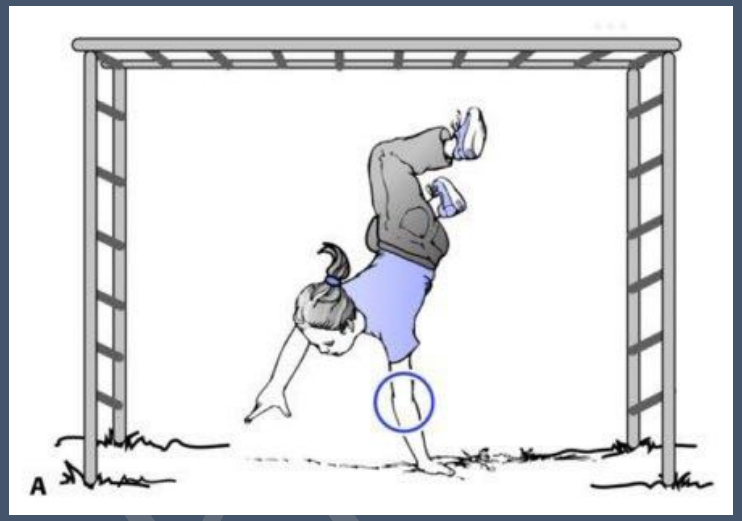
- 60% all elbow injuries
- 4-10 yrs age
- FOOSH
- Types – Extension 97% >>> Flexion 3-4%
- Acute – Nerve / vascular/compartment Syndrome
- Chronic – Malunion – Cubitus Varus (GunStock)



Question 2







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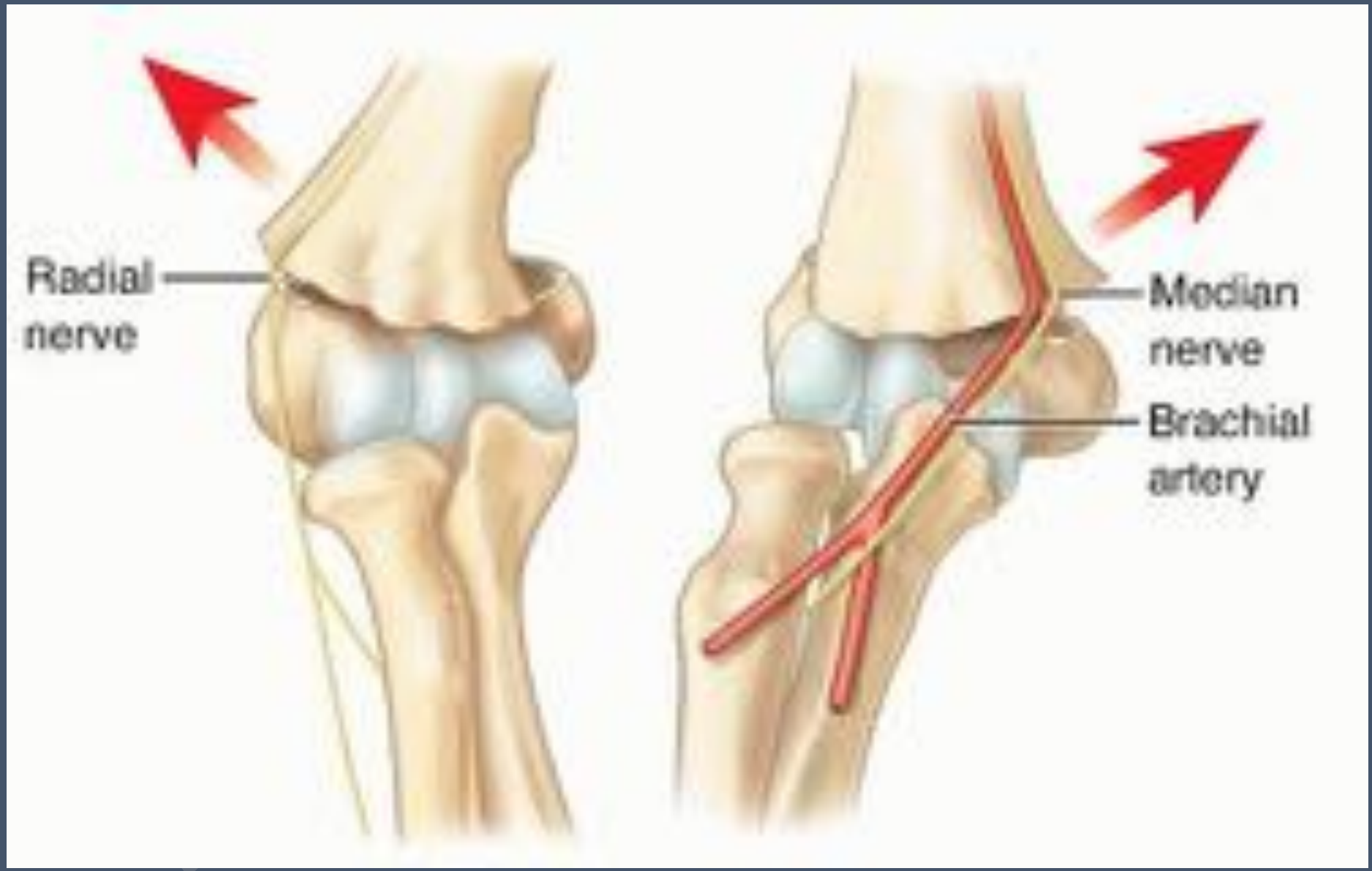
Examinations

- GC, other injuries
- Swelling, CLW, abrasions
- Distal radius – m/c ipsilateral injuries with SCH fracture - HIGH risk of compartment syndrome.



AIN Palsy
12-15%

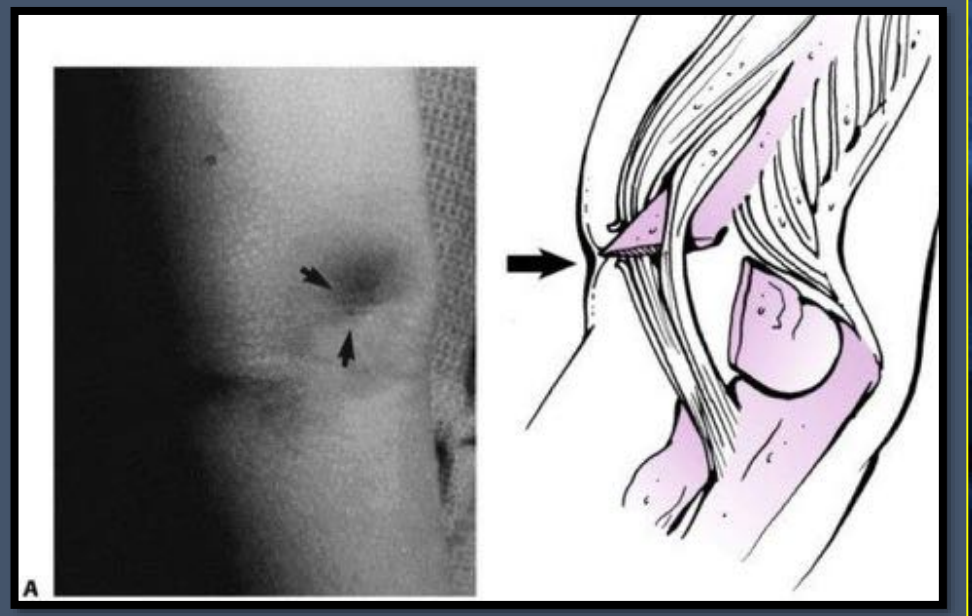
PIN Palsy
8%

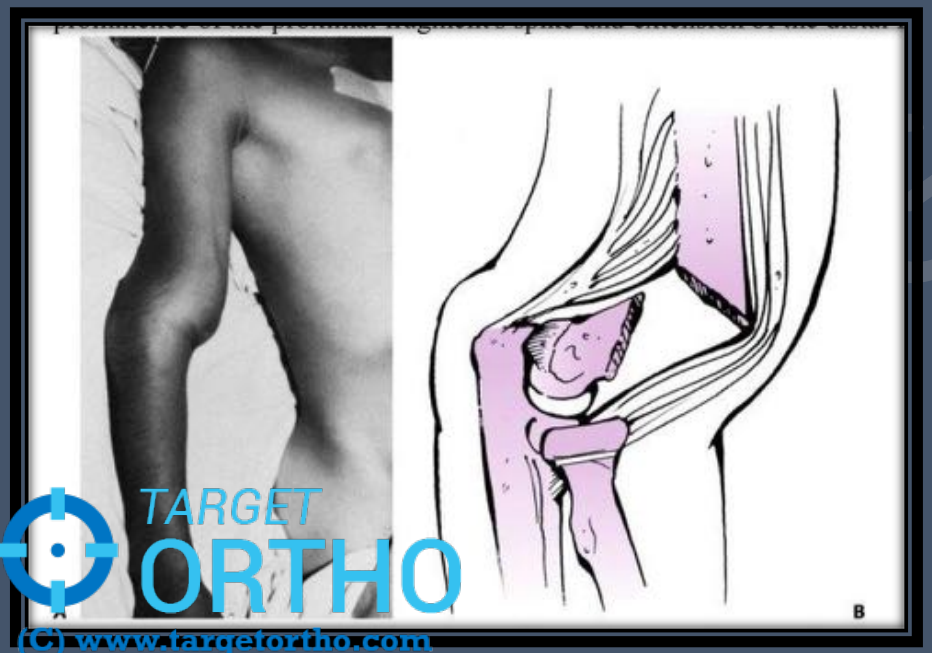
Ulnar Palsy
3%

Posterolateral

Posteromedial

Flexion type





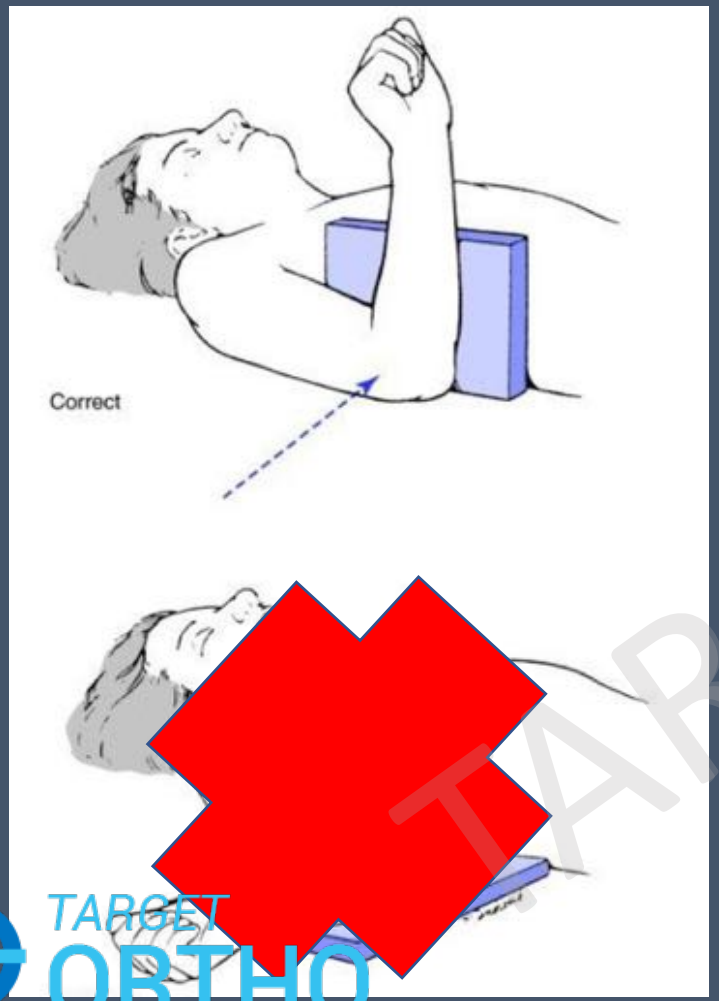
Vascularity

- Distal Pulse / SpO2 Monitor
- Best indicator – Perfusion of hand Pulse – absent – injury/spasm
- Ischemic limb-forearm pain, loss of motor function, passive stretch pain, paraesthesia.
- SCH with pale/white hand – surgical emergency

Radiology

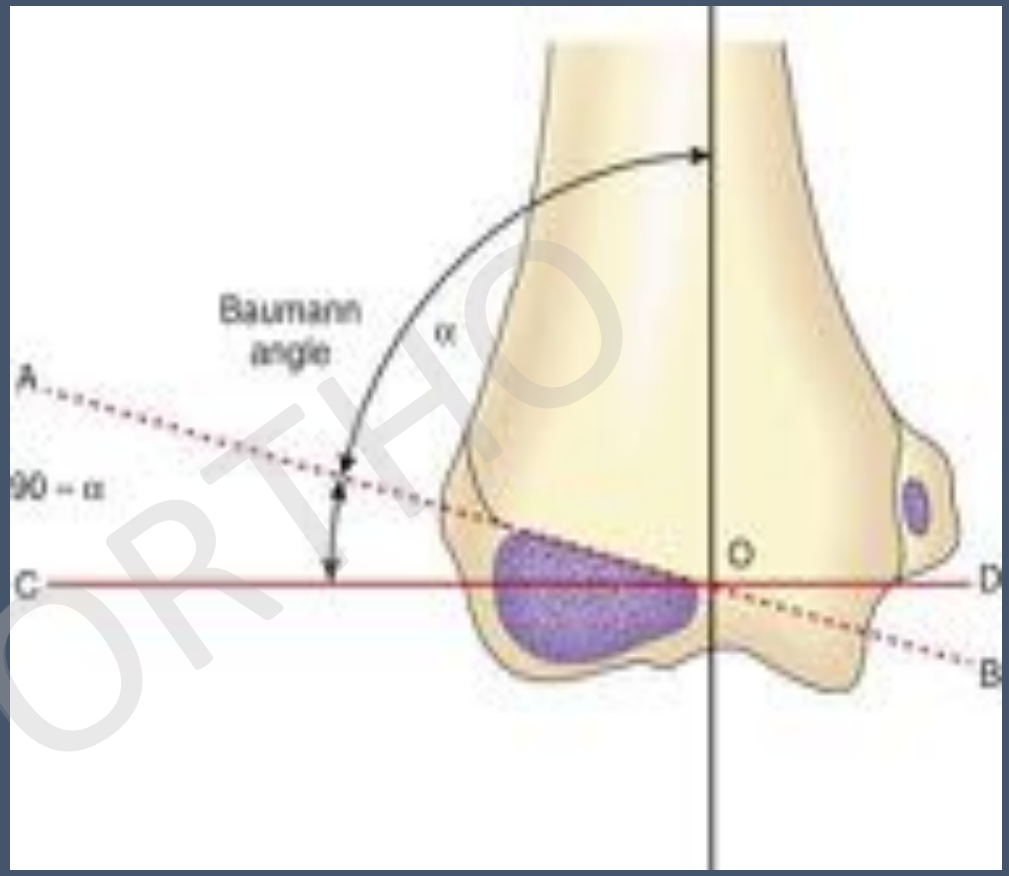
- Fat pad = occult fracture
- Look for
  Evidence of fracture/
  degree of comminution/
  intra-articular extension.
- Anterior Humeral Line –
  intersects- mid third capitellum in >4yrs, but may lie – anterior third in <4years.
- Always – take entire Humerus and forearm views – full length

Position of taking xrays :-



Radiographic evaluation

- AP View
  - Baumann Angle
  - Metadiaphyseal angle
  - Humeroulnar angle (Carrying angle)
- Lateral View
  - Anterior humeral line
  - Teardrop
  - Crescent sign
  - Shaft condylar angle



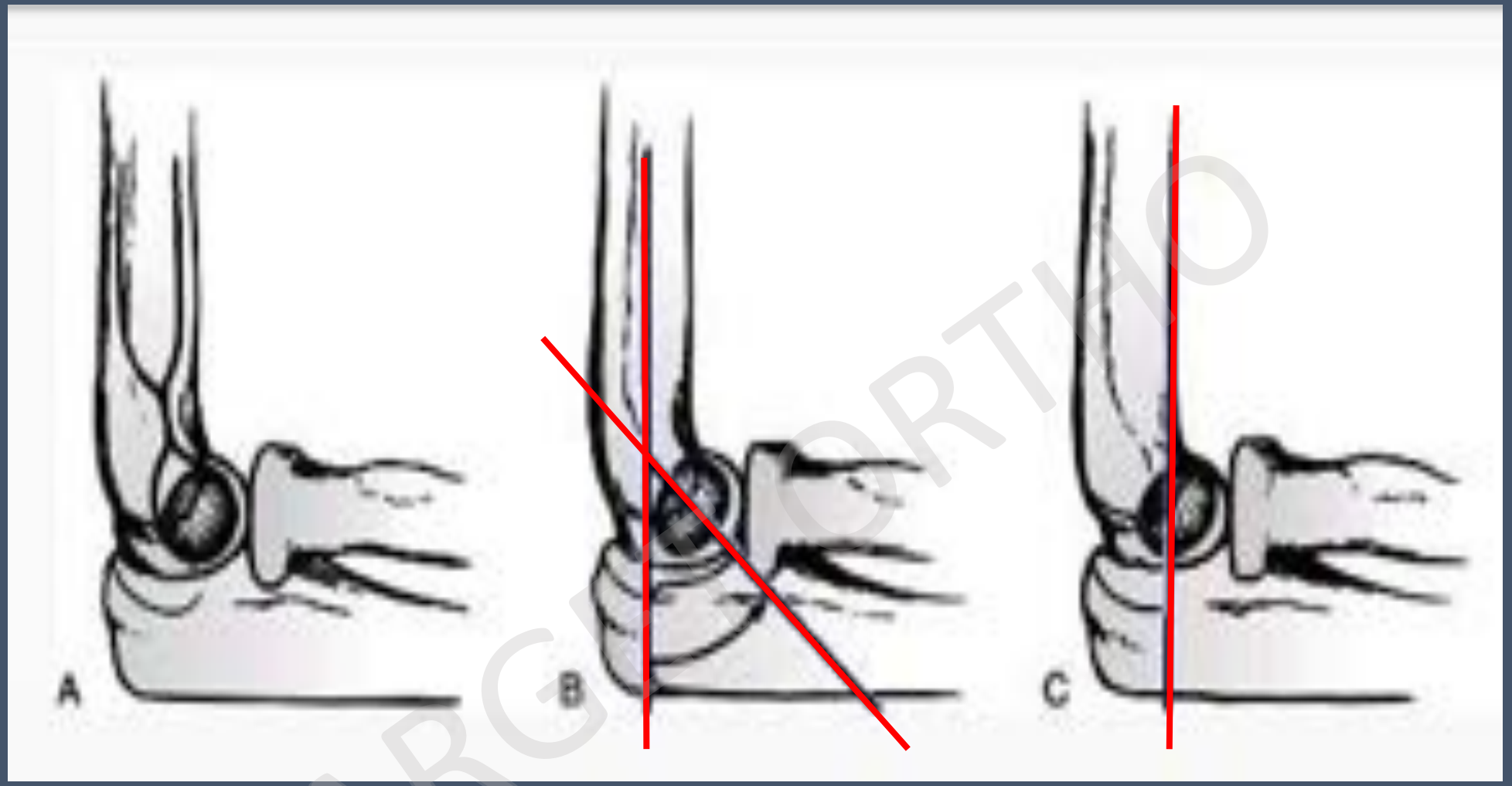
BAUMANN ANGLE – 64-82

- Medial column collapse
- To evaluate the quality of reduction.

