

Anatomy & classification of Proximal humerus fractures

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3% of all upper extremity fractures

Majority (80%):

1. Undisplaced
2. Elderly
3. Low Energy

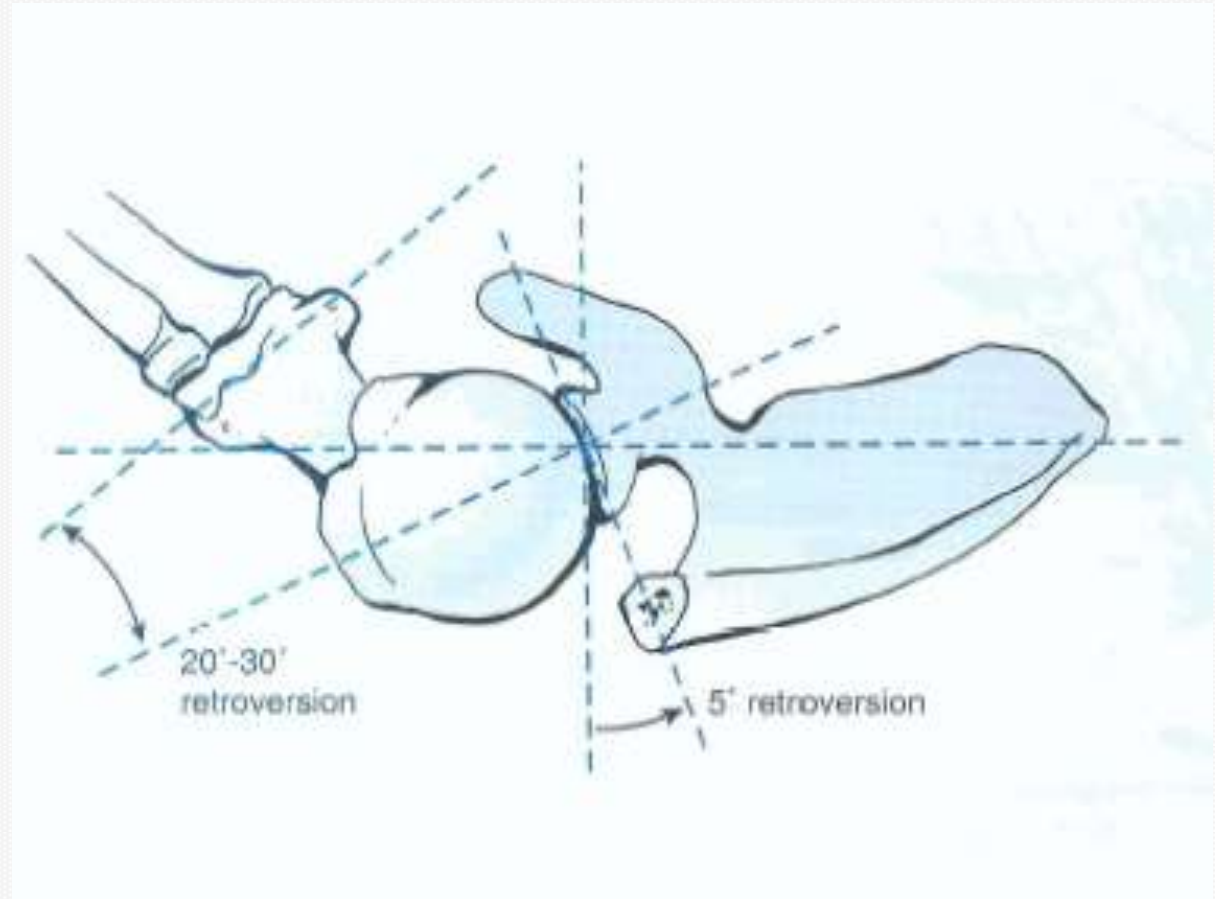
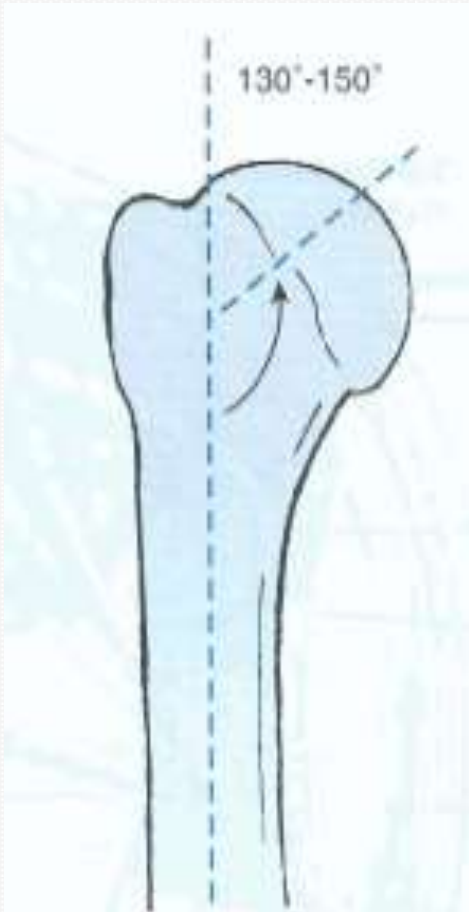


