

Proximal Humerus

Shaft Humerus

DR ANURAG TIWARI

MBBS (MAMC), MS Ortho (MAMC), DNB, MNAMS, FASM

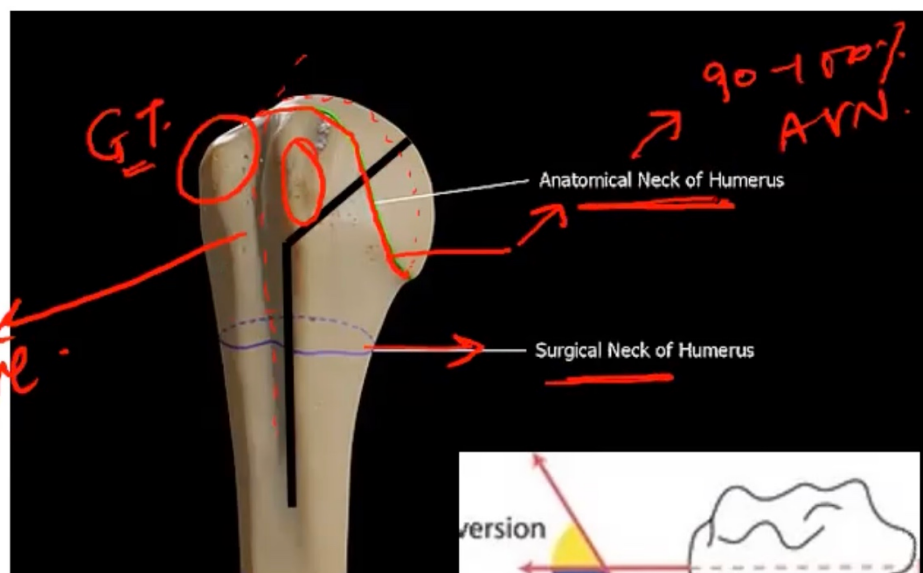
Fellow, Joint Replacement, USA

Faculty, Target Ortho

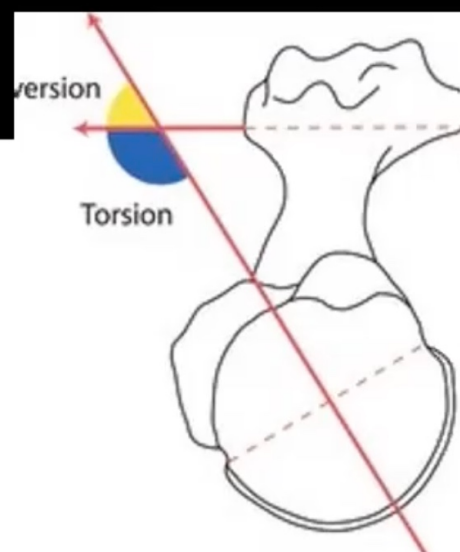
Anatomy

- Bony landmarks-

Brachial groove

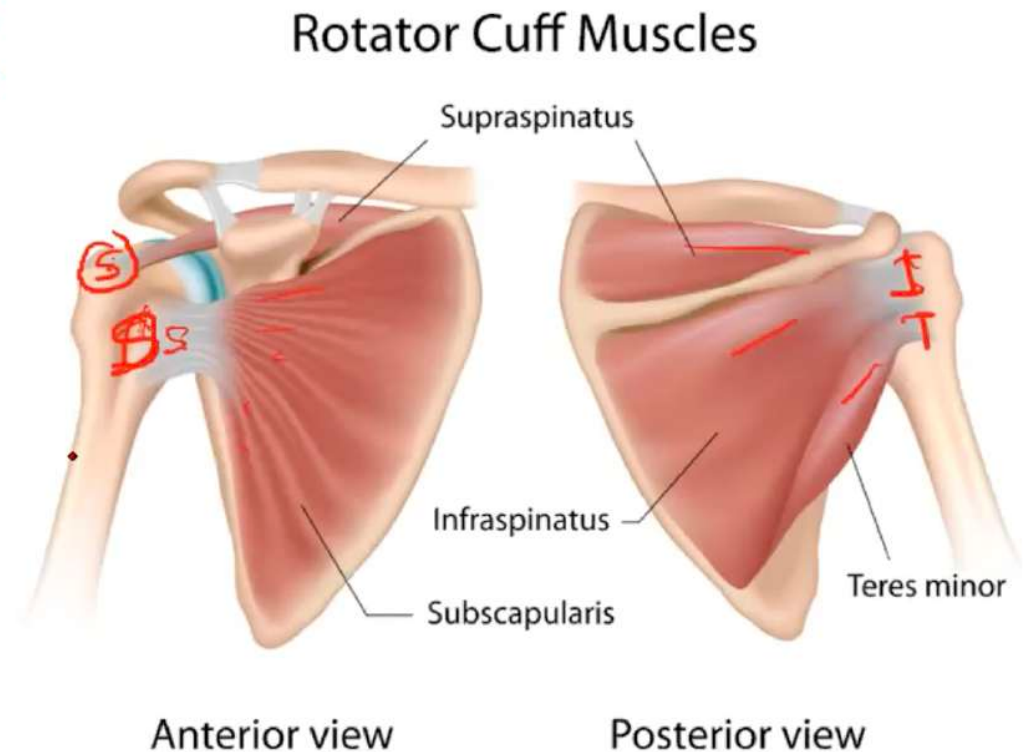


- Neck shaft angle = 135
- Retroversion = 20



Muscle attachments

- ✓ Rotator cuff muscles - SITS
- ✓ Deltoid
- ✓ Pectoralis major



Displacements

Posterior, Superior, Medial and
External rotated

Greater tubercle –

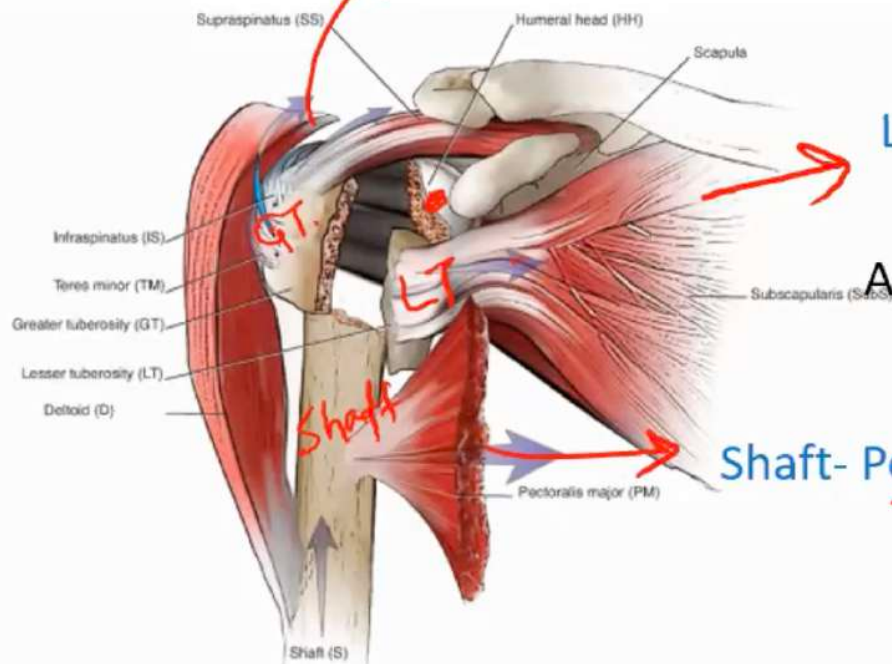
[Supraspinatus,
Infraspinatus, teres minor

Lesser Tubercle- Subscapularis

Anterior, Medial and Internal rotated

Shaft- Pectoralis Major

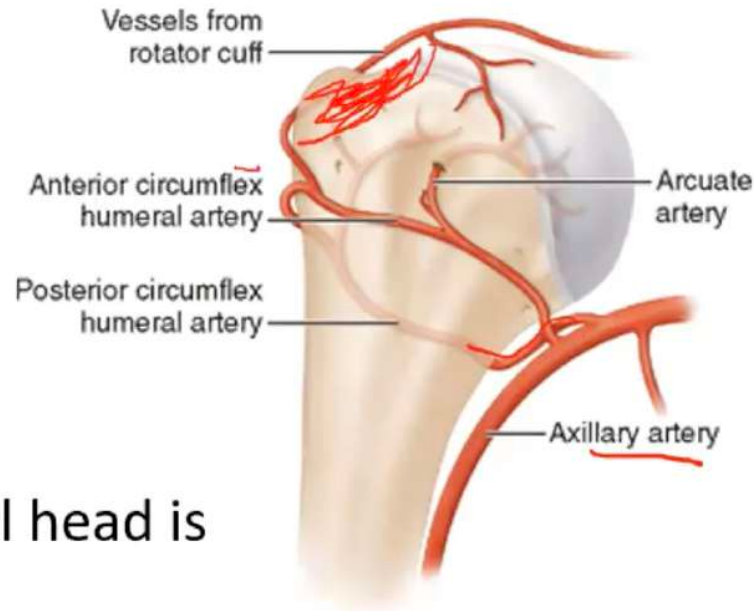
Medial shift



PROXIMAL HUMERUS & SHAFT HUMERUS #: DR ANURAG TIWARI

Blood supply of humeral head

1330



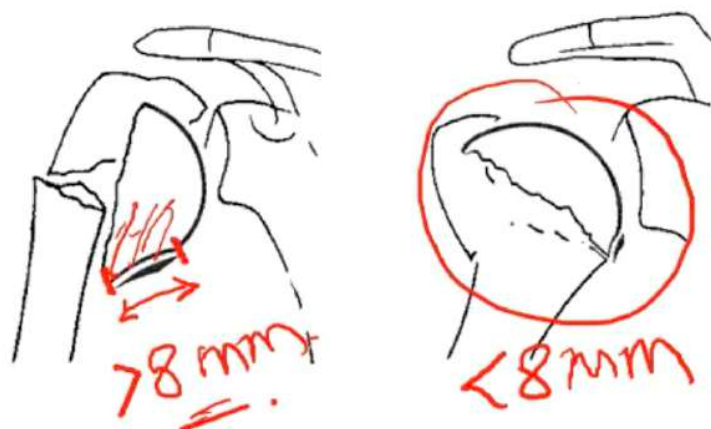
- Main Blood supply to humeral head is
- by which branch