Every 5° change in this angle causes change of 2° of carrying angle

Humeroulnar angle (Carrying angle)

Metadiaphyseal angle



Tear Drop

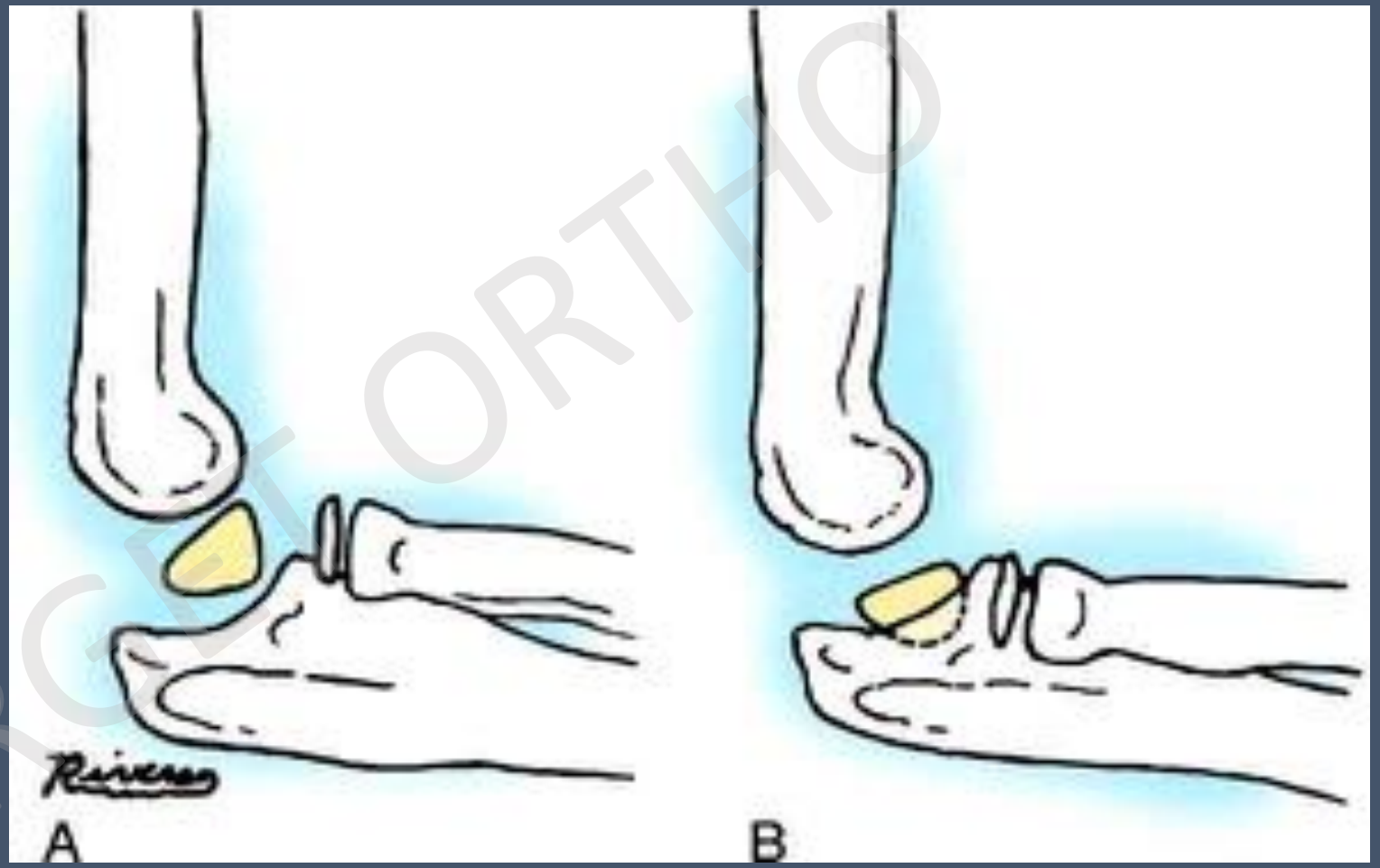
Shaft condylar angle
N : 40*

Anterior Humeral Line

Crescent sign:

Radiolucent space between the distal humeral epiphysis and upper end of ulna.

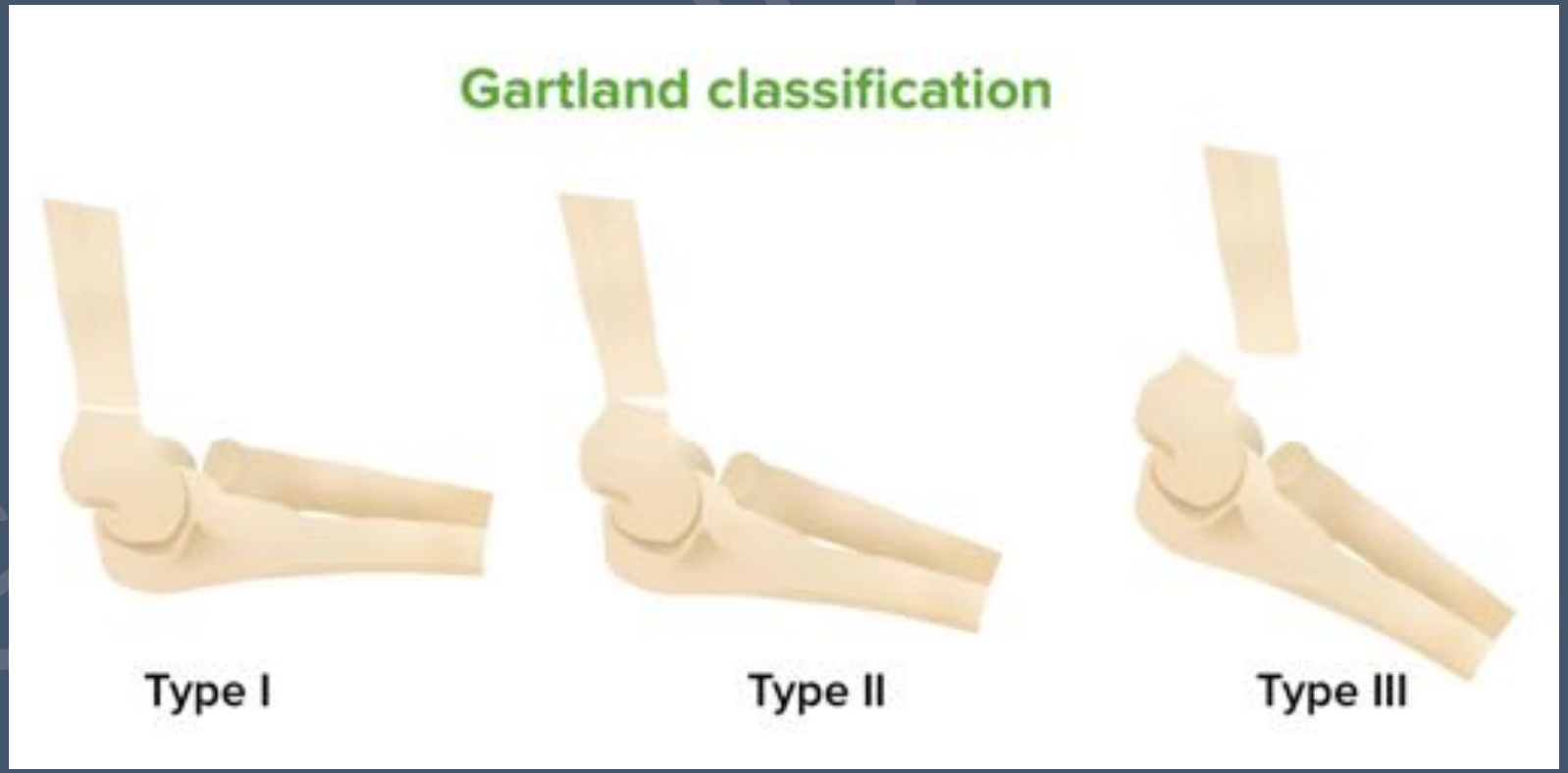
In case of any tilt the part of ulna overlies the distal humeral epiphysis and creates a ‘crescent sign’.



Suggestive of Cubitus Varus

Classification – fracture

- GARTLAND
- Type 1 – non displaced
- Type 2 – intact post hinge
- Type 3 complete Displacement



Type 1

- Post slab
- Cast

Type 2

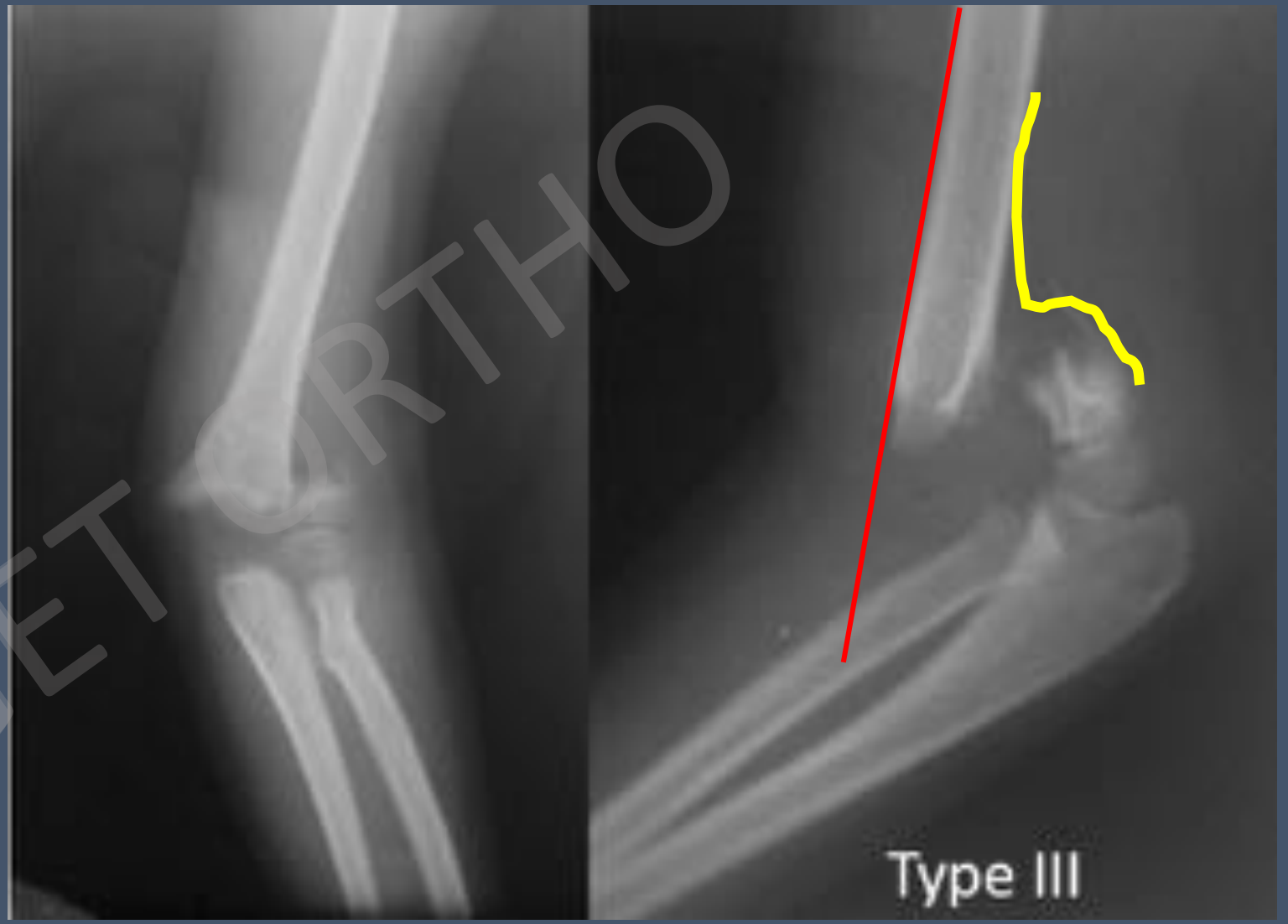
- 2A and 2B
- Gordon/ Griffet Index

- Type 2 – A and B

- Difference?

Type 3

- CR and pinning
- Pin configuration



Leitch – TYPE 4 – Unstable in Flexion and Extension (Trauma or iatrogenic)

Global instability

De Boaeck – Comminuited medial column unstable – cubitus varus

*

Figure 13-30 Laterally torn periosteum in a posteromedially displaced supracondylar humerus fracture.
(From Skaggs DL. Closed reduction and pinning of supracondylar humerus fractures. In: Tolo VT, Skaggs DL, eds. Master Techniques in Orthopaedic Surgery: Pediatrics. Philadelphia, PA: Lippincott Williams & Wilkins; 2007 .)