Minority (20%):

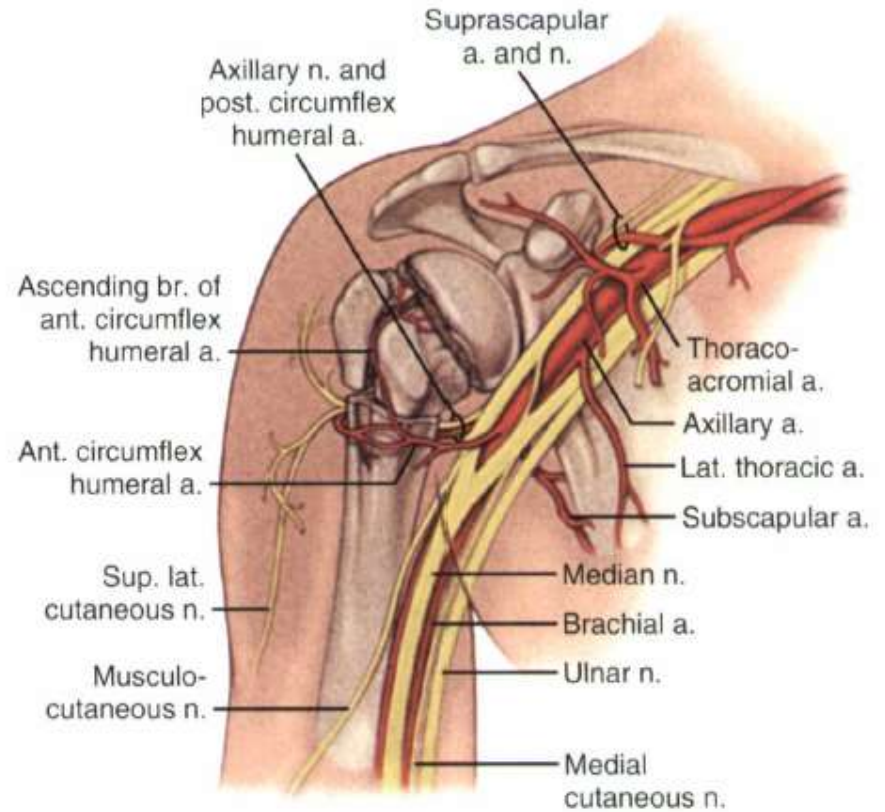
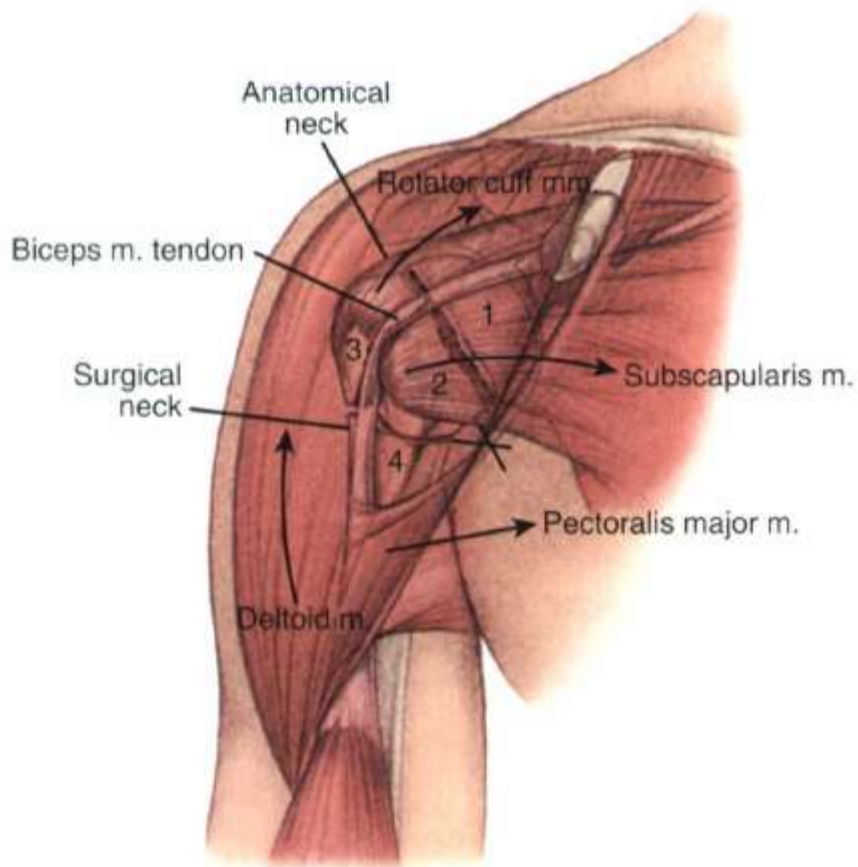
1. Displaced
2. Young
3. High Energy