- A. Anterior Circumflex Humeral artery ⁶⁷
- ~~B. Posterior Circumflex Humeral artery~~ ³³
- C. Brachial Artery ₀

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Predictors of humeral head ischemia

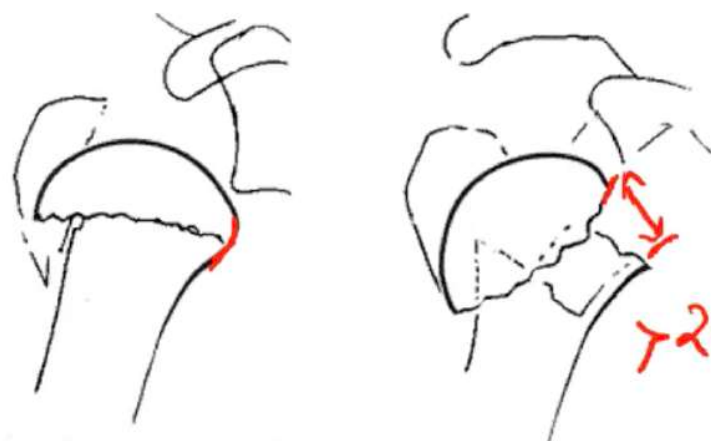
- Hertel Criteria



medial metaphyseal extension

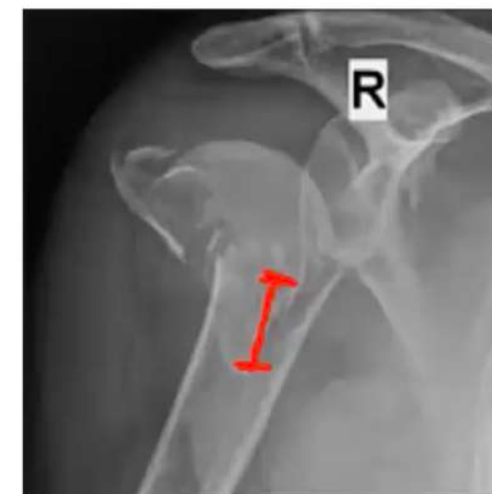
AVN.

<8mm. } ↑ Ischemia



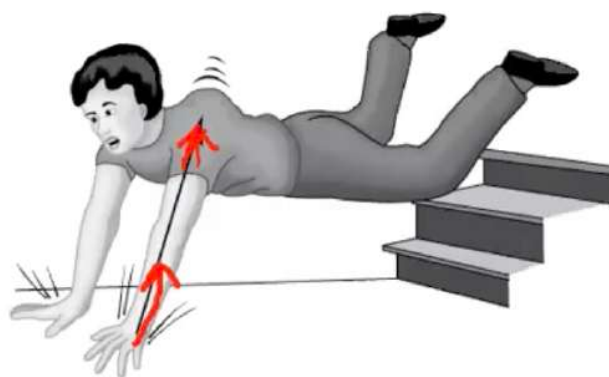
Medial hinge displacement

>2mm. >2mm.



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Mechanism of injury



Fall on outstretched hand



Direct fall on shoulder

Young



Trivial fall - Osteoporosis

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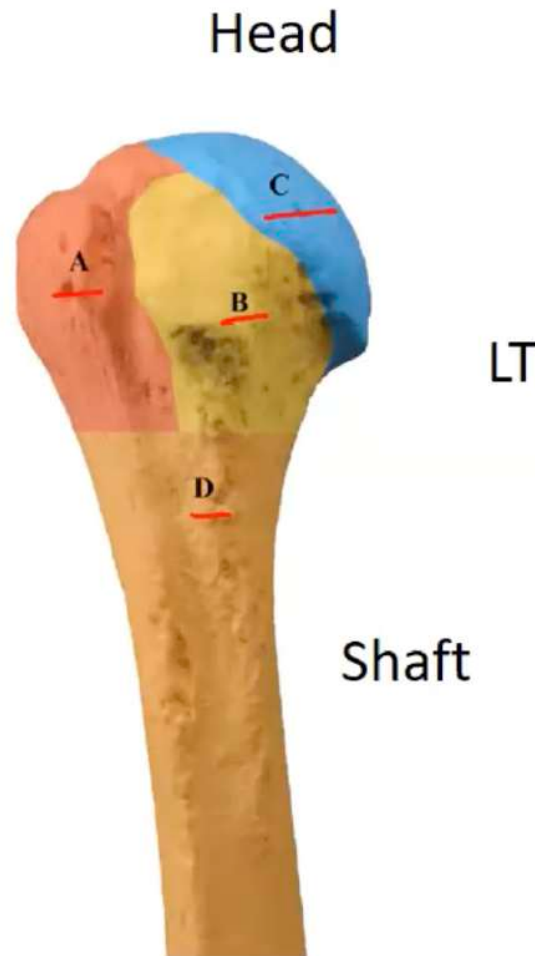
Classification

four part anatomy

Four part anatomy
Concept originally given by-

- A. Hertel
- ☒ B. Codman *20%*
- C. Watson Jones
- D. Neer *80%*

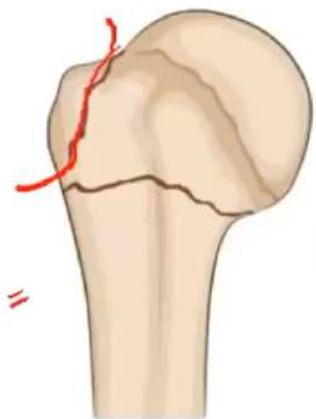
GT



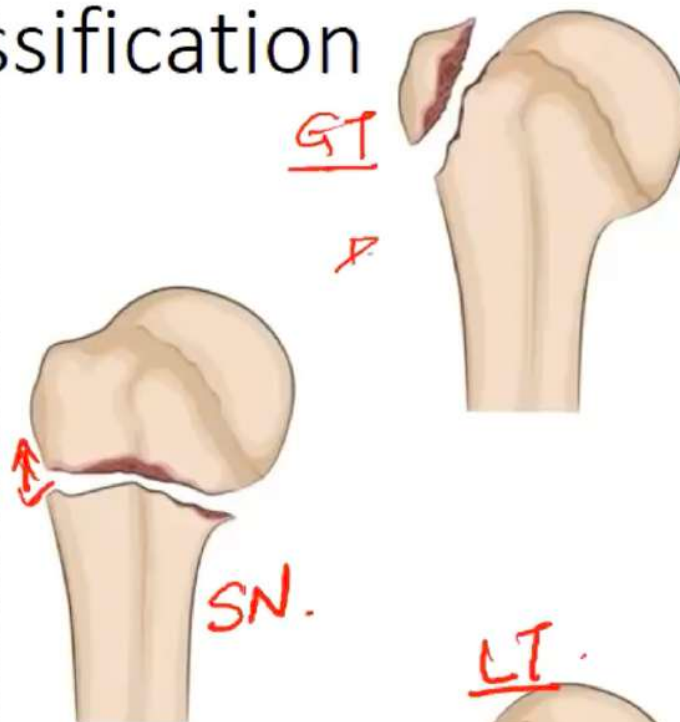
Neer's Classification

- A Part-

✓ $>1cm$
✓ $>45^\circ$



1 PART



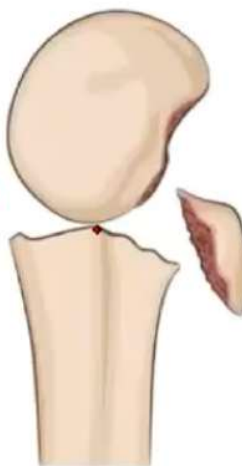
2 PART



LT



GT + SN



3 PART

4 PART

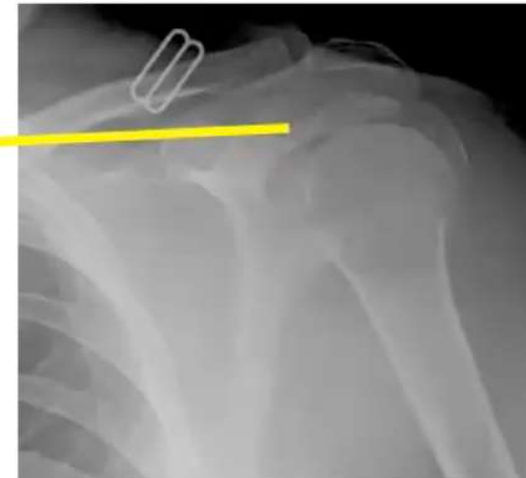
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✓ • Fracture dislocation



✓ • Articular surface

"Double shadow"
↓
"head split"