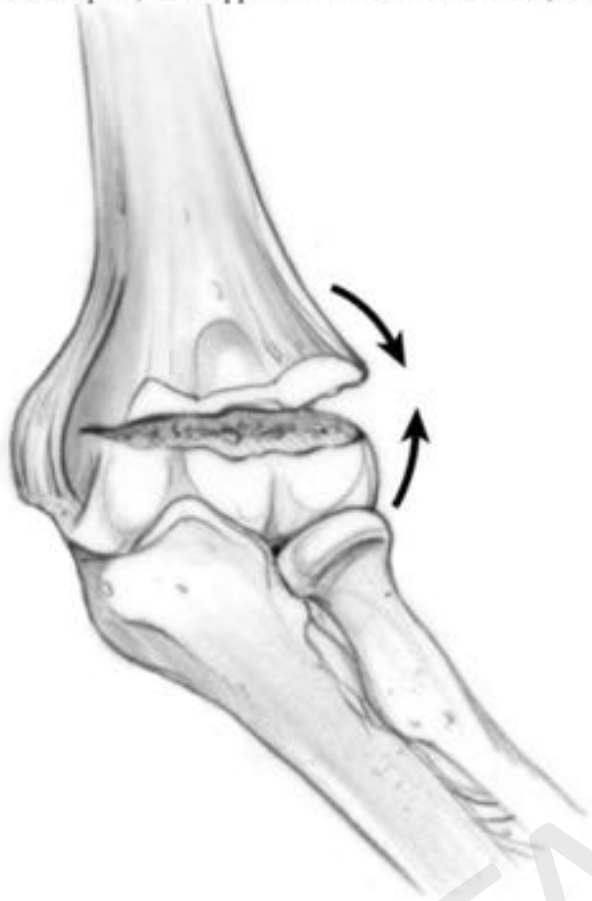
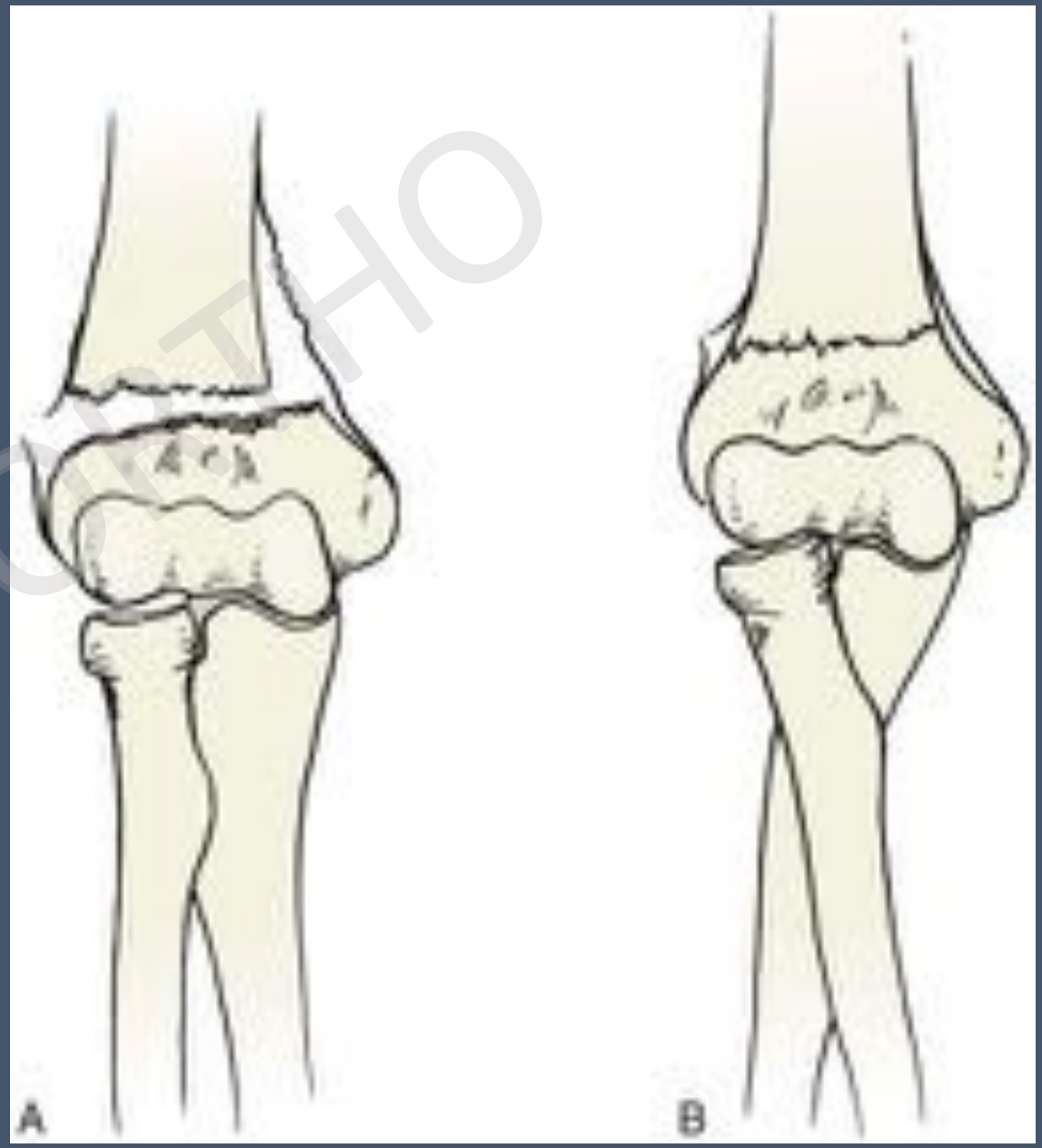
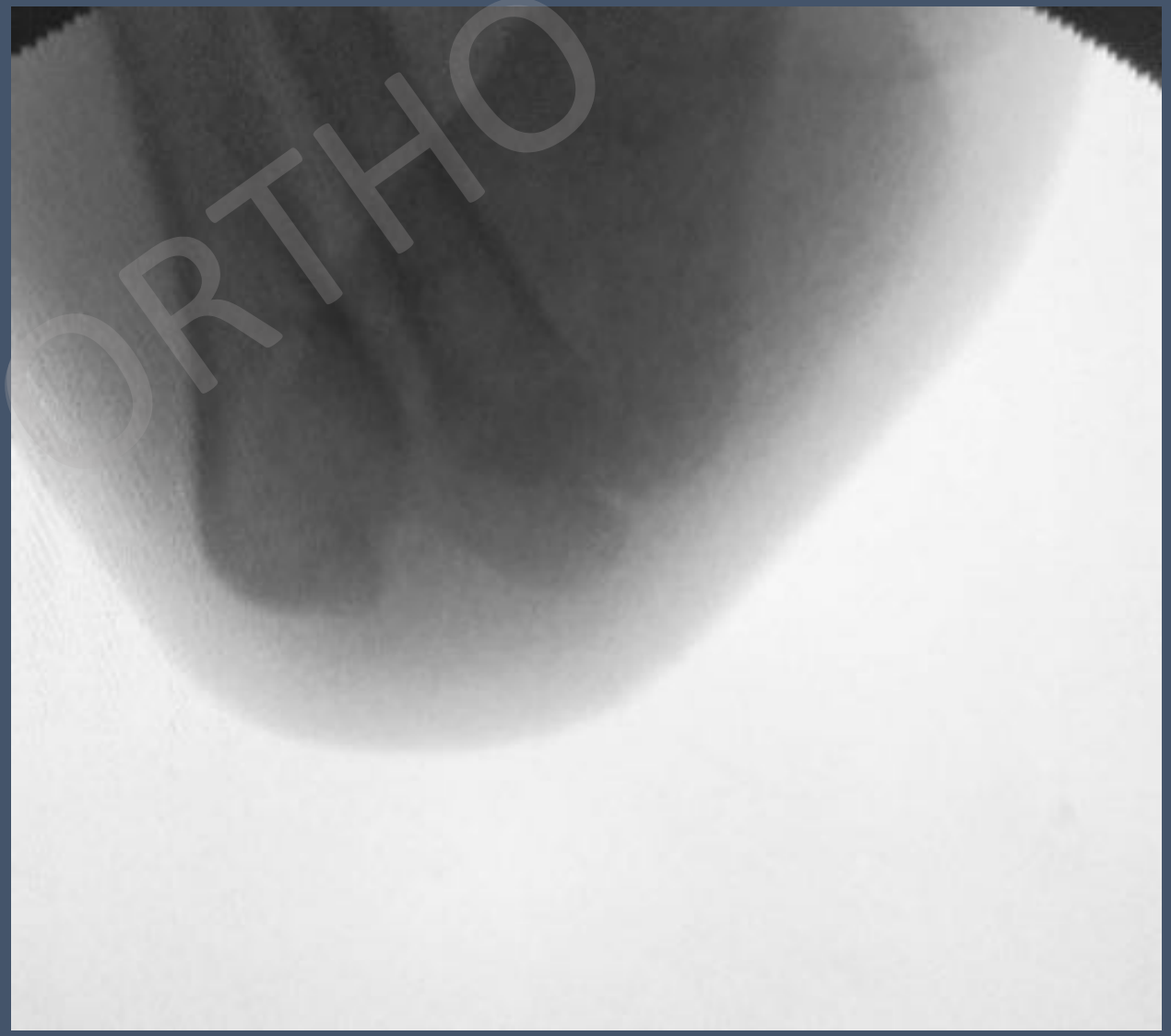


TABLE 13-3 Forearm Rotation to Aid in Reduction as a Function of Direction of Fracture Displacement

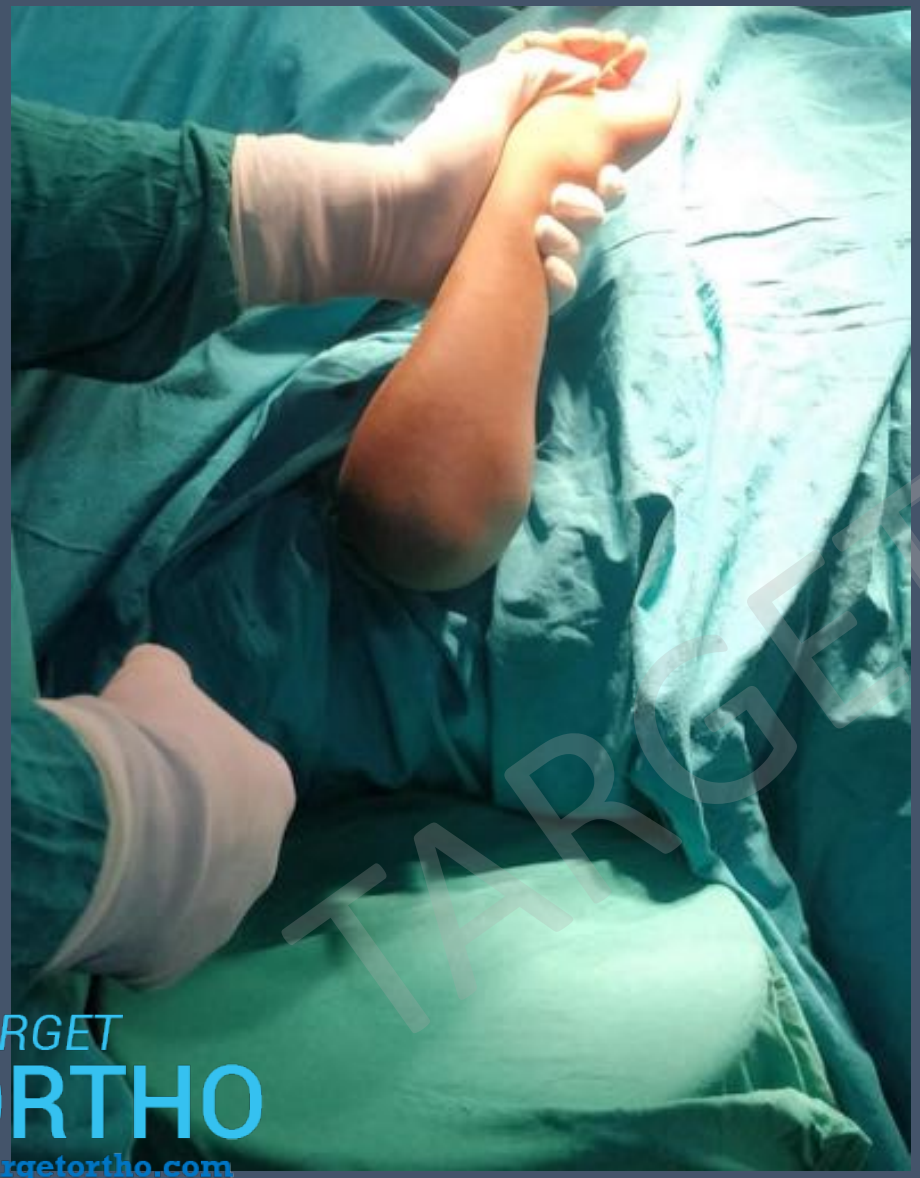
Displacement	*Periosteum Is Torn*	*Forearm Rotation to Aid in Reduction*
Posterior medial	Lateral	Pronation
Posterior lateral	Medial	Supination



Column Views: M- Ex : Medial Column; External rotation

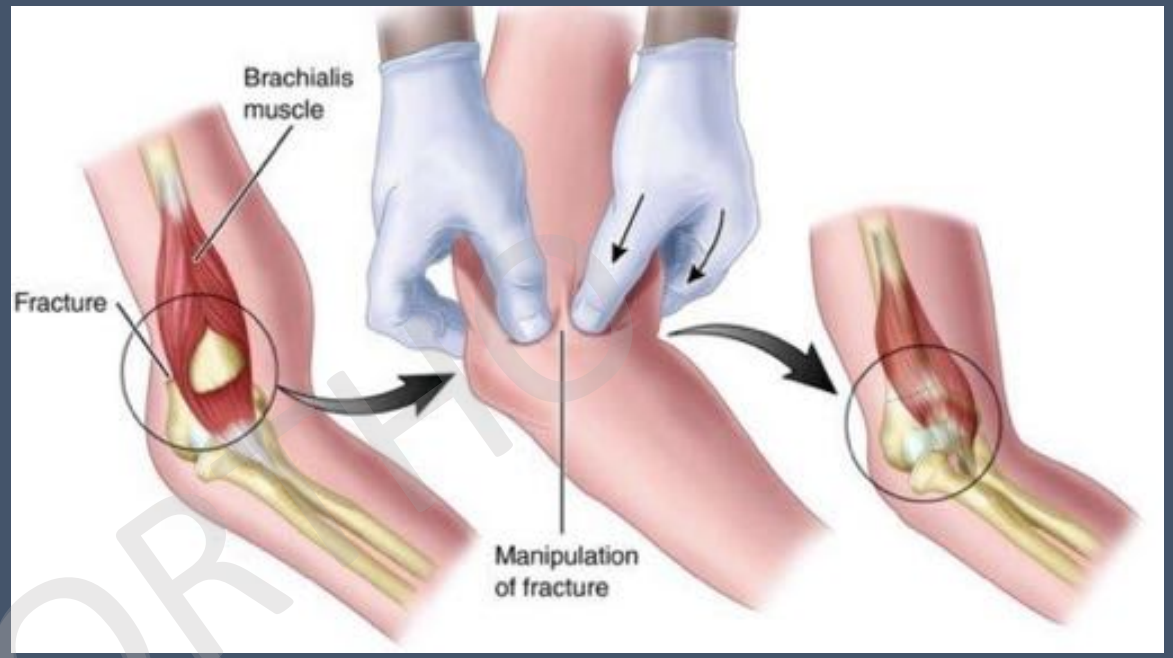


Column Views: L- IN : Lateral Column; Internal rotation

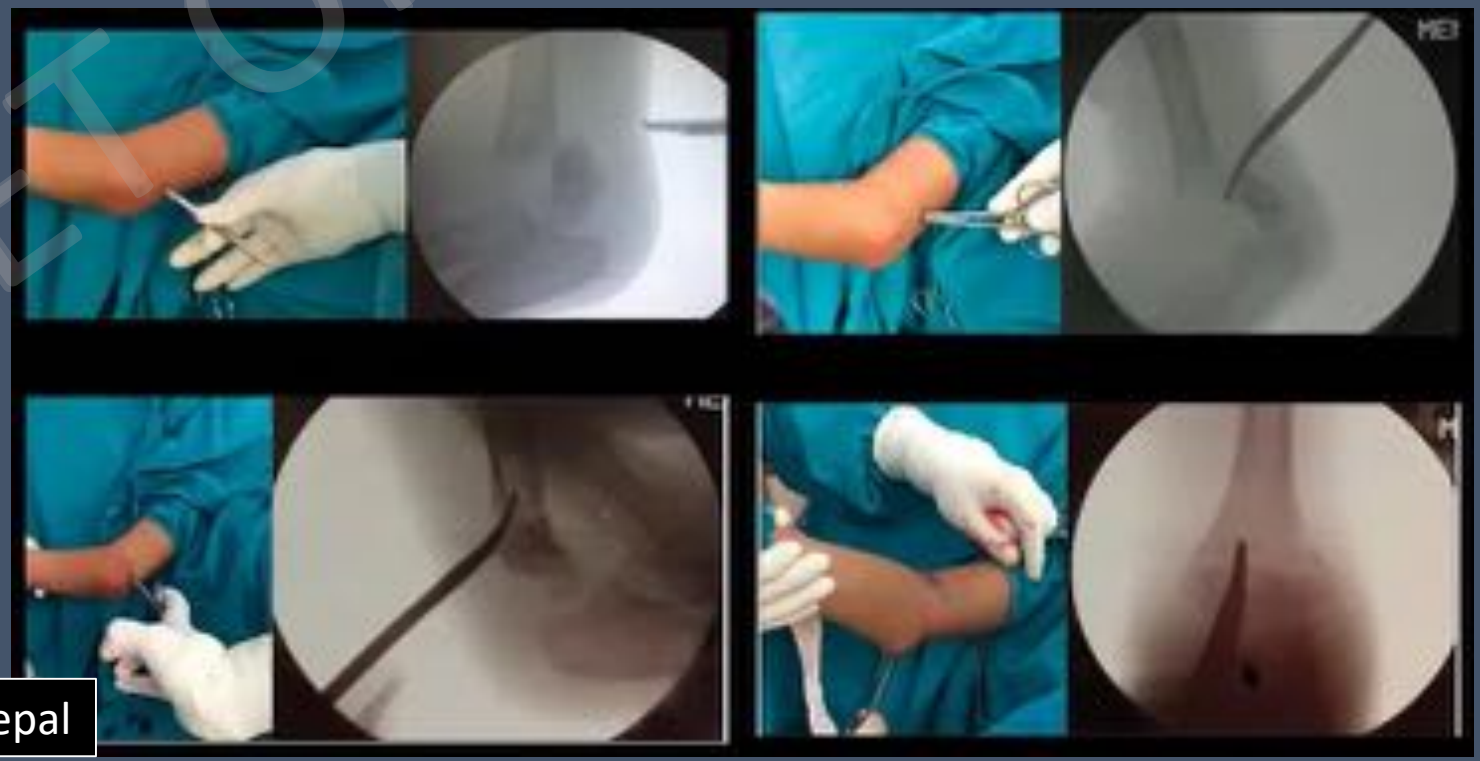


Puckered – anterior – Brachialis sign– Milking.