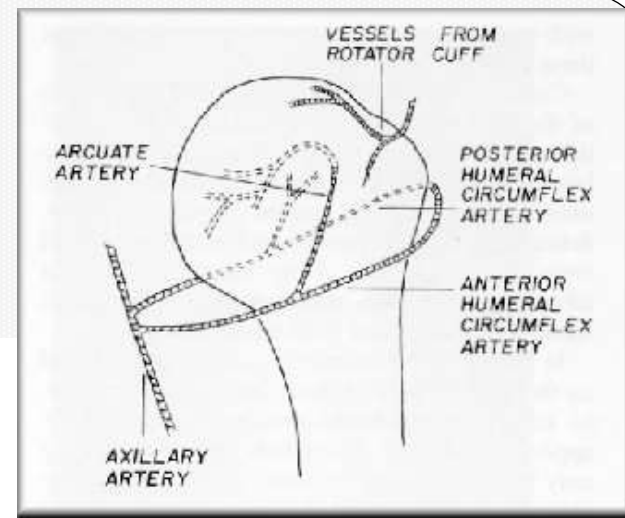
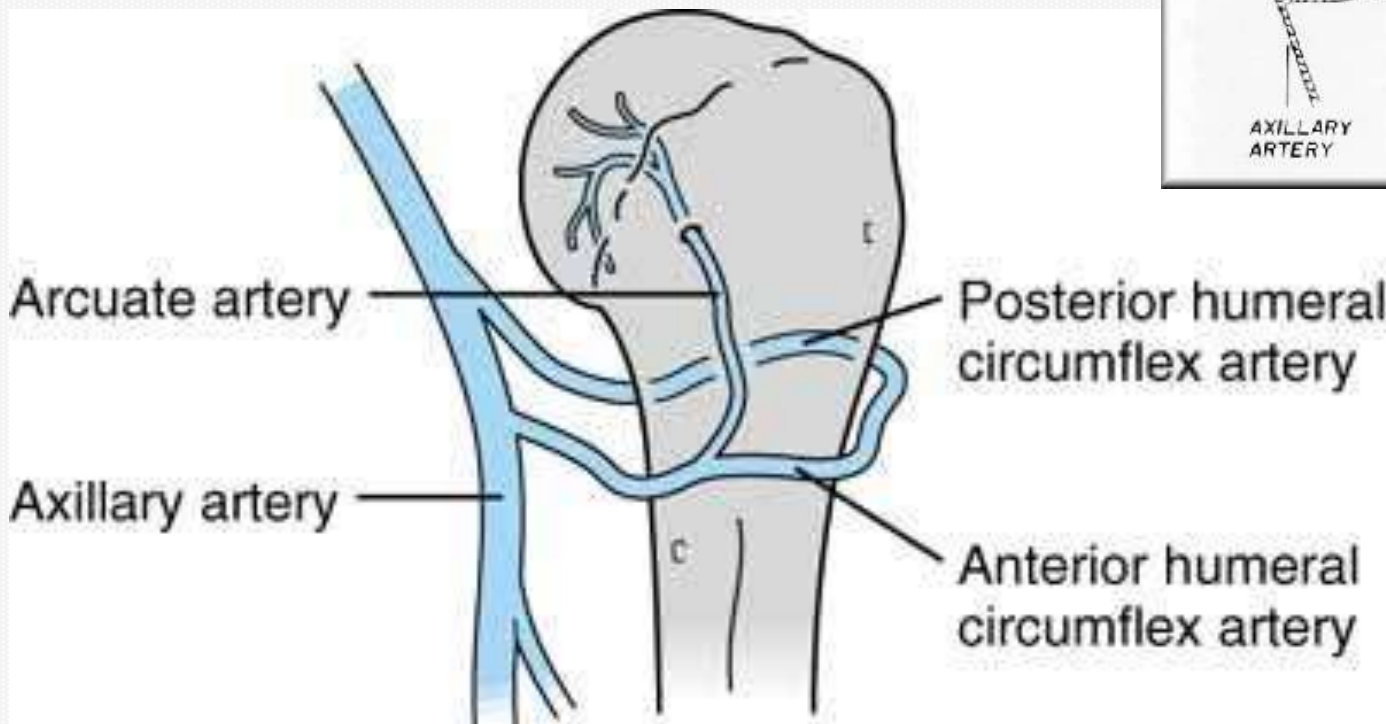