Clinical presentation

- Pain, Swelling, Bruise
- Crepitus, Loss of transmitted movements

- What is Terrible triad of shoulder?
- A. Humerus head # + shoulder dislocation + GT #
- B. SN # + LT # + GT #
- C. SN # + Shoulder dislocation + Glenohumeral ligament injury
- D. GT # + Shoulder dislocation + Nerve injury

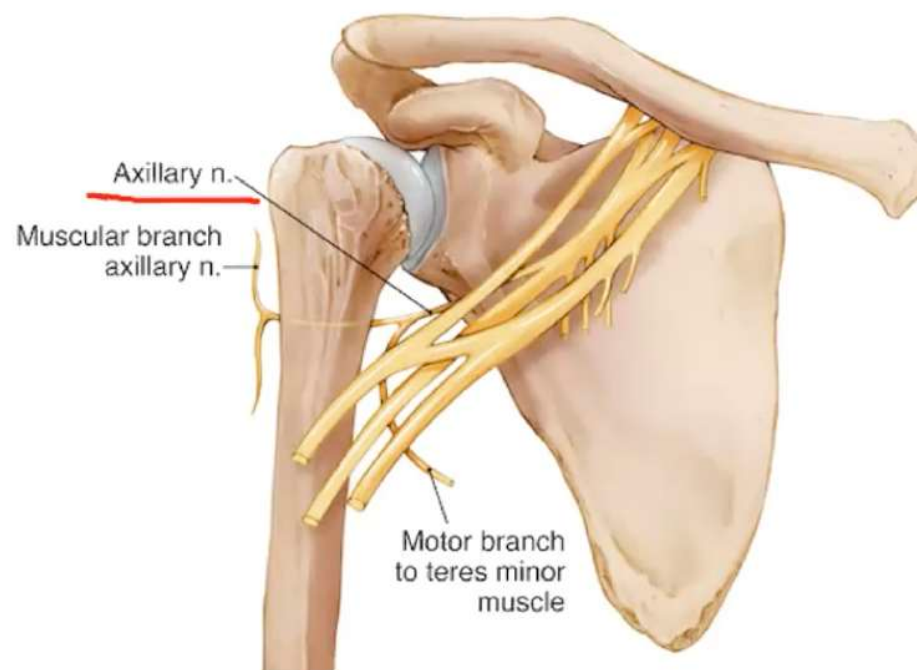
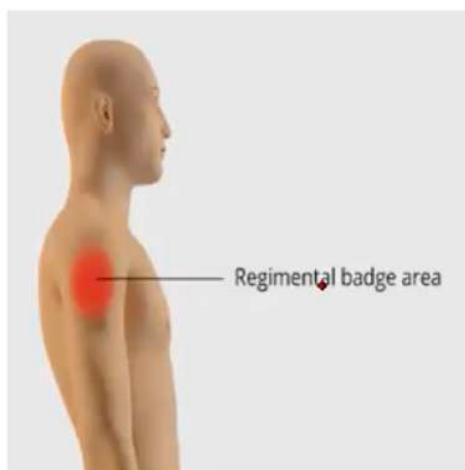
→ Axillary N / Brachia.

Nerve injury

• Motor-

Deltoid
Teres minor

• Sensory



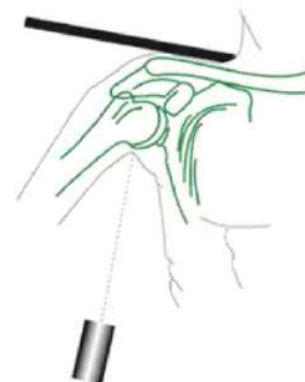
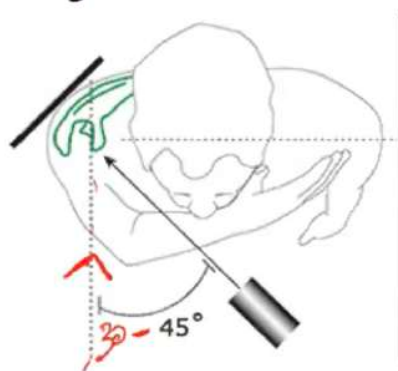
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X-ray

- X-ray AP view of shoulder joint to be taken as

B. 30-45° lateral tilt.

X-ray Projection



AP.



Grashey-



SCAPULAR Y

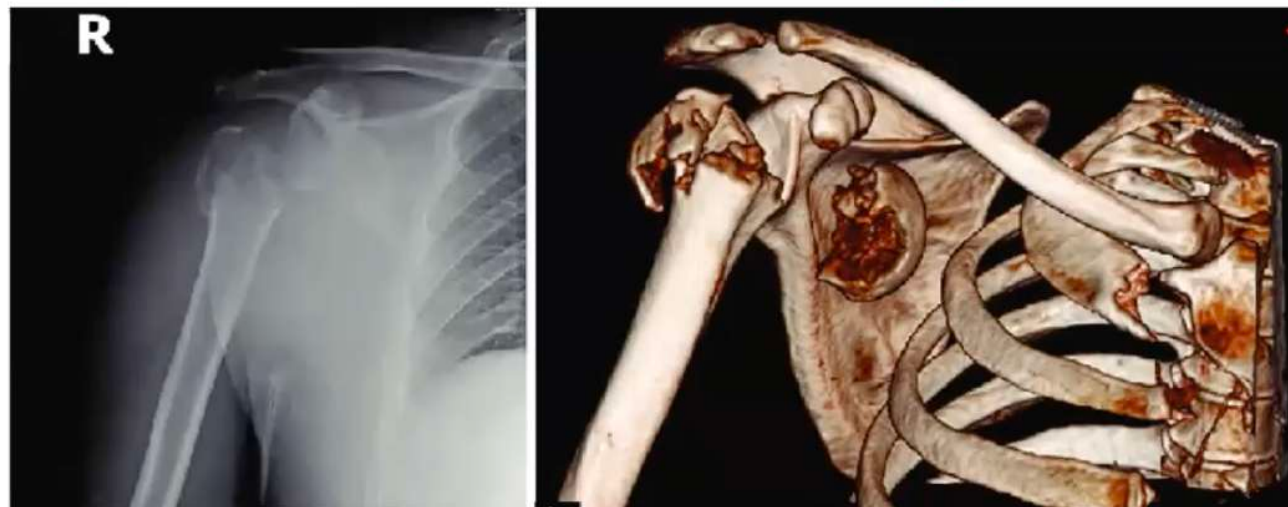


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Role of CT scan

- ✓ Comminution
- ✓ Displacement
- ✓ Osteopenia
- ✓ Planning

3D reconstruction



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Treatment

Indications-

① Stable #

② Undisplaced or minimally displaced #

• Non operative ③ Patient not fit for surgery

④ Elderly patients with low functional demands

GT# <5mm
 ↑
 1cm
 <45° angulation

• Operative

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Non operative

- Apply Arm Pouch sling
- Start pendulum exercises after 1 week
- Start isometric exercises at 3 weeks
- Strengthening exercises at 6 weeks
- ~~Repeat radiograph to check for displacement.~~



Operative options

- CR + percutaneous fixation
- Trans osseous suture fixation
- Intramedullary Nail
- ORIF with Plate
- Shoulder Replacement

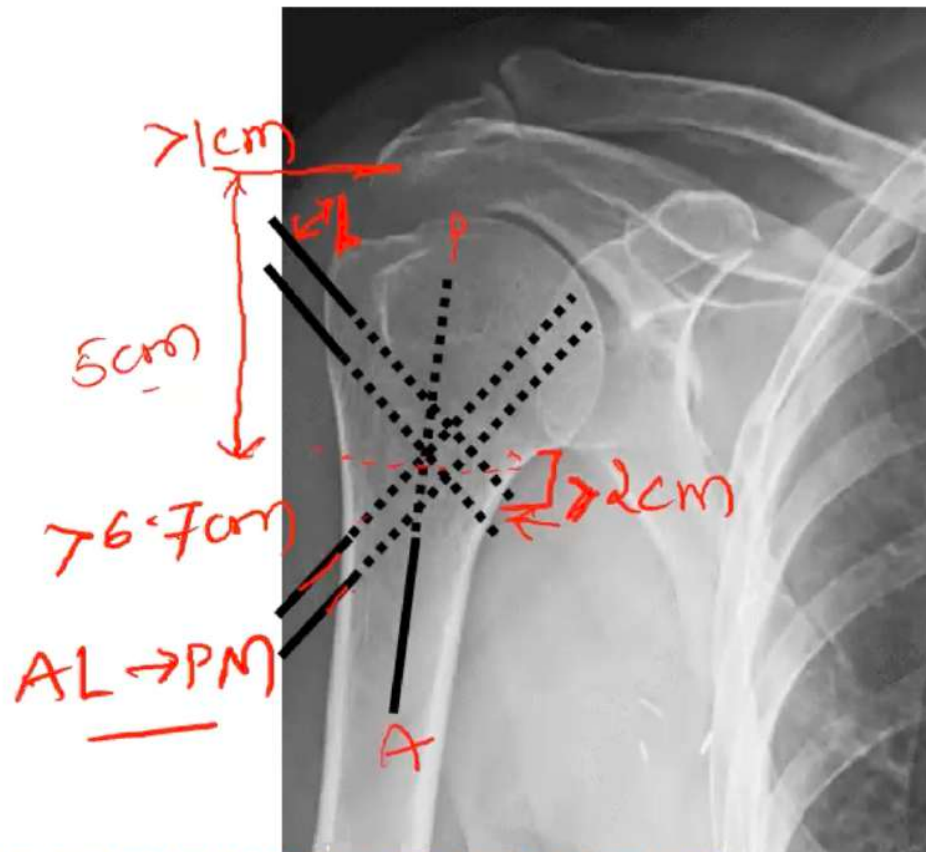
Close reduction and percutaneous pinning