SOS – open anteriorly – stay lateral to biceps brachi tendon.



Brachialis Milking



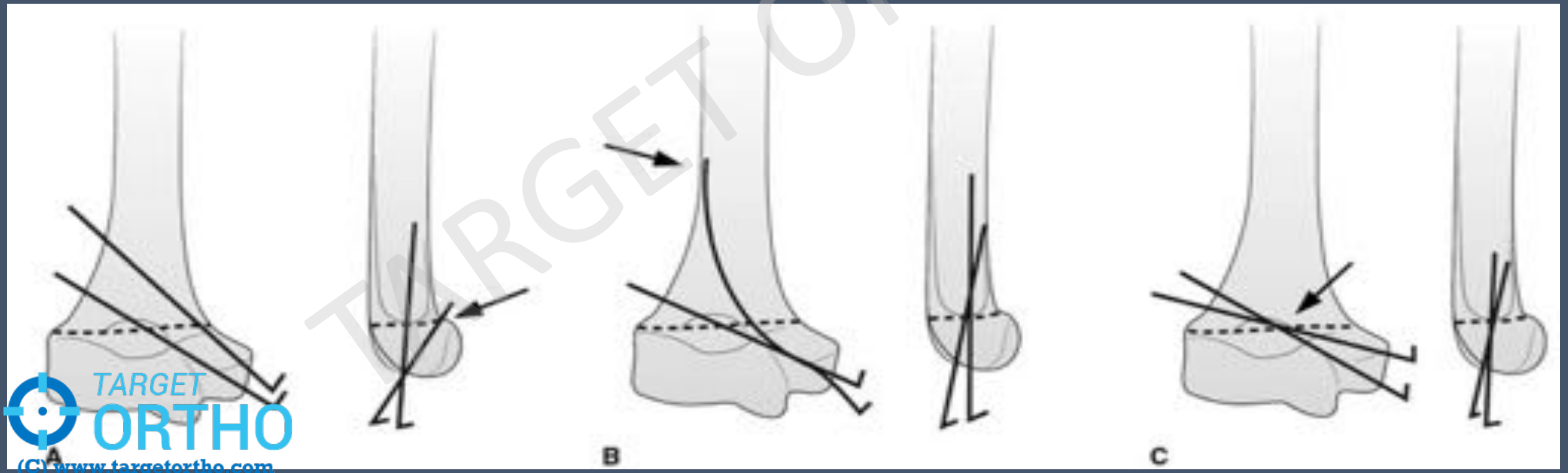
Tansen Technique, Nepal

PIN configuration

- Traditionally – cross
- 10% - ulnar nerve injuries - direct penetration/ stretching
- Some – anterior nerve subluxation

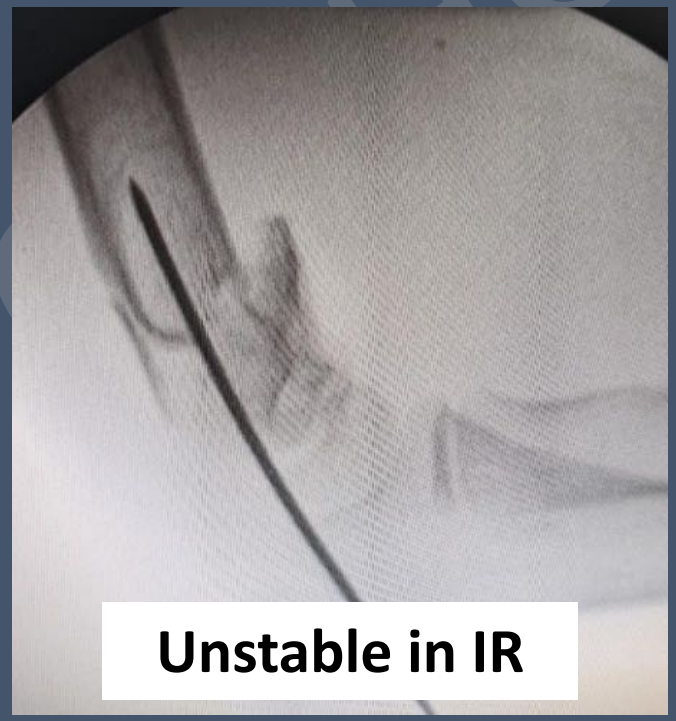
Errors in lateral pinning :

- Atleast 2 cortices
- Pin separation, (atleast 13mm/ one third width of humerus)
- Two 2mm pins > Three 1.5 mm pins



Medial Oblique

Intercondylar



Unstable in IR

High Supracondylar

Indications for Medial pinning

Gartland Classification

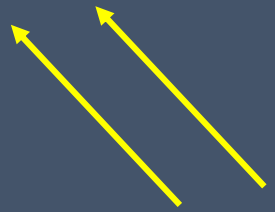
- I
- II
  - II A
  - II B
- III

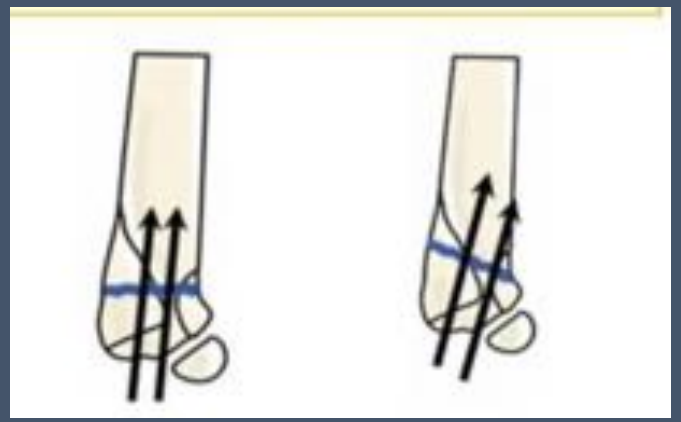
Conservative/Casting

Surgery (CRPP/Open)

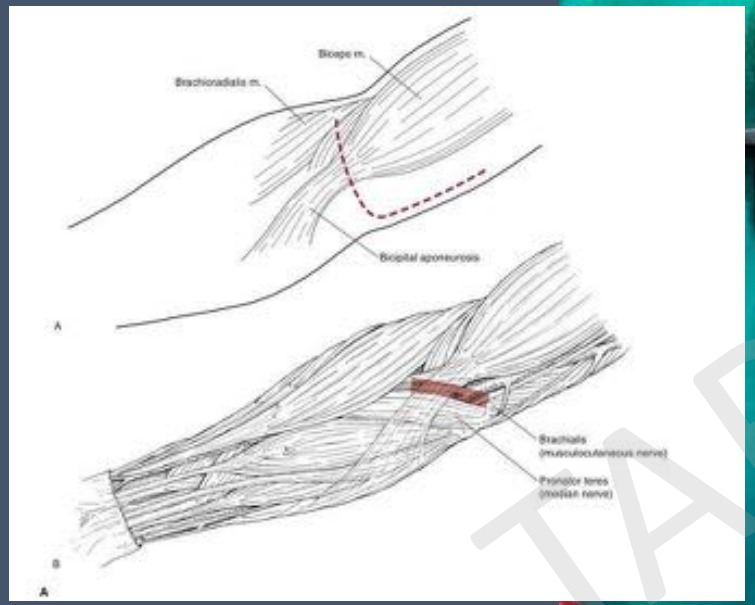
As Per Bahk Classification

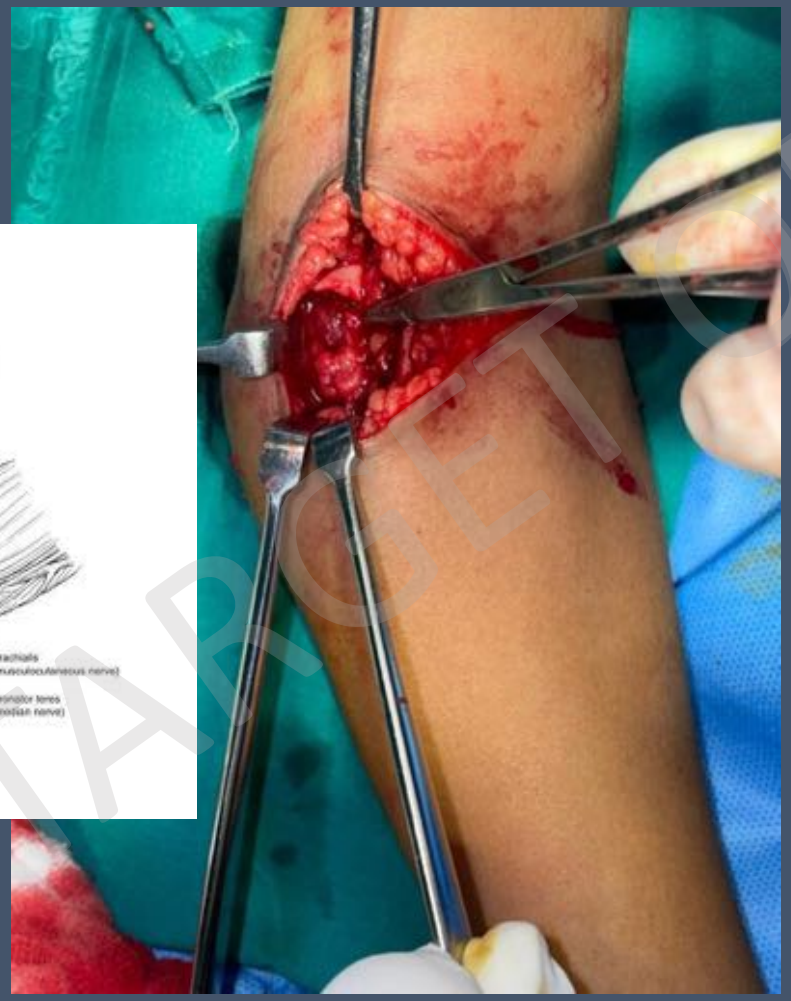
- Medial Oblique
- Lateral Oblique
- Transverse
- High
- Low Saggital
- High Saggital