Anatomy



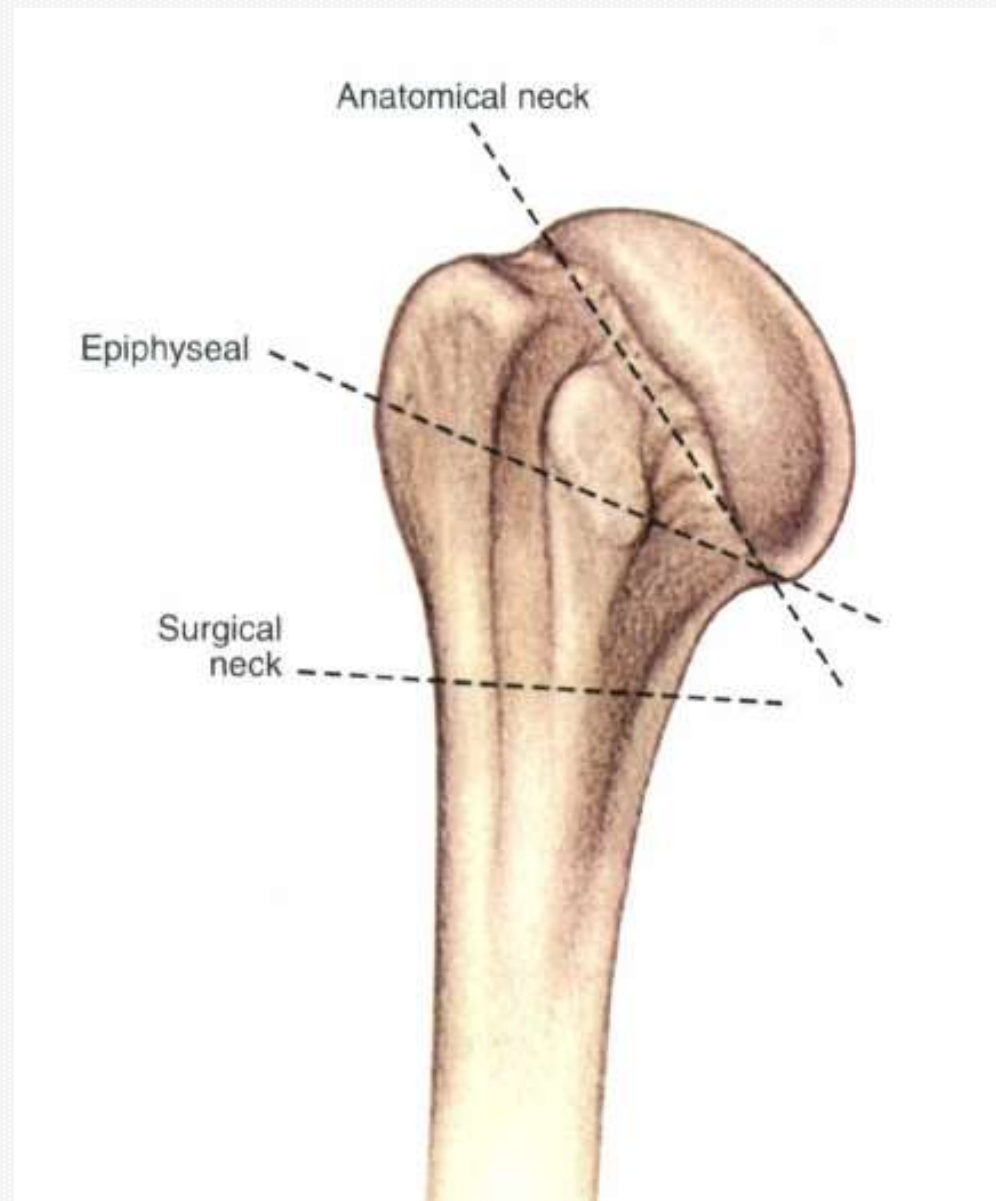
Anatomy



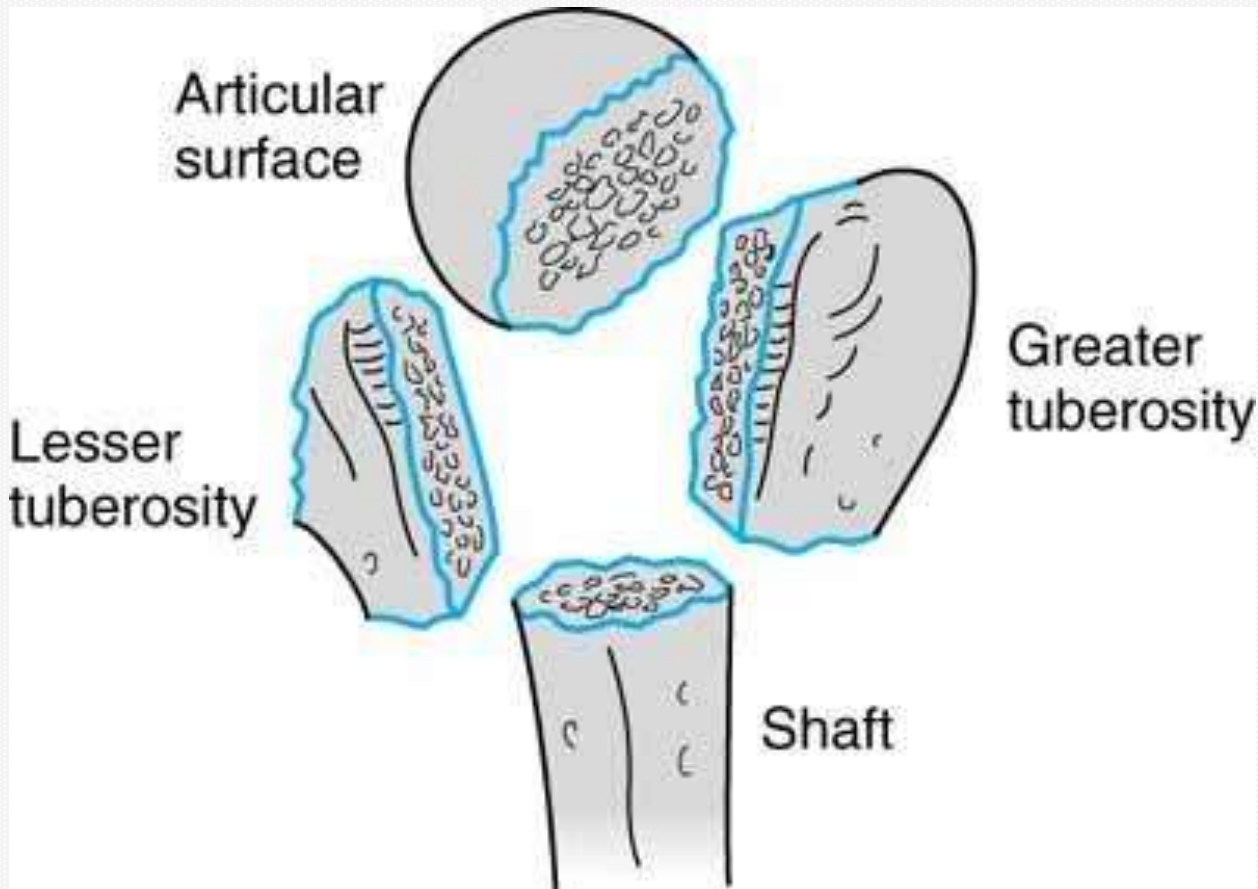


Laing PG. The Arterial Supply of the Adult Humerus. J BoneJoint Surg 1956;38-A:1105.