- Two part, three part
- Good bone quality, minimal comminution and intact medial calcar
 → varus.
- C/I –
- Comminution with poor bone quality
- Osteopenia
- Inability to reduce fracture

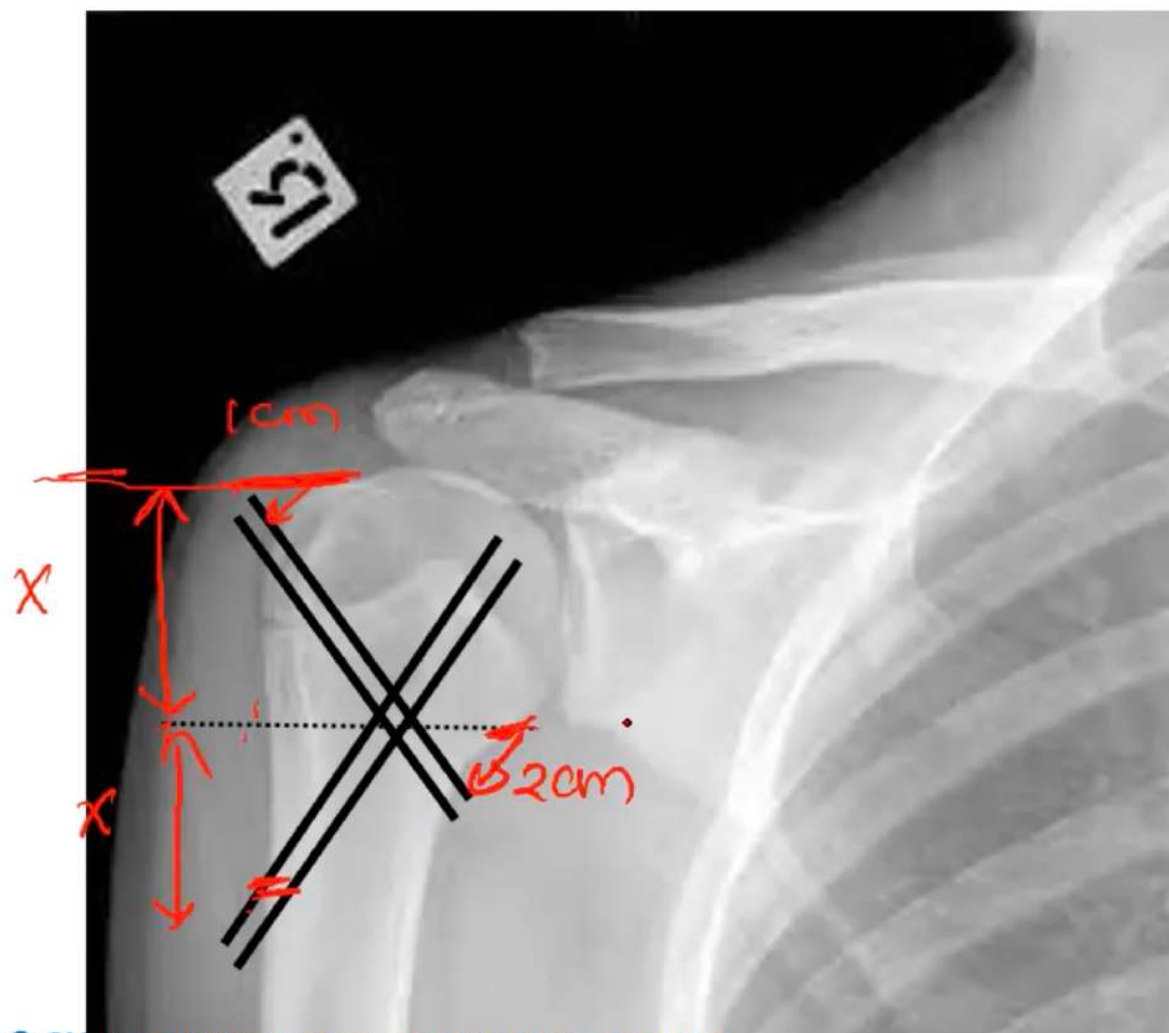


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- Thoren



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ORIF with Plate

→ "Gold standard"

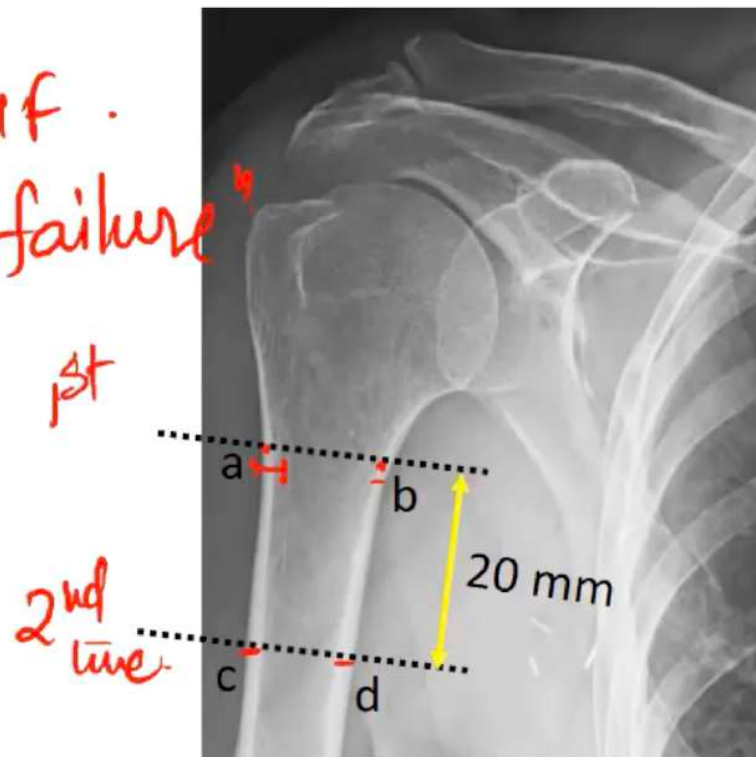
- Indications
- Two, three and four part # in young age ^{> 1cm}
- Displaced GT > 5mm (screw).
- Articular fracture
- Approach-
 ↓
 • Deltopectoral approach (Vth)

“For plate fixation – Bone quality should be good”

Combined average Cortical thickness Criteria-

> 4 mm → ORIF .
 • < 4 mm - If failure!

$$\frac{(a + b + c + d)}{2}$$



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- Which plate –

PHILOS.

5-7mm

- Position of plate-

- 2-4 mm posterior to bicipital groove

- 5-7 mm distal to GT tip

- Number of screws-

- Head- 4-6 screws

- Shaft- 3-4 screws



Prevent varus collapse- Calcar screws

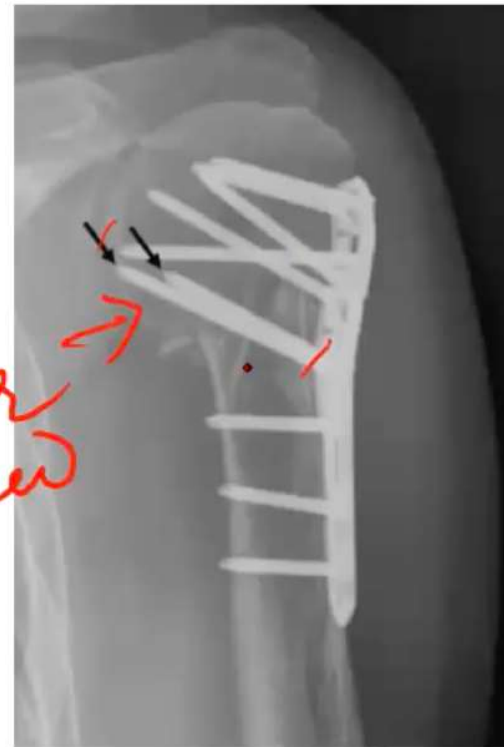
→ X



✓



Calcar
screw



Prevent varus collapse- Fibular grafting



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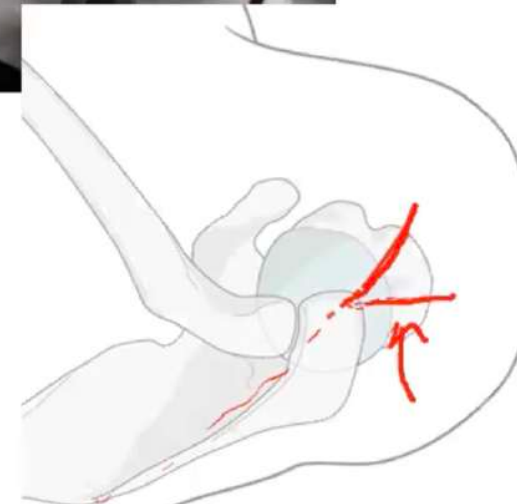
- Most common complication after plating of proximal humerus fracture?
- A. Screw perforation through humeral head *50%.*
- B. Non union *- 13%.*
- C. Avascular necrosis of humeral head
- D. Surgical site Infection *38%.*

0-7.