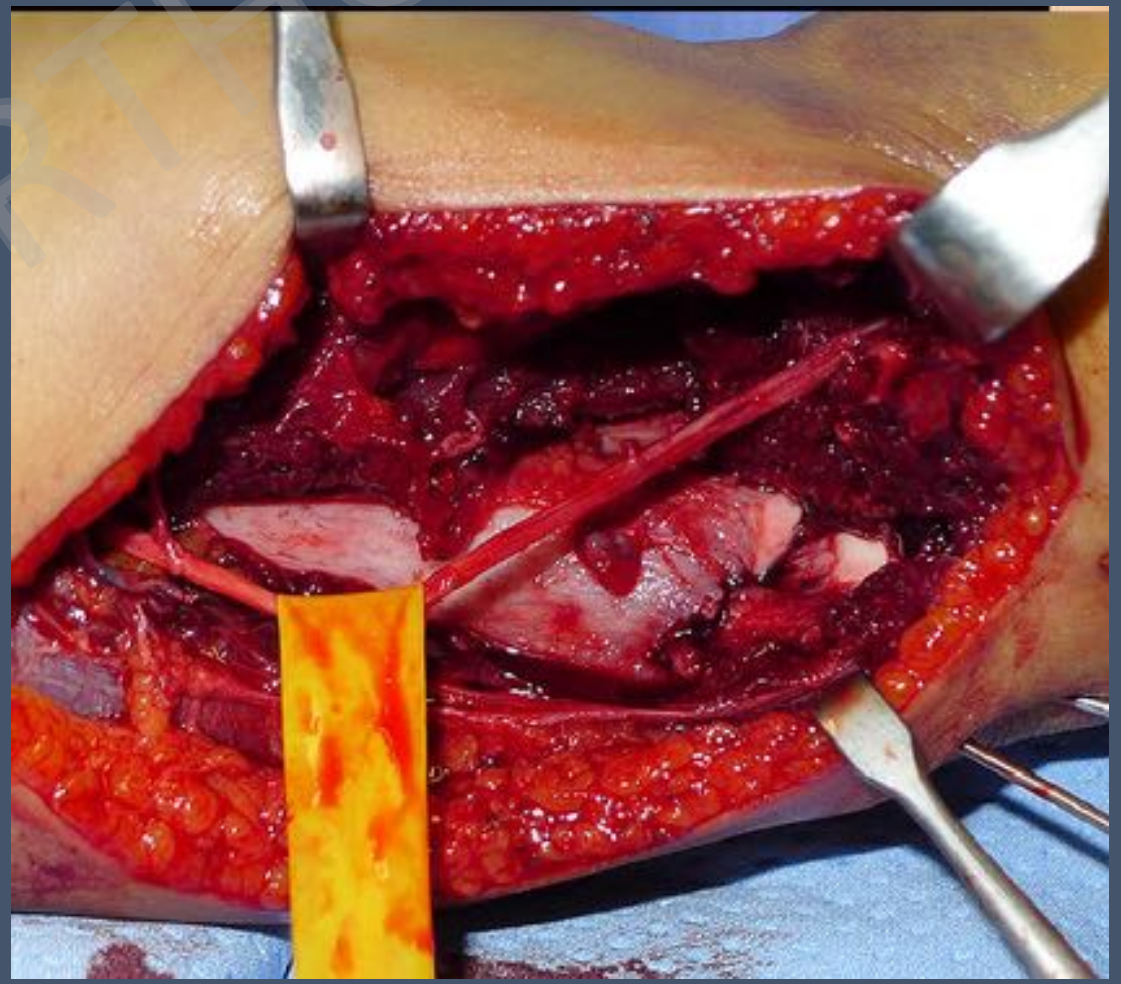




Open Reduction





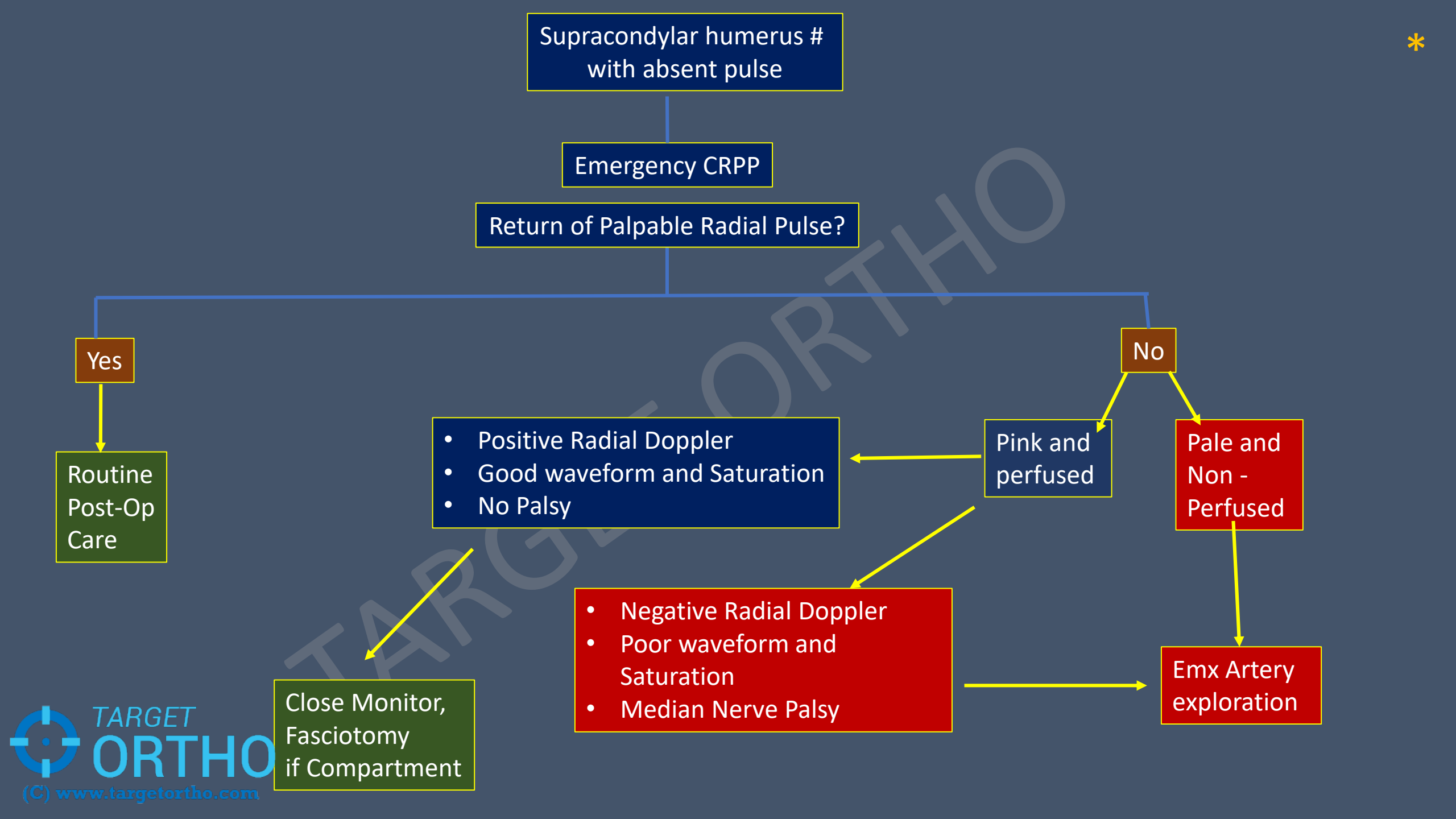


PINK PULSELESS HAND

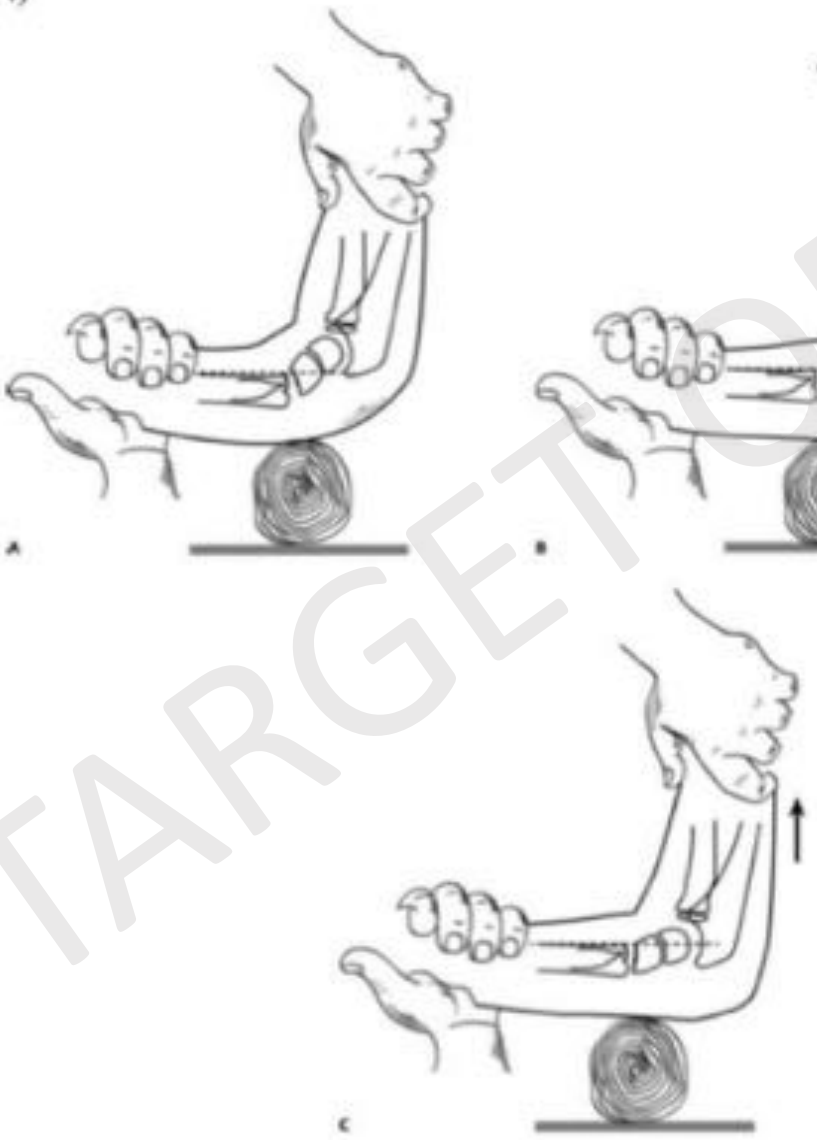
- Emergency surgery – Pink pulseless and dysvascular(pale) SCH #

- Fracture – closed reduced – and pinned.
- 15-20 mins -In OT,
- Well perfused, Pulseless – arm splinted 40-60 * flexion -Monitoring.

- If not restored – Immediate – exploration of vessel – direct repair/graft.
- Prophylactic fasciotomy done- reperfusion /prolonged ischemia.


Supracondylar humerus # with absent pulse
Emergency CRPP
Return of Palpable Radial Pulse?
Yes
Routine Post-Op Care
No
Pink and perfused
Pale and Non - Perfused
• Positive Radial Doppler
• Good waveform and Saturation
• No Palsy
Close Monitor, Fasciotomy if Compartment
• Negative Radial Doppler
• Poor waveform and Saturation
• Median Nerve Palsy
Emx Artery exploration
TARGET ORTHO
(C) www.targetortho.com

A: Prereduction with a rolled towel used as a fulcrum. B: Push with overreduction into extension.C: Pull back to align the anterior humeral line with the middle third of the capitellum.
(Reprinted with permission from Chukwunyerenwa C, Orlik B, El-Hawary R, et al. Treatment of flexion-type supracondylar fractures in children: the 'push–pull' method for closed reduction and percutaneous K-wire fixation. *J Pediatr Orthop B*. 2016;25(5):412–416 .)



Timing of surgery –

Early Sx: Splint in ER, - next morning

Emx for : Open/skin tent/DNVS/Floating elbow/compartment

Complications

Early

- **4.2 % Pin migration/ Pin tract infection**
- Ulnar Nerve symptoms (Sensory/ Motor)
- Compartment

Complications

Early

- 4.2 % Pin migration/ Pin tract infection
- **Ulnar Nerve symptoms (Sensory/ Motor)**
- Compartment

A

B

Complications

Intermediate

- Myositis
- Stiffness

Complications

Intermediate

- Myositis
- **Stiffness**

Complications

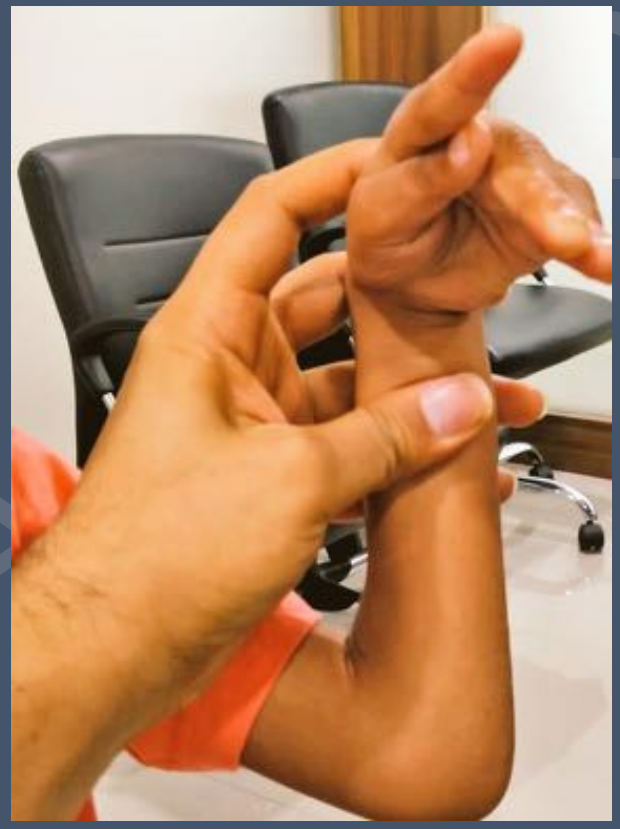
Late

- **Cubitus Varus/ Valgus**
- Volkman ischaemic contracture

Complications

Late

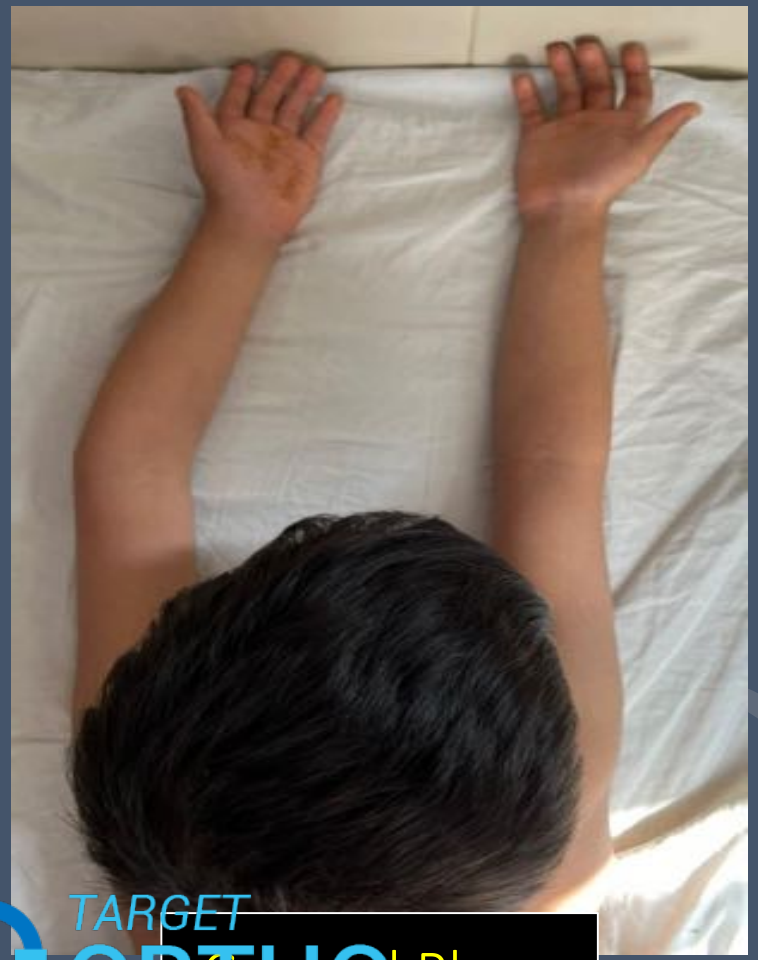
- Cubitus Varus/ Valgus
- **Volkman ischaemic contracture**



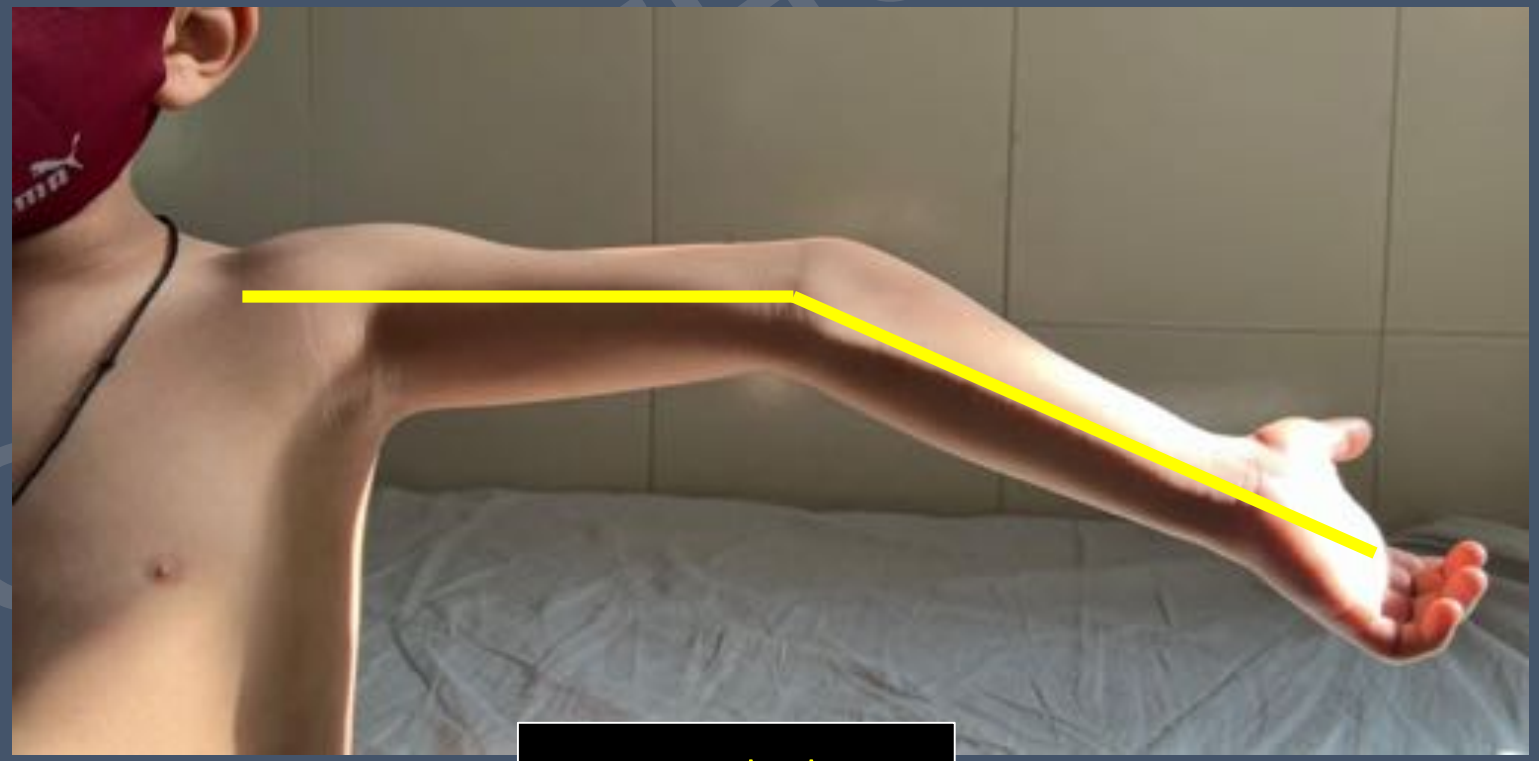
Cubitus Varus

- How to assess
- When to operate
- What surgery
- Implants
- Complications to avoid

Three Plane deformity Assesment



Coronal Plane



Saggital Plane

Axial Plane

Rotational malalignment

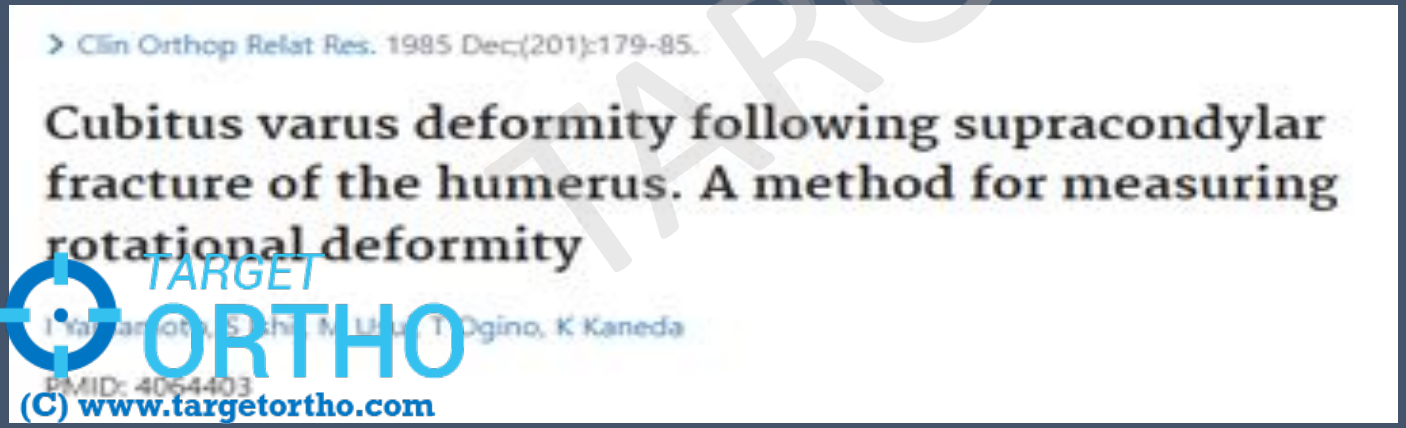
- Yamamoto Test
- Bhende Test (JBJS)

Elbow at 90 * flexion and the shoulder held at the maximum extension position.

Apply maximum internal rotation to the subject's upper limb around the long axis of the humerus.

In children with the internal rotation deformity of cubitus varus, a certain abnormal angle is formed between the horizontal plane of the back and the midline of the forearm.

The angle is designated the internal rotation angle."