Kocher classification

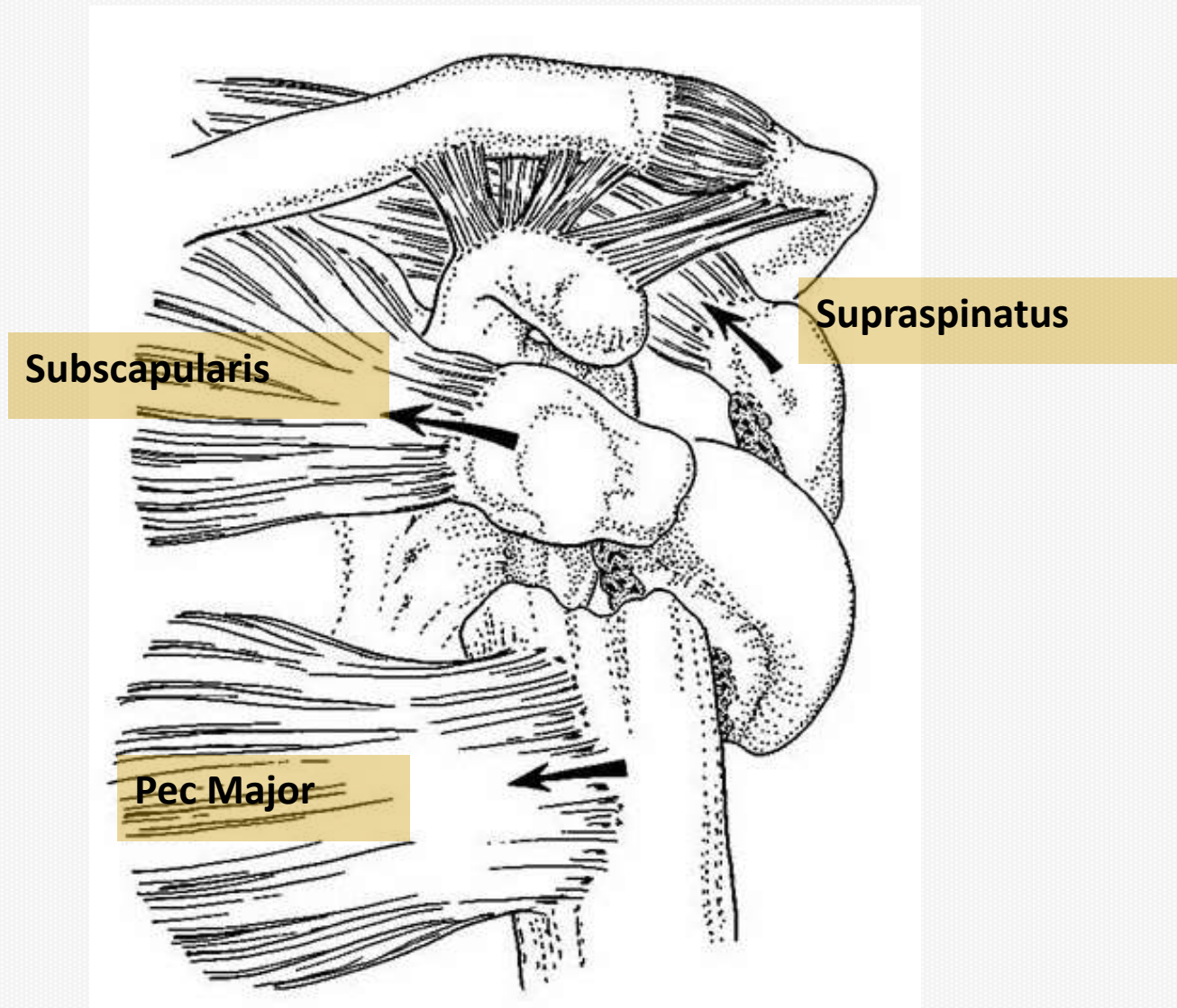


(Modified from Kocher T: Beitrage zur Kenntnis einiger praktisch wichtiger Fracturenformen. Basel: Carl Sallman Verlag, 1896.)



Codman EA. The Shoulder. Boston: T Todd, 1934.

Deforming forces in proximal humeral fractures