Humerus Nail

- Indications-
 - Displaced two part surgical neck #
 - Pathological #
 - Segmental – proximal humerus with shaft #
- Main Complication- Rotator cuff dysfunction-
Shoulder pain.
- “Give anterolateral incision and cut rotator cuff in line of its fibres”

3 - GPa
SN



SCAPTION

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Shoulder replacement

- Hemiarthroplasty

- Indications-

- Elderly with anatomic neck #,

- Three or Four part # severe comminution not reconstructable

- ~~Osteopenic bone~~

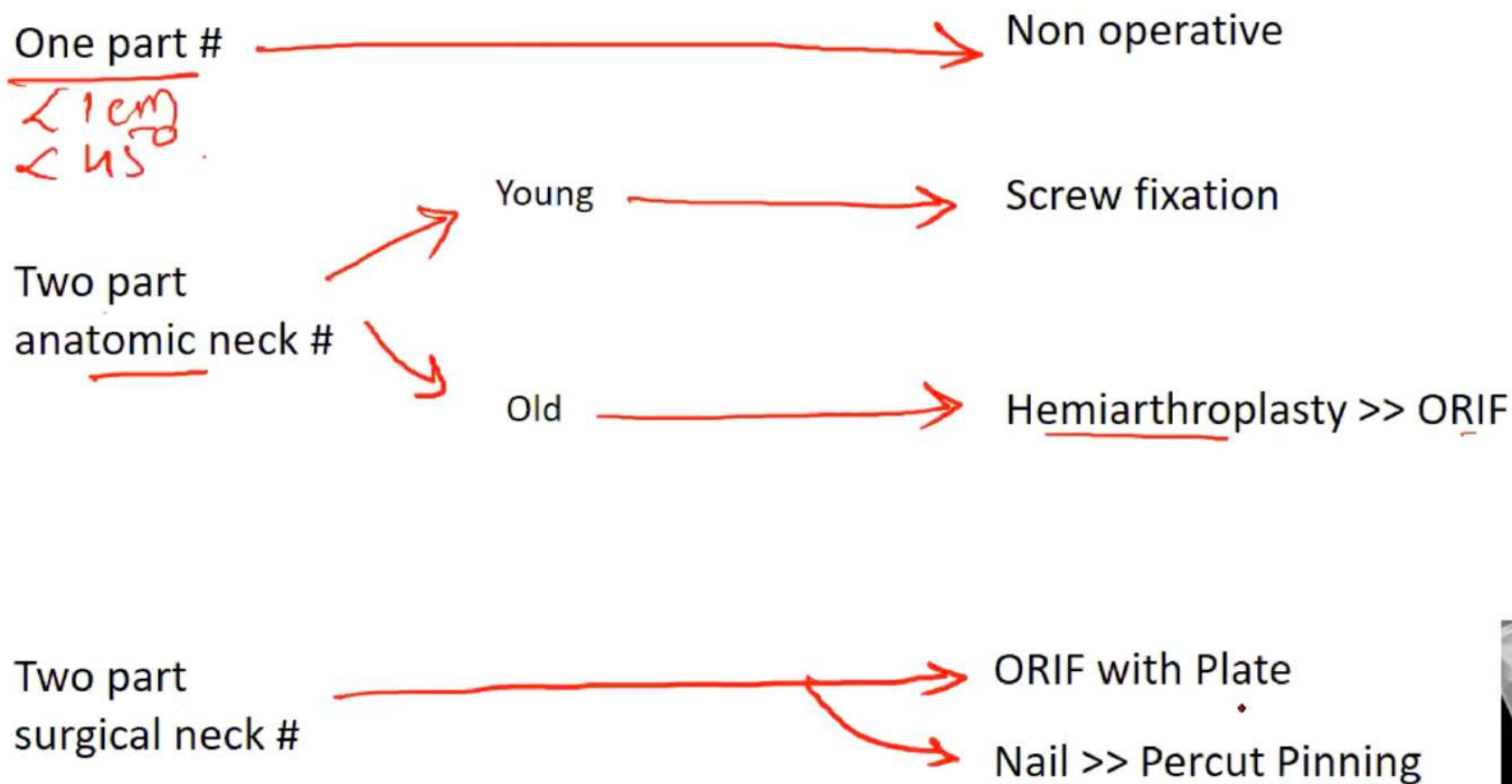
- ~~Head depression~~ > 40% involvement,

Early Hemi >>> Late Hemi



Algorithm

Proximal humerus



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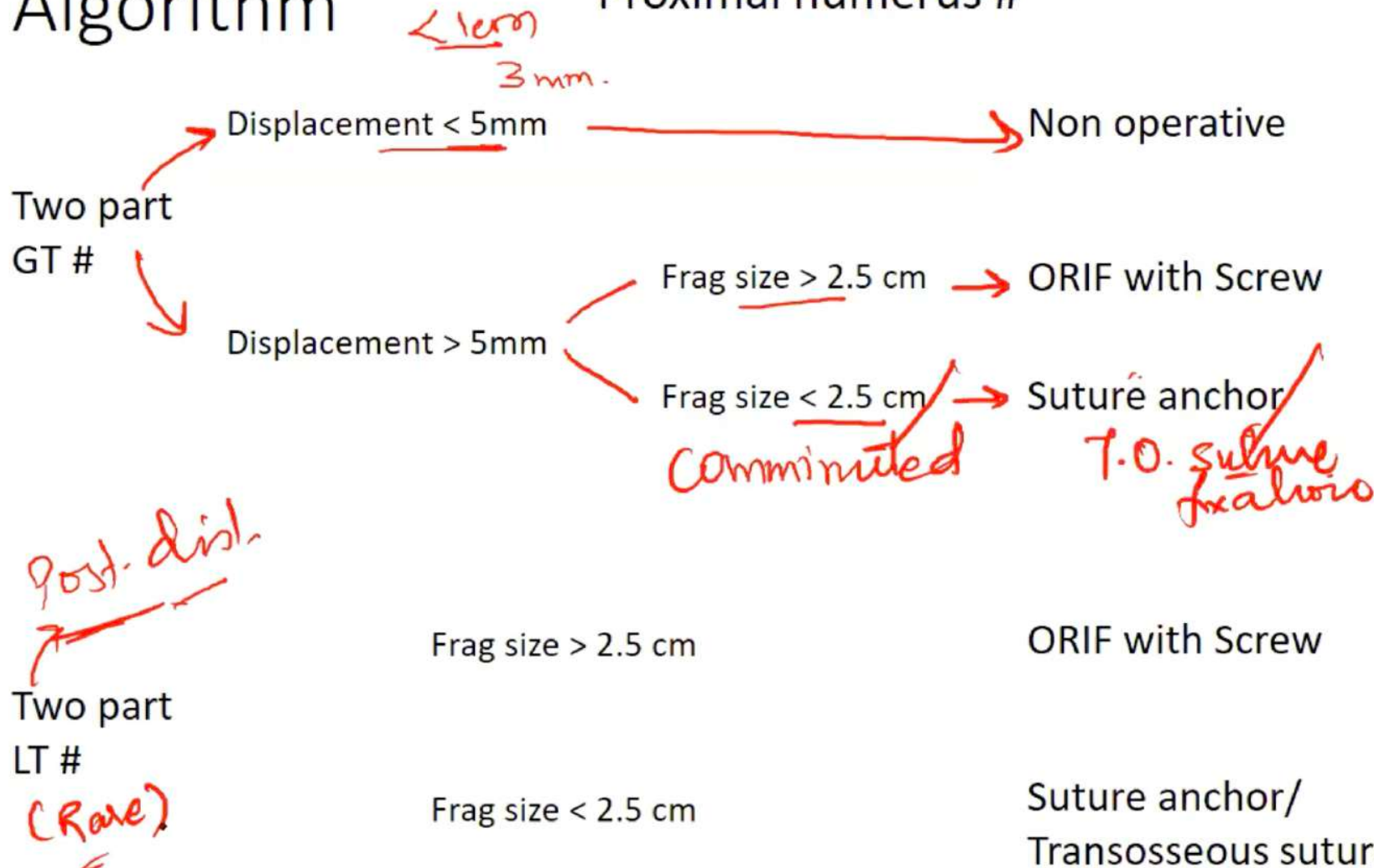
Algorithm