Rotational malalignment

- Yamamoto Test
- Bhende Test (JBJS)

CLINICAL MEASUREMENT OF VARUS-VALGUS DEFORMITY AFTER SUPRACONDYLAR FRACTURE OF THE HUMERUS

HARISH S. BHENDE

Fig. 1

Fig. 2

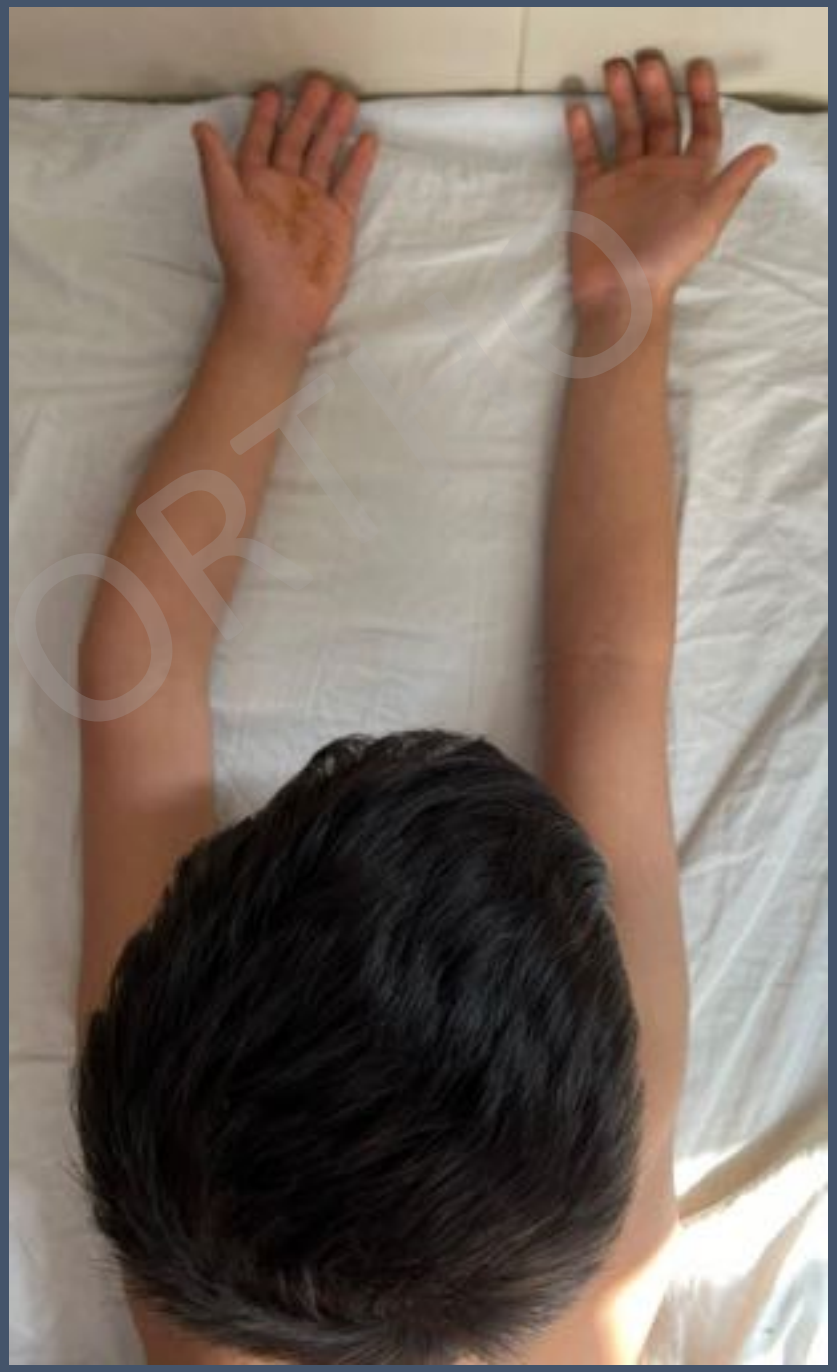
Radiology:
Fishtail / Progressive Angles

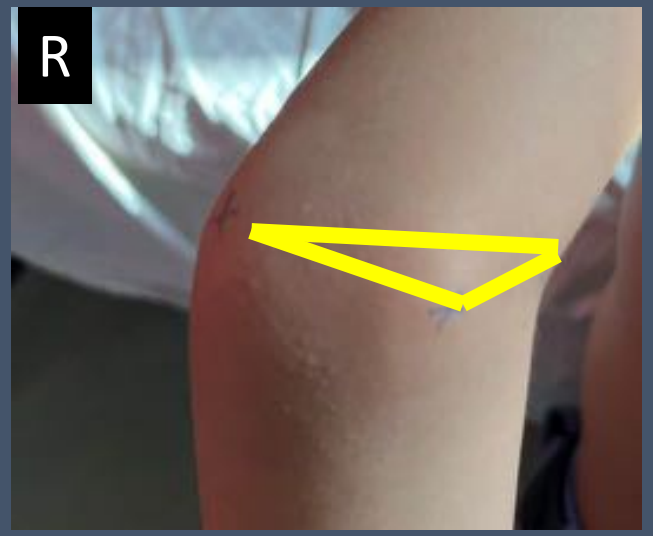
Will It Remodel/ When To Operate?

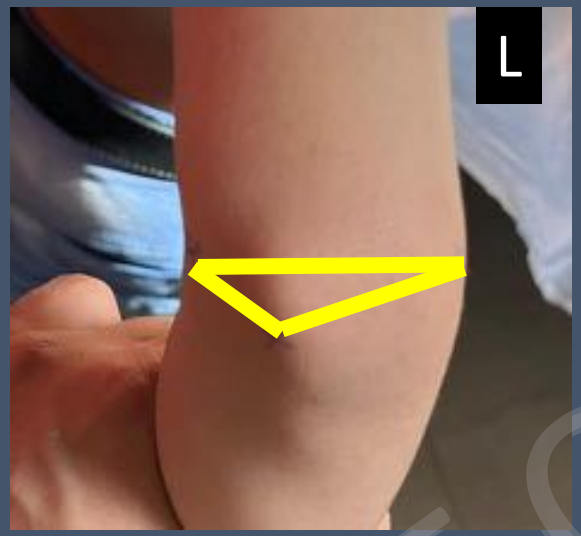
Case Example

On presentation

- 6 years age,
- 1 year 3 months post the primary injury
- Complaints of left elbow deformity.

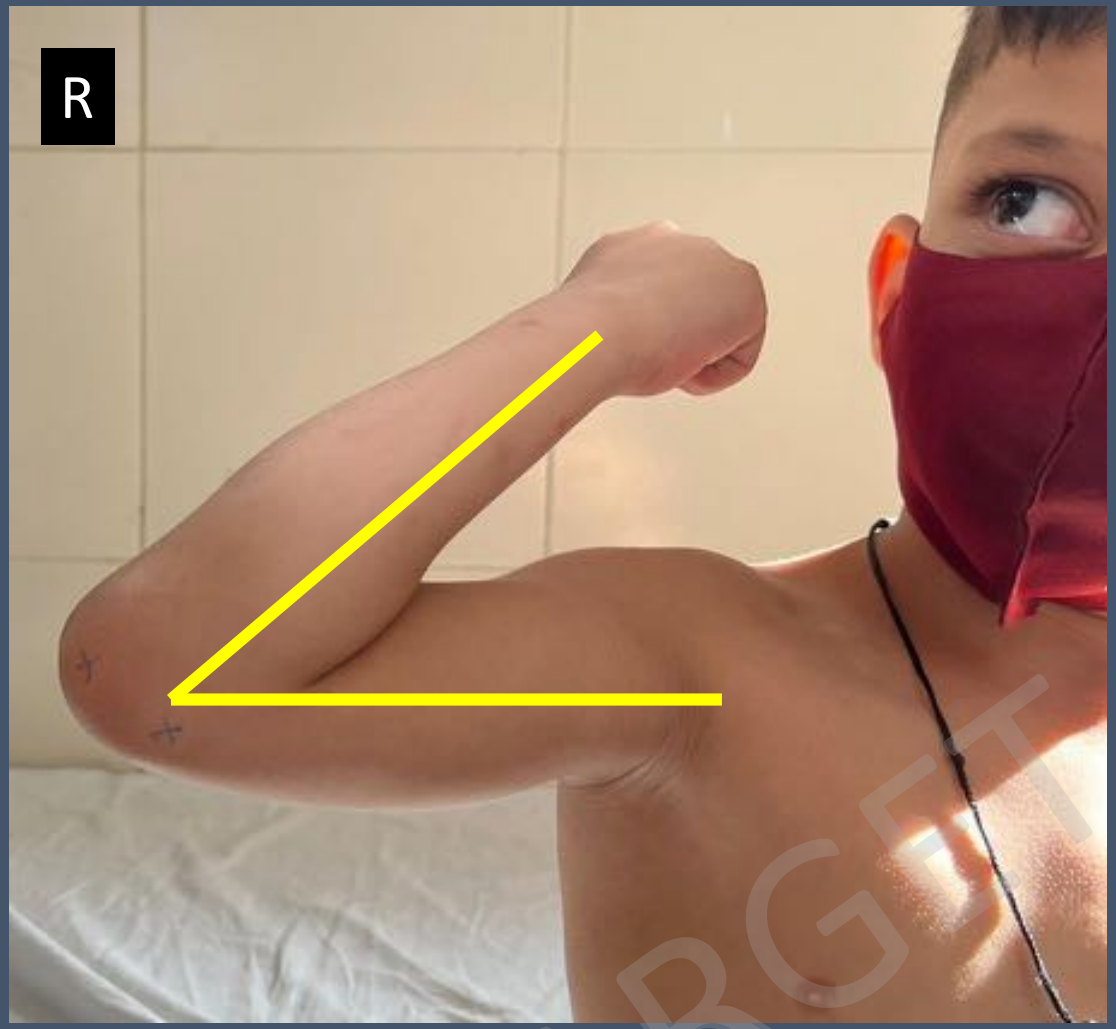




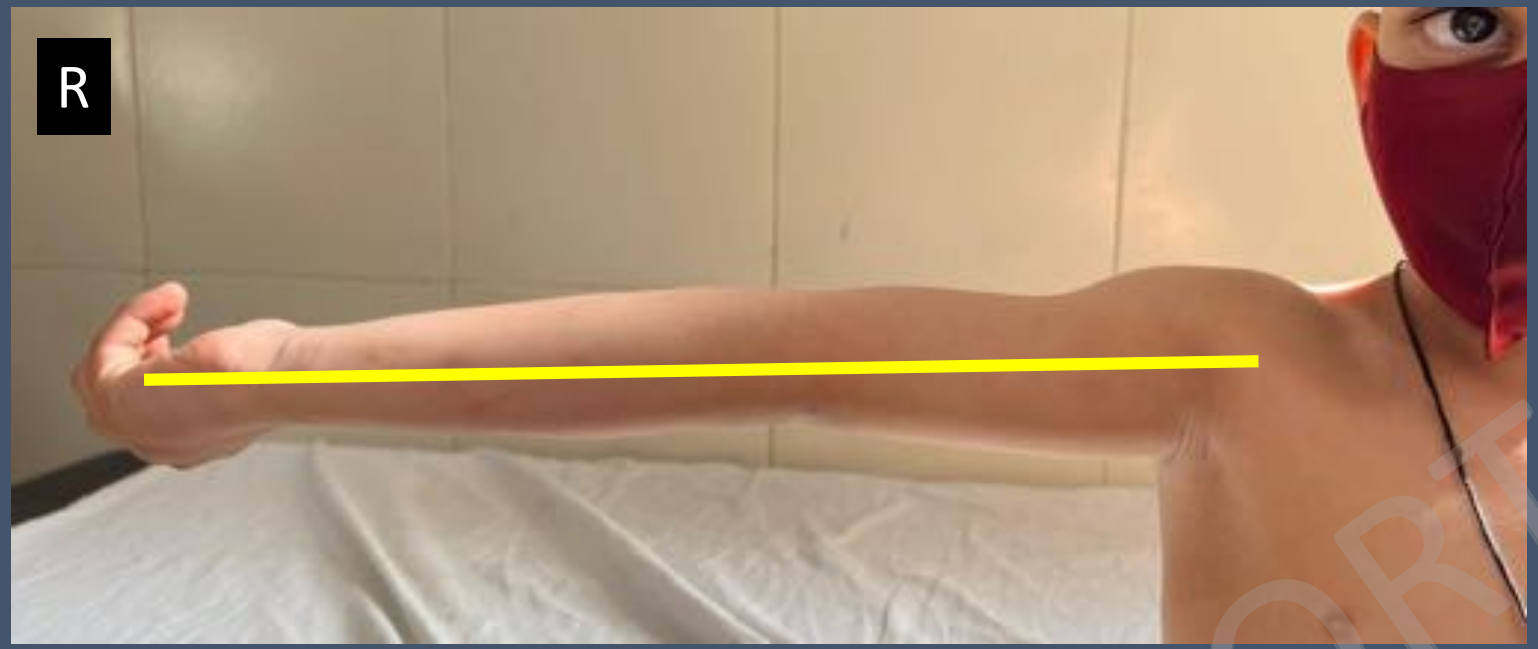


Three point bony maintained.

Isosceles triangle in flexion
and a straight line in extension.



Elbow flexion on
Rt side was possible upto 135°
Lt side upto 115°.

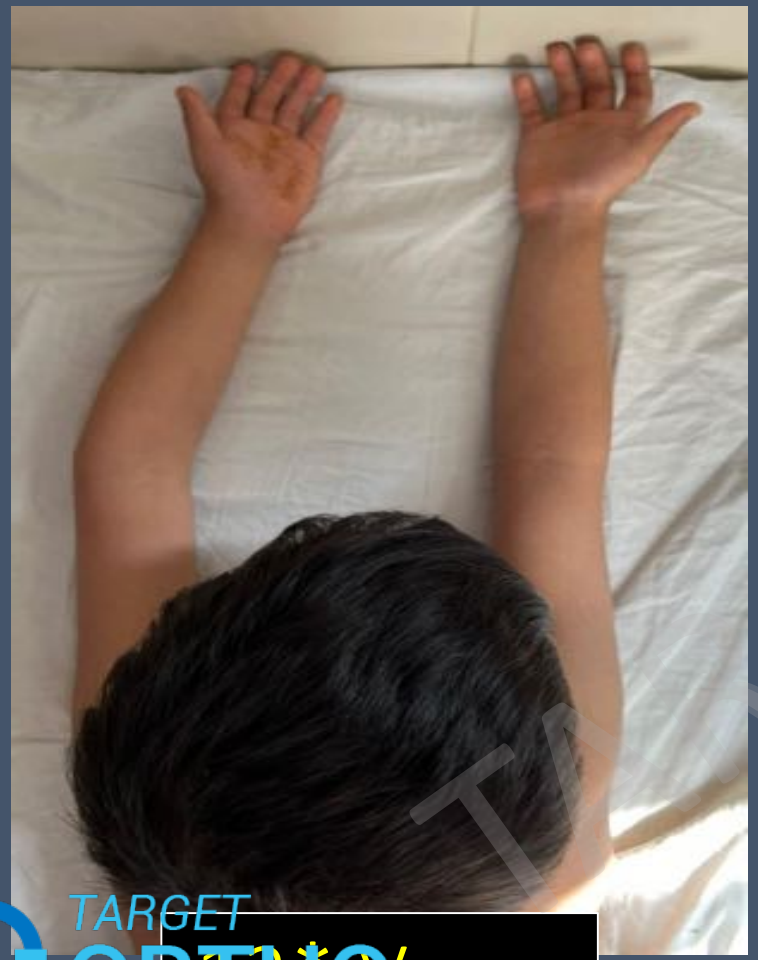


Extension possible on the right side was upto 0°

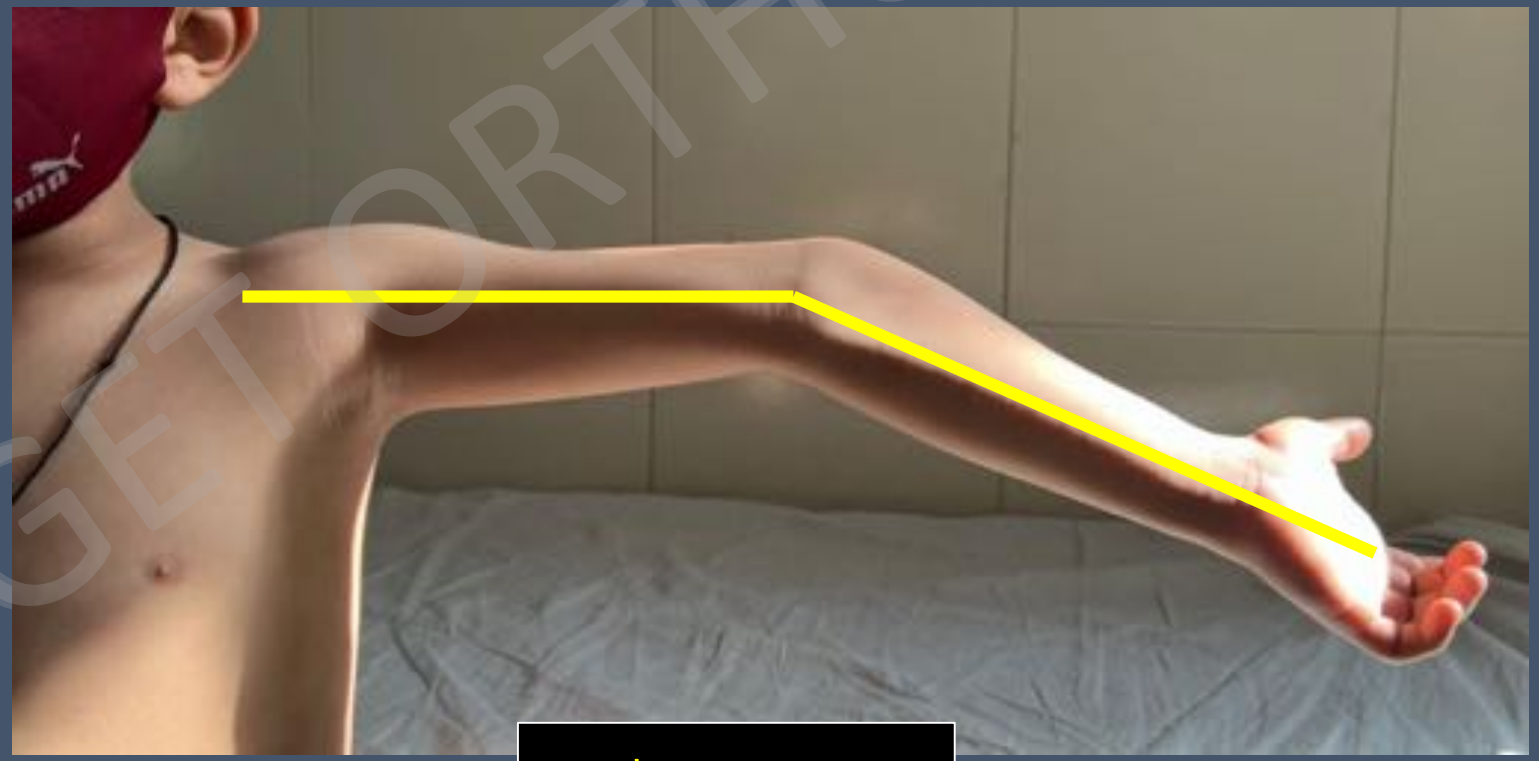
But on the left side was 20° of hyperextension

- No rotational malalignment.
- No Distal neurovascular deficit

Three Plane deformity Assesment



12* Varus



20* Extension

No rotation

Varus angle : 12°

Varus angle : 12°

Baumann angle: 93°

Is Cubitus Varus only a cosmetic Problem?