Proximal humerus



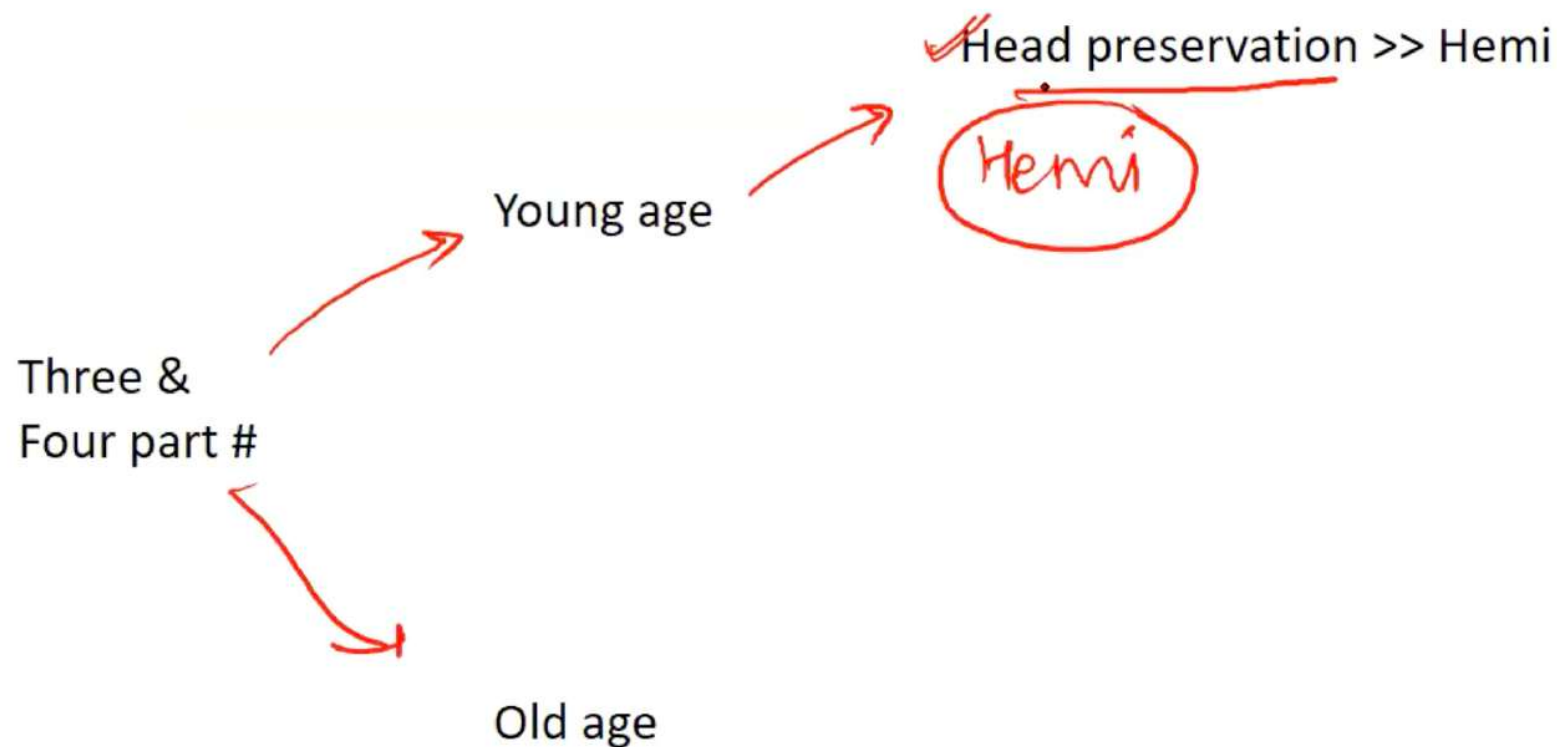
Algorithm

Proximal humerus



Algorithm

Proximal humerus #



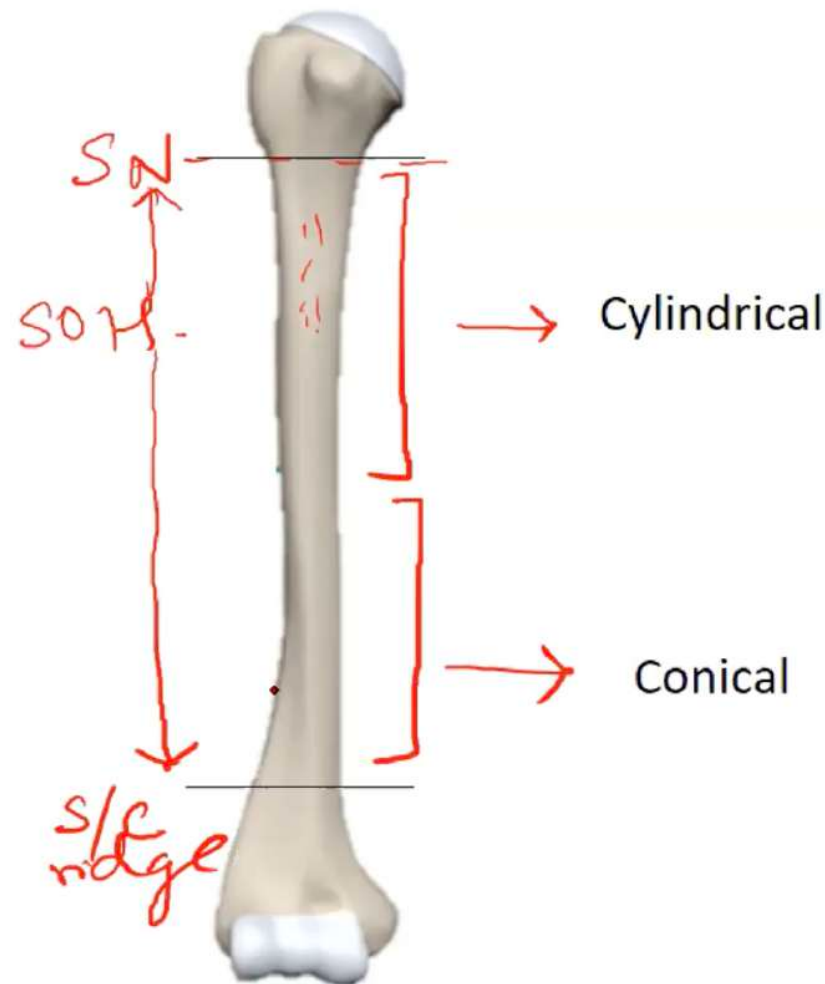
Hemi >> Head preservation

Complications-

- AVN
- Infection
- Non union
- Malunion
- Stiffness
- Post traumatic arthritis

Humerus shaft

- Anatomy



PROXIMAL HUMERUS & SHAFT HUMERUS #: DR ANURAG TIWARI

Clinical features

- Pain
- Swelling
- Bruise
- Crepitus
- Abnormal mobility

Nerve injury

- Radial nerve injury- ^{MC.}
- 3-30 % incidence
- 80-90% neuropraxia- recover spontaneously

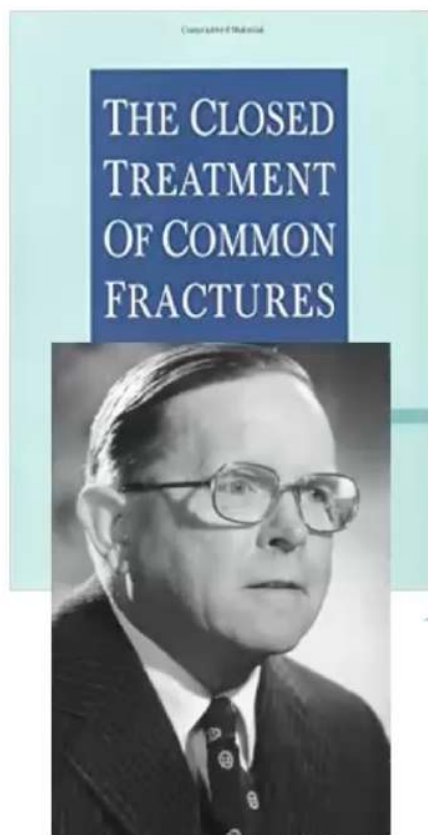
Xray



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- Non operative- Hanging Casts
U slab
Functional Brace
- Operative-
 - ① Plate
 - ② Nail
 - ③ External Fixation

Non operative treatment



"Humerus shaft"

"It is perhaps the easiest of the major long bones to treat by conservative methods."

Acceptability criteria

- ✓ 3 cm of shortening
- ✓ 20 degrees of angulation
- ✓ 30 degrees of Rotation

Shoulder:

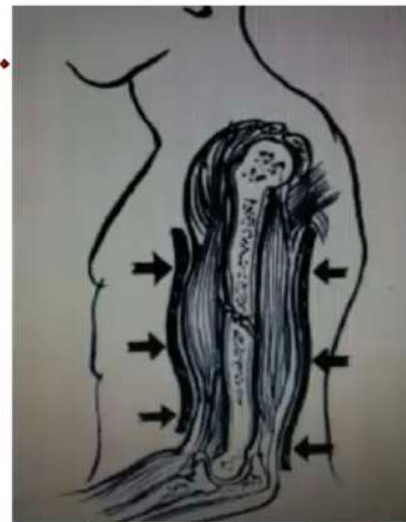
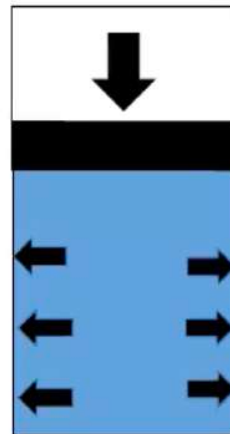
Elbow

Functional brace by Sarmiento

“Continuing function of limb while in fracture, encourages union.”

Muscle= Liquid

Liquid = Not compressible



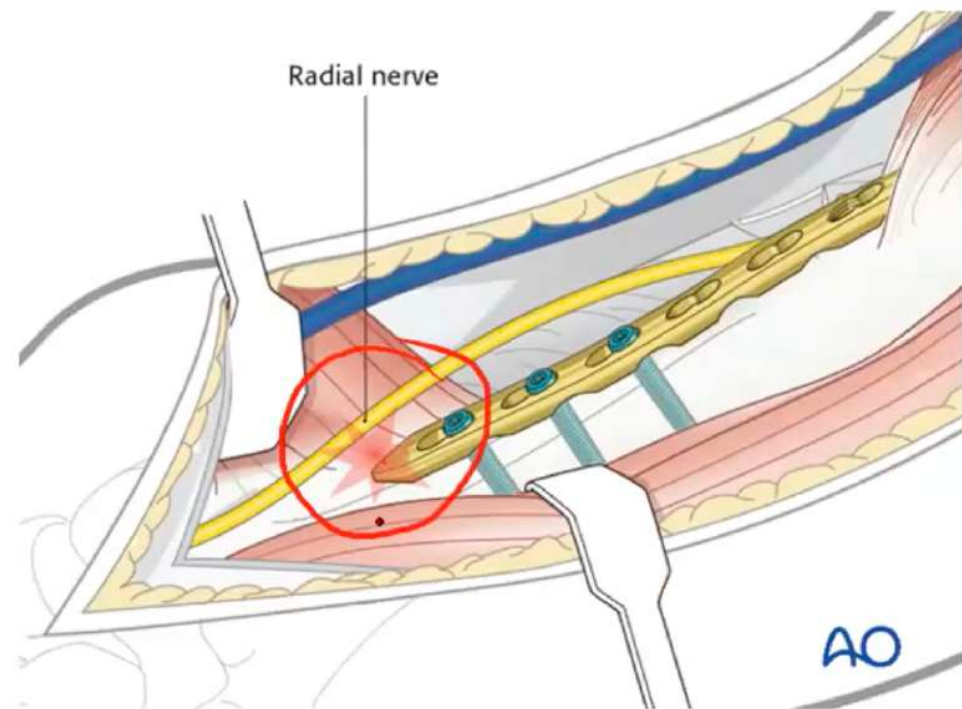
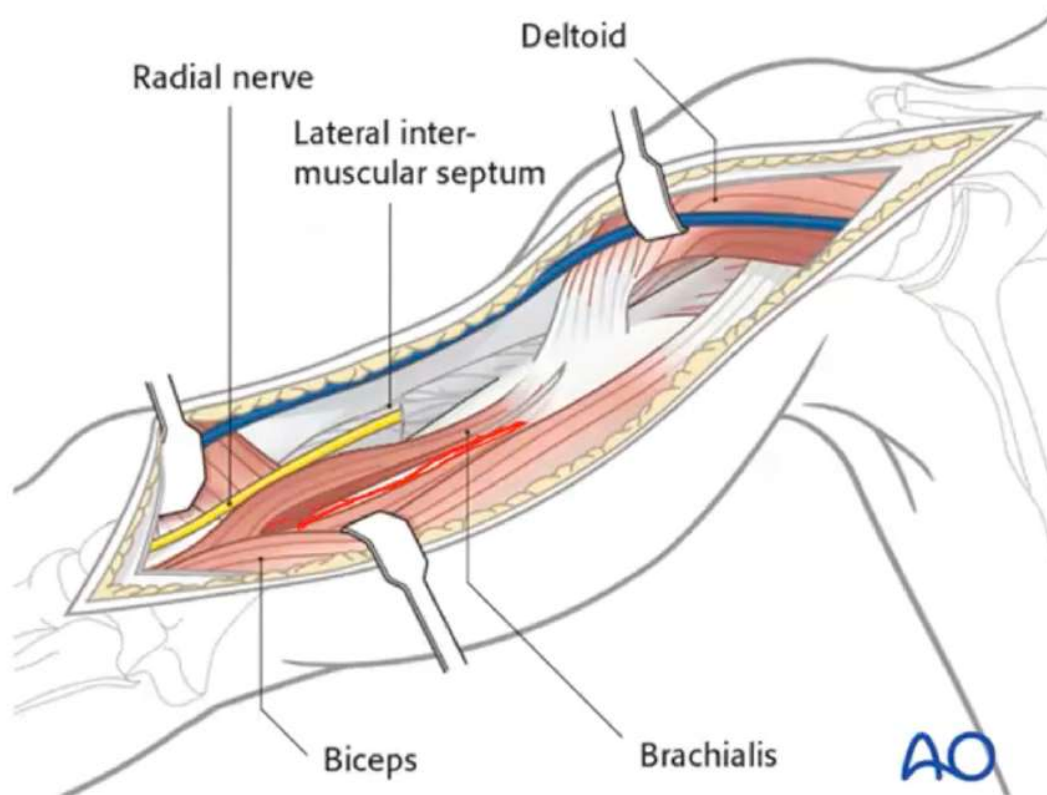
Principle – Hydraulic theory

Active muscle contraction inside the well fitting brace reduces the fracture and micromotion facilitates callus

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Anterolateral approach-

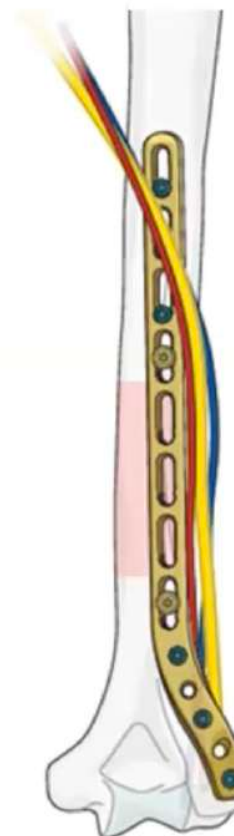
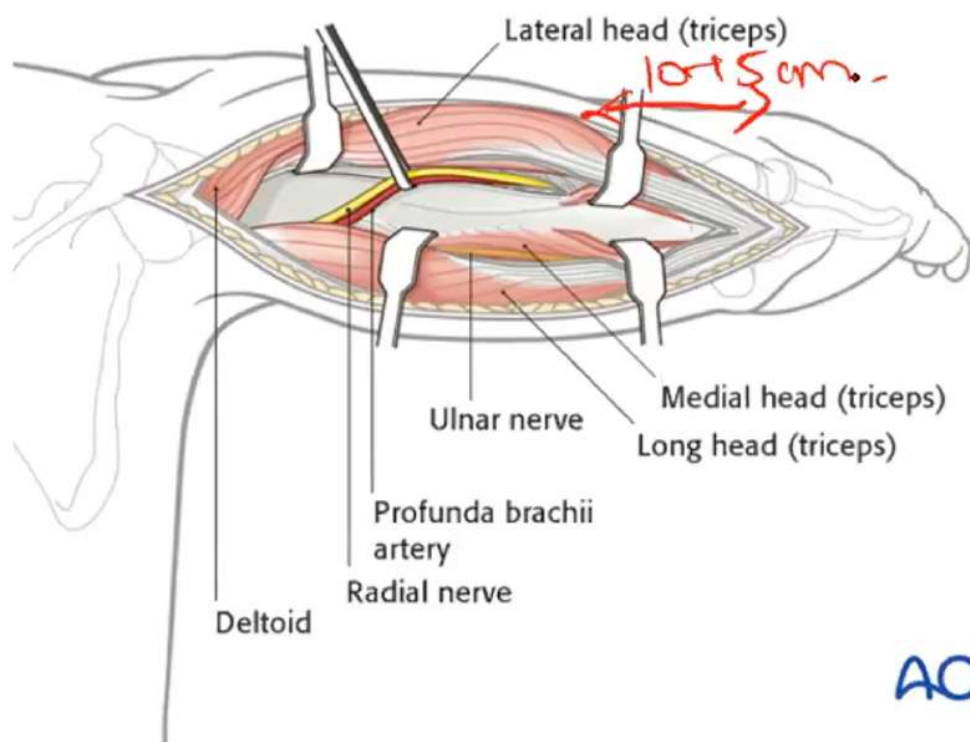
“Beware of Radial nerve entrapment at distal corner of plate”



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Posterior approach- "Identify and isolate radial nerve"

Lateral.



PROXIMAL HUMERUS & SHAFT HUMERUS #: DR ANURAG TIWARI

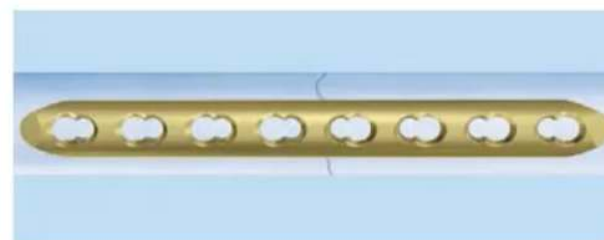
• Which Plate-



Broad LCP.



Narrow LCP.
LCDCP.



Locking.



Anatomic.
Distal.

No of screws-

Without lag screw- 3 cortices¹ 4/4.

With lag screw-



MIPPO



Radial .
2-5mm.



- Keep forearm supinated while fixing distal screws
- No of screws- 2 / 3 screws in each fragment

PROXIMAL HUMERUS & SHAFT HUMERUS #: DR ANURAG TIWARI

CRIF with Humerus nail

- Problems-
- Rotator cuff problems- Shoulder pain

Solution-

- ✓ 1. Incise rotator cuff in line of its fibres—
Incision Anterolateral to acromion.

- ✓ 2. Retrograde entry nail

Distal locking

(L → M)

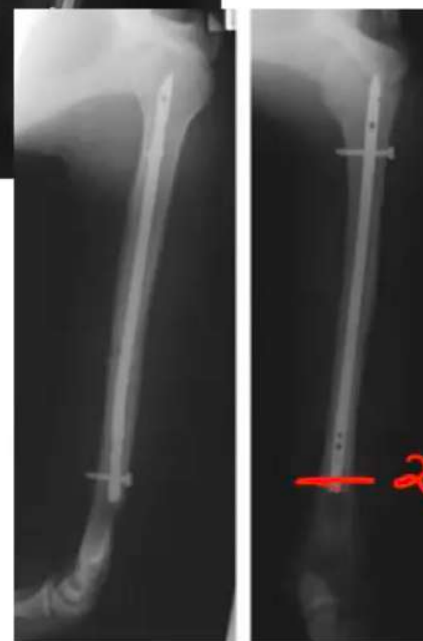
Radial nerve

(A → P)

- Nerve injury

musculocutaneous nerve

PROXIMAL HUMERUS & SHAFT HUMERUS #: DR ANURAG TIWARI



→ 2 cm above olecranon.