- Posterolateral rotatory instability of the elbow (PLRI)
- b. Lateral condylar fractures
- c. Snapping medial triceps
- d. Ulnar nerve instability

Surgical Options

Simple closing-wedge osteotomies

Step Cut

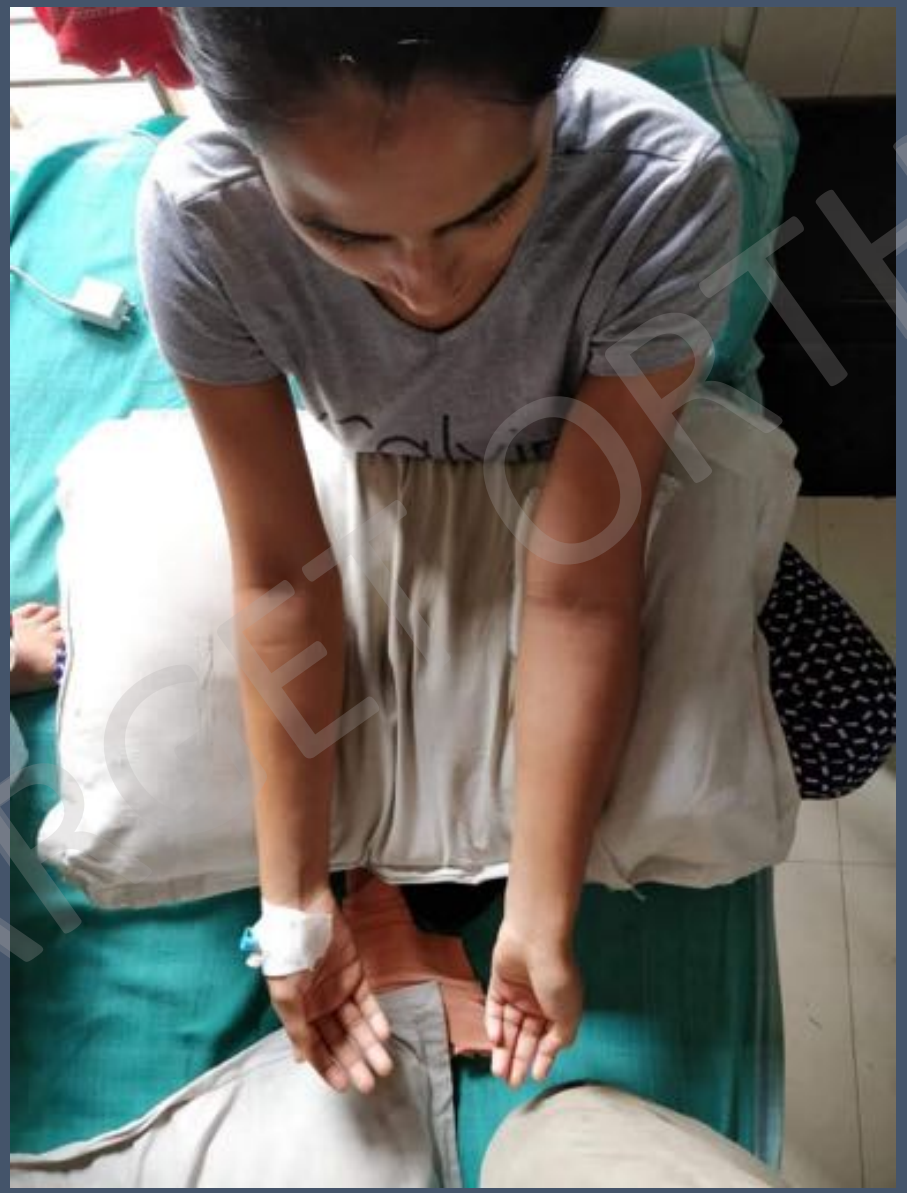
Dome

Lateral prominence

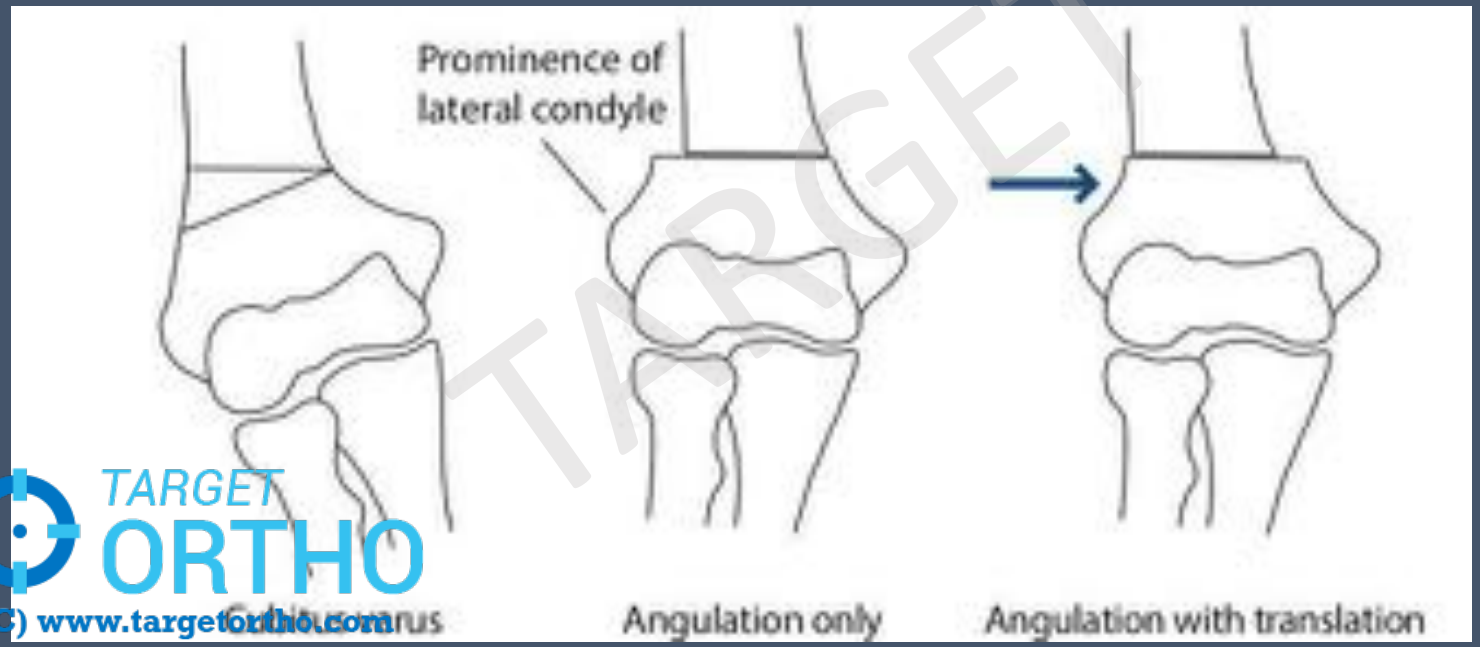
Simple closing-wedge osteotomies

Extensive dissection

Step Cut/ Dome

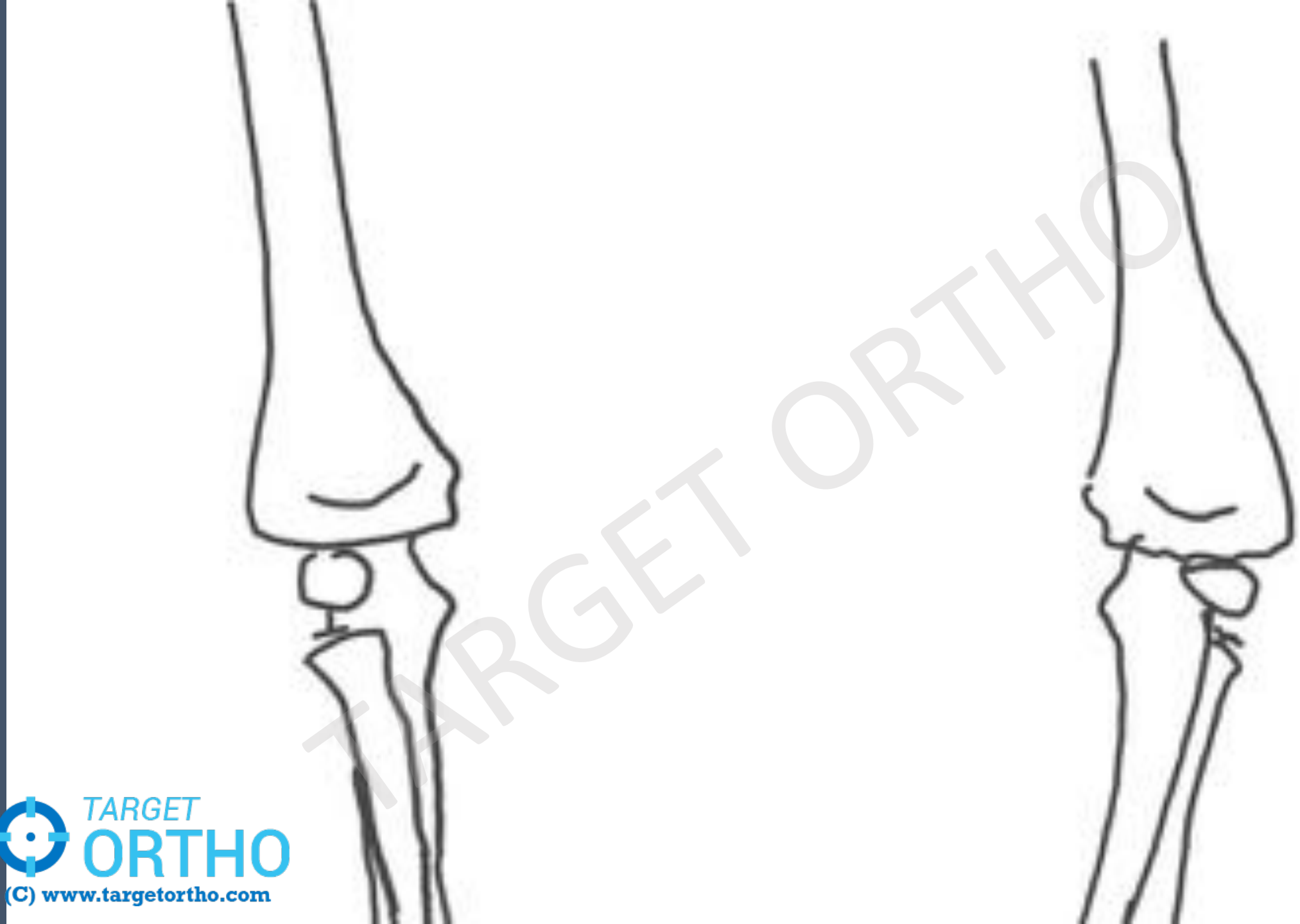


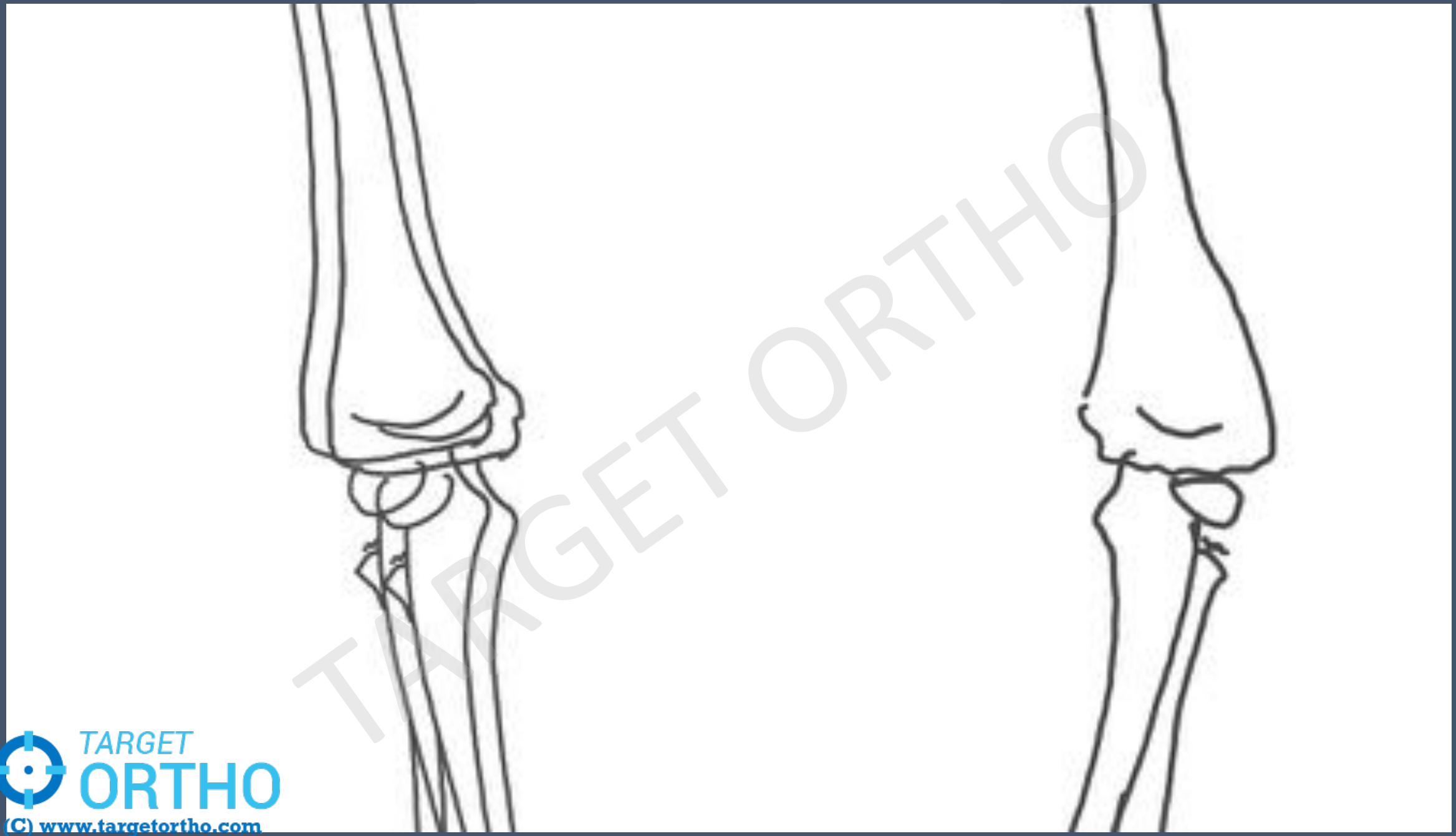
Away from CORA

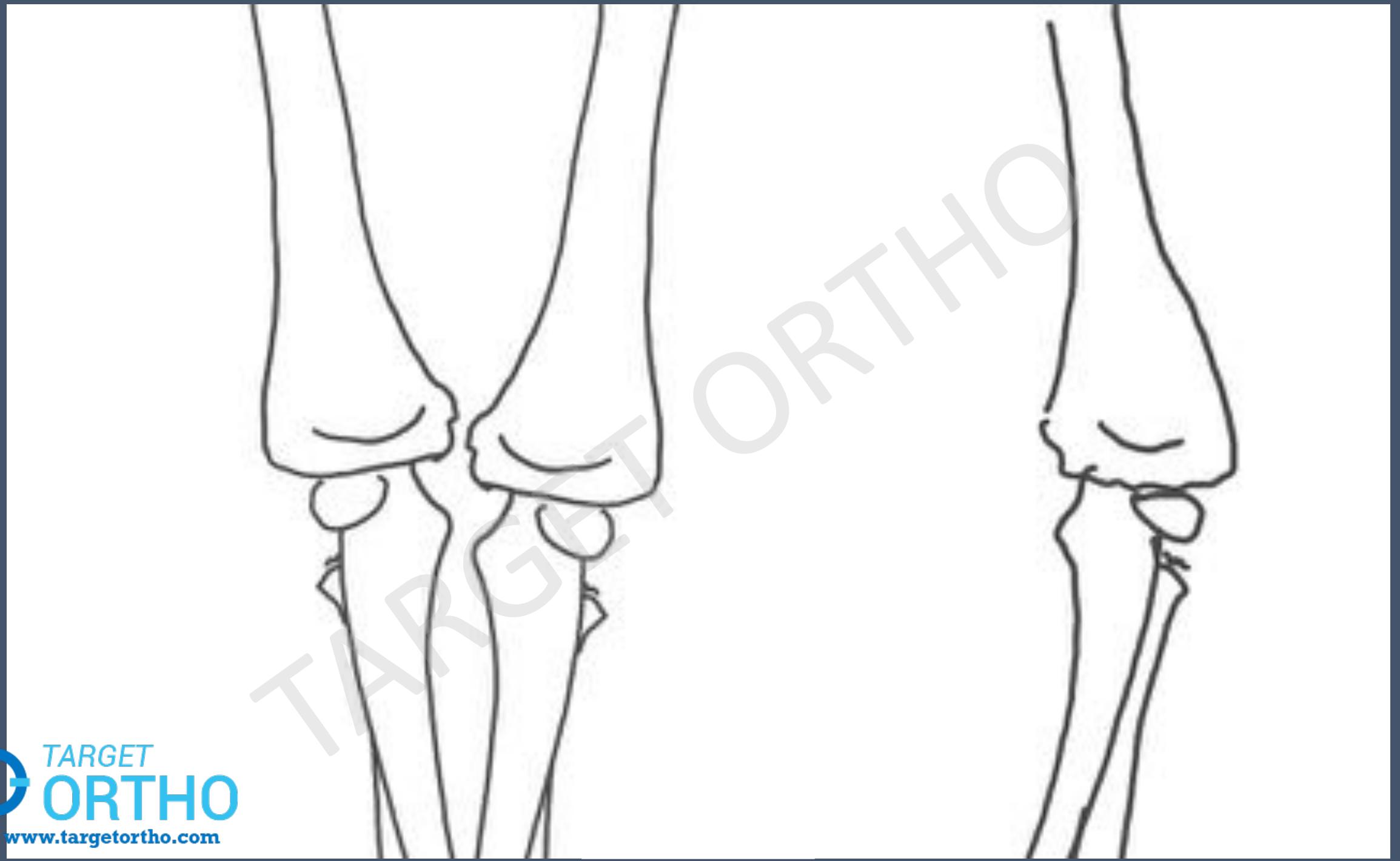


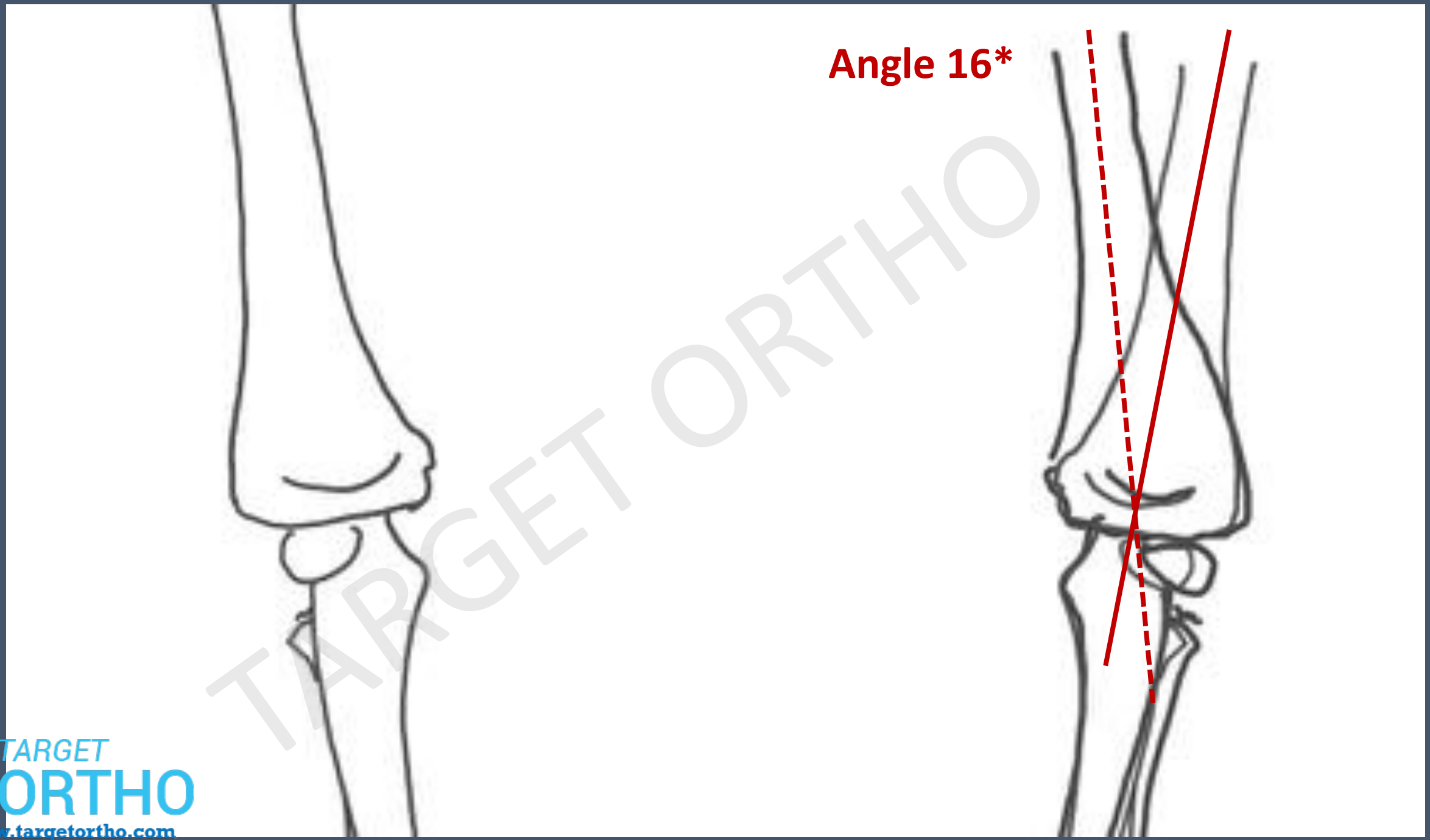
Planning for Oblique wedge osteotomy

- Approach: TR/BR Interval
- Implant: K wire/ 2.5-3.5 mm / Reconstruction plate

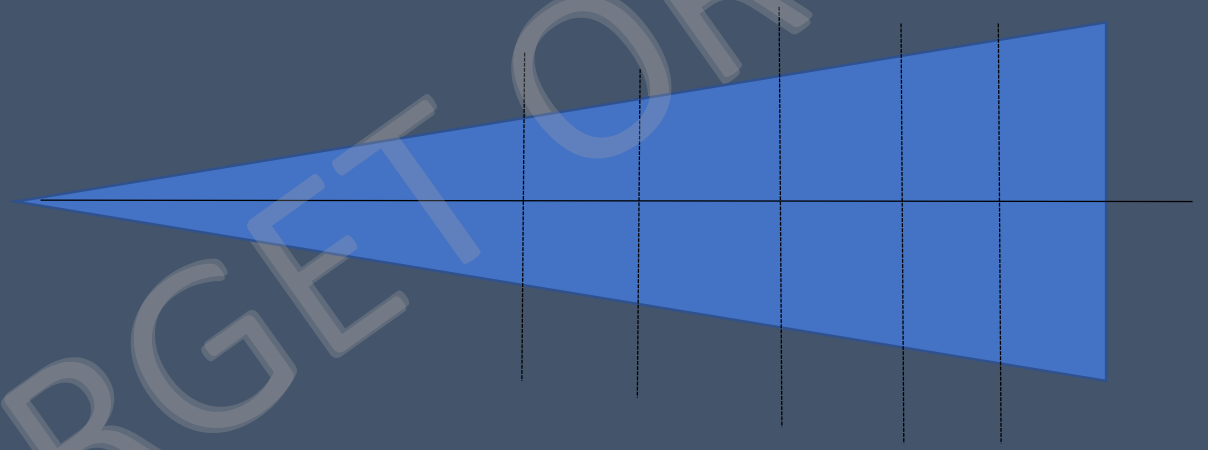








Triangle with 16* wedge cut and sterilized.
Or
Can use a sterile Goniometer



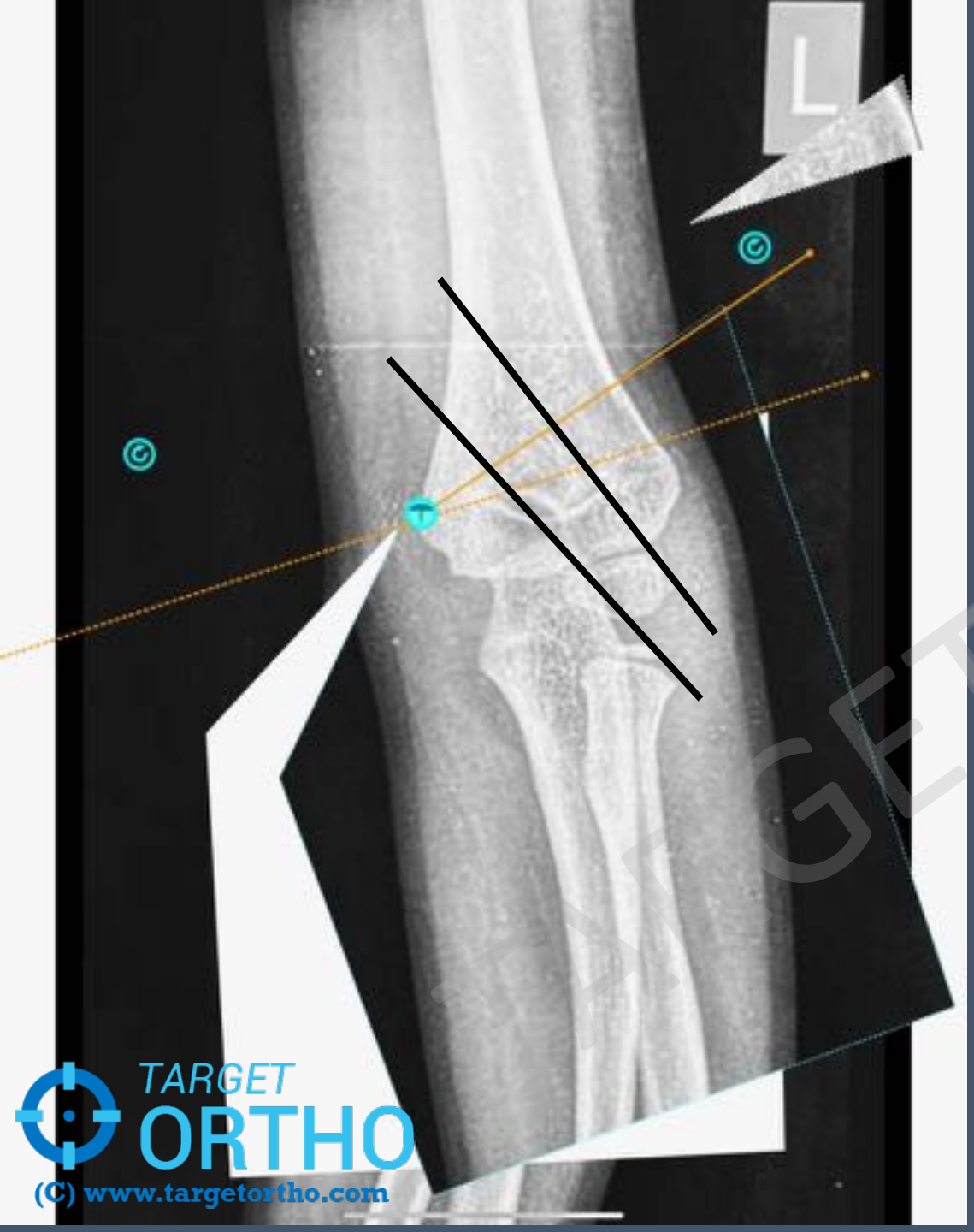
Plan a V according to the angle of correction

Place the apex of the V just above the medial epicondyle.

(1) the distal cut is just superior to the olecranon fossa, and
(2) the proximal cut length is greater than or equal to the distal cut length

The distal osteotomy line is oblique to pathologic joint line

Wedge is removed



With a medial intact hinge, the osteotomy is closed.

Fixed with K wires.

JB&JS
ESSENTIAL SURGICAL TECHNIQUES

SUBSPECIALTY PROCEDURES

Oblique Lateral Closing-Wedge Osteotomy for Cubitus Varus in Skeletally Immature Patients