External fixator

Extremely contaminated Open #

Poor soft tissue condition (Infection/ Burns)

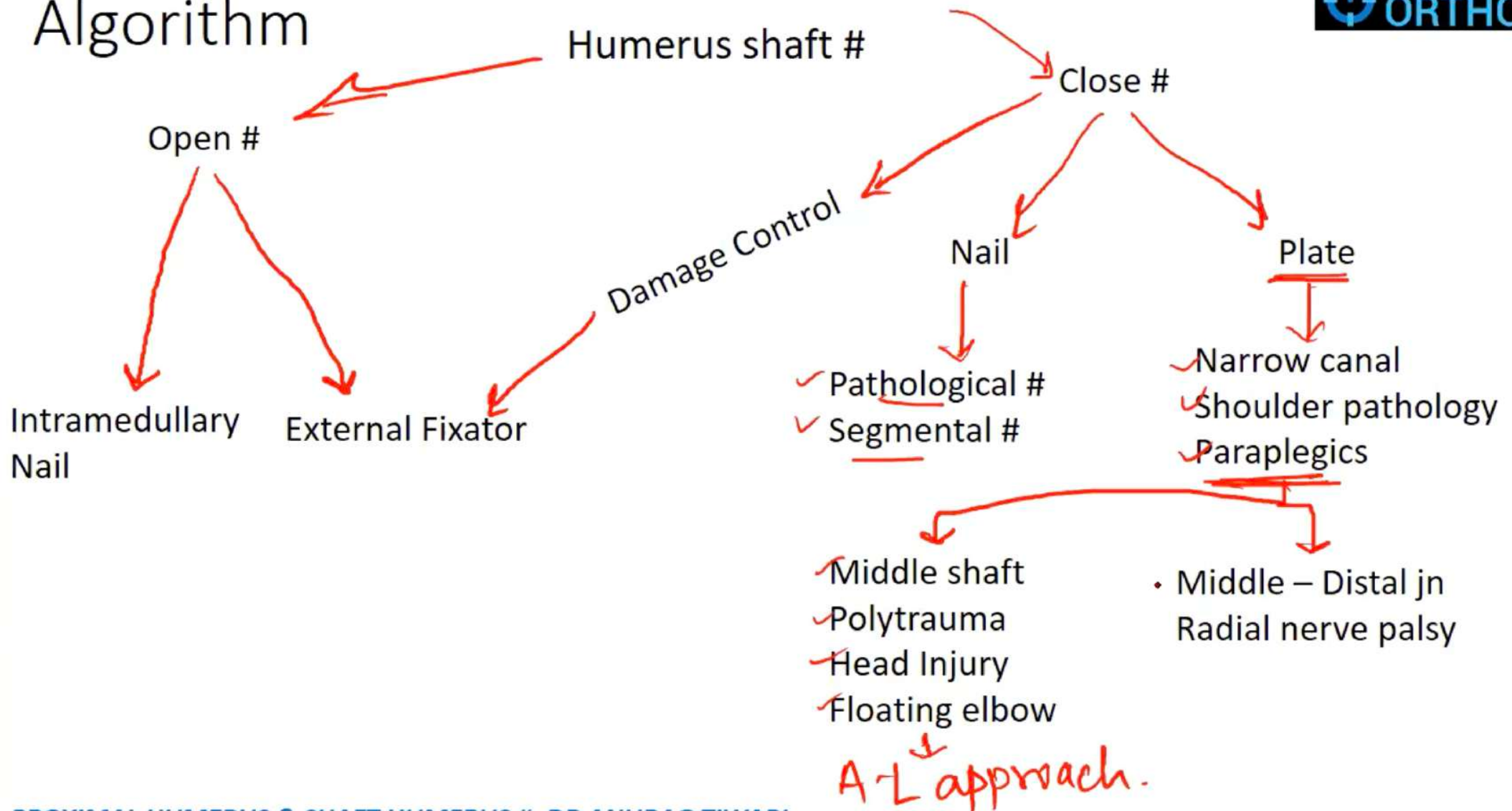
Damage control orthopaedics

“ Rapid stabilization ”



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Algorithm

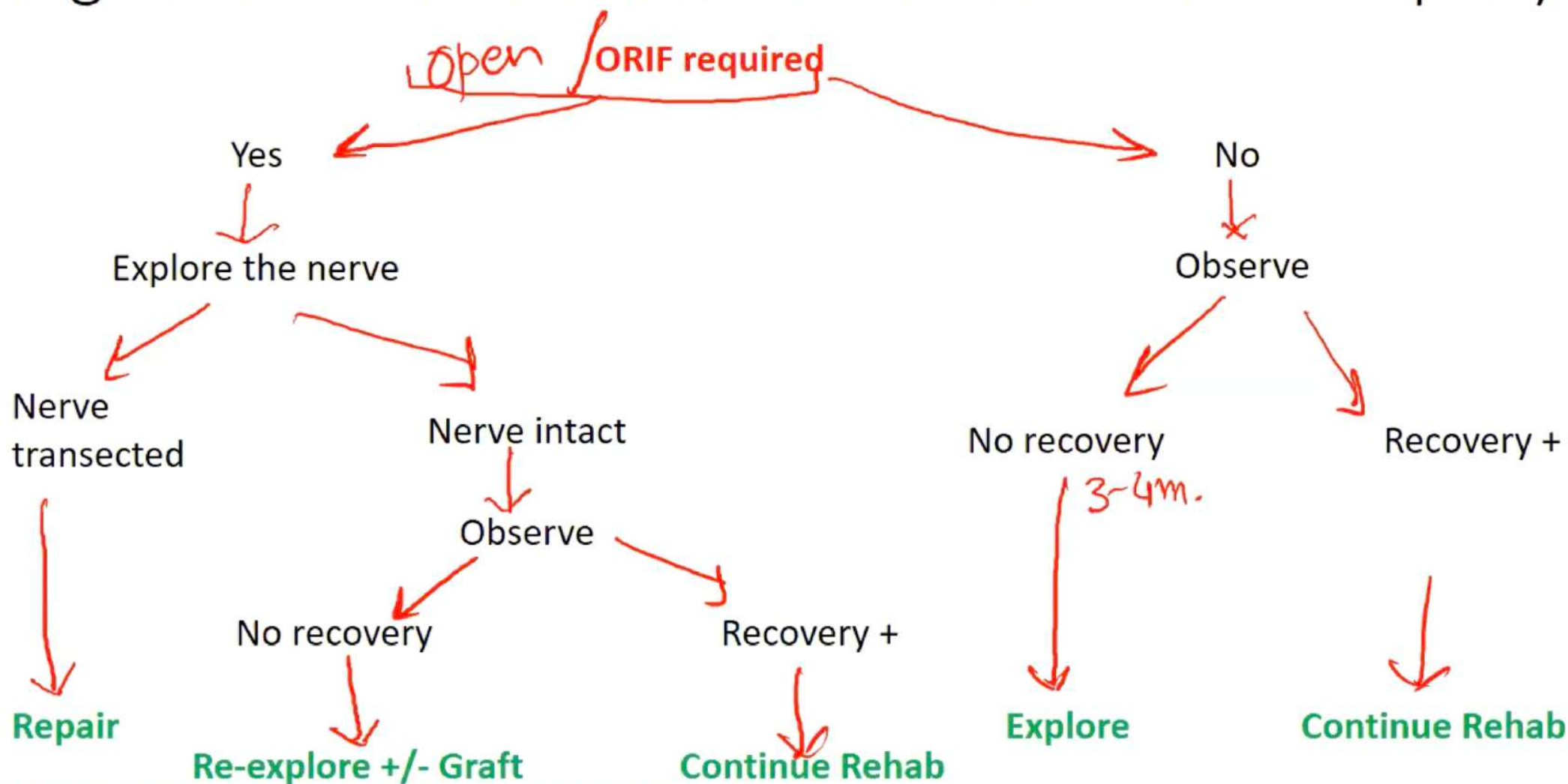


PROXIMAL HUMERUS & SHAFT HUMERUS #: DR ANURAG TIWARI

- Patient presents to you immediately after trauma with Shaft humerus # with radial nerve palsy, As far as fracture is concerned, you decided conservative management.
- What will be your management for radial nerve palsy?
- A. Nothing to be done
- B. Explore the nerve
- C. Apply cockup splint
- D. ORIF with plate

- Patient presents to you immediately after trauma with Shaft humerus #, You did close reduction and applied slab. Post slab application, patient had wrist drop.
- What will be you do ?
- A. Nothing to be done
- B. Explore the nerve
- ☒ C. Apply cockup splint
- D. ORIF with plate

Algorithm of # Shaft humerus with radial nerve palsy



PROXIMAL HUMERUS & SHAFT HUMERUS #: DR ANURAG TIWARI

- Patient with humerus shaft # with complete brachial plexus palsy.
- What is the preferred management for fracture?

- A. Functional Brace (Sarmiento)
 - B. Intramedullary nail
 - ☒ C. ORIF with plate *Better*
 - D. External fixator
- X*

Complications

- Rotator cuff problems
- Non Union
- Infection
- Radial Nerve palsy — M.C.