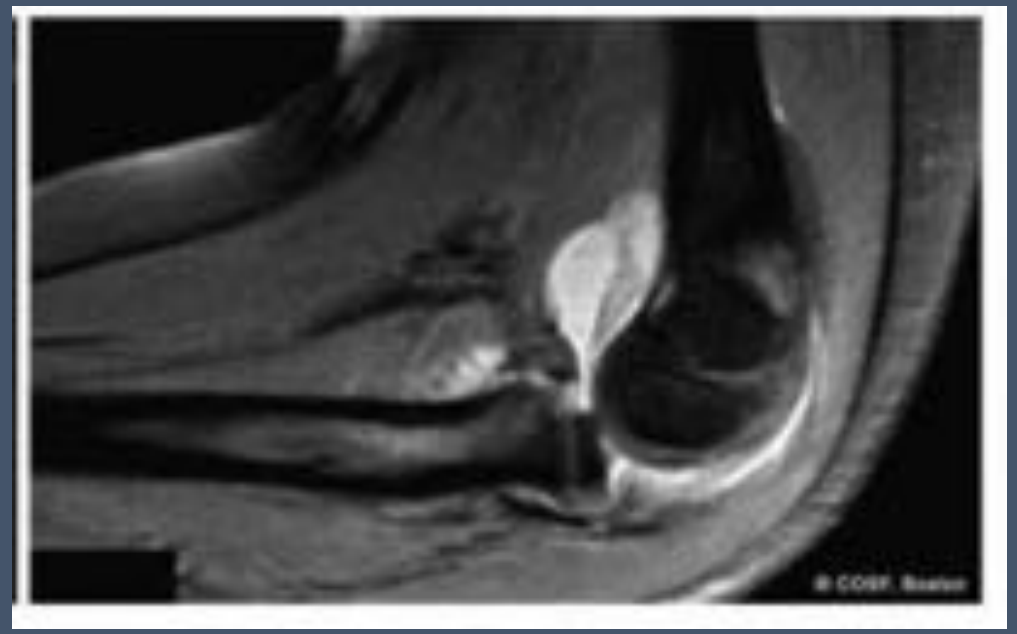
Dustin A. Greenhill, MD, Scott H. Kozin, MD, Michael Kwon, MD, Martin J. Herman, MD

Indications			
Bilateral cubitus varus or valgus in child with chromosomal anomaly	Unilateral cubitus varus or valgus + Mild deformity + No risk of progression (no growth plate damage) + Parents or child very concerned about deformity	Unilateral cubitus varus or valgus + Moderate or severe deformity + No risk of progression (no growth plate damage)	Unilateral cubitus varus or valgus + Mild or moderate deformity + Progression present (growth plate damage present)
⇩ No intervention	⇩ Closed wedge supracondylar osteotomy	⇩ Closed wedge supracondylar osteotomy + Displacement of distal fragment (medially while correcting varus OR laterally while correcting valgus)	⇩ Defer surgery until close to skeletal maturity and follow guidelines as in column 2 or 3 *Intervene earlier if deformity becomes severe or if joint instability develops*
Treatment			

Elbow “ TRASH “ Lesion

- The Radiologic Appearance Seemed Harmless

TRASH Lesions
Unossified Medial Condylar Humerus fracture
Unossifies transphyseal distal humerus fracture
Entrapped Medial epicondylar fractures
Osteochondral fracture- Dislocation
Radial head compression fracture with RC subluxation
Monteggia
Lateral condylar avulsion Shear



Thank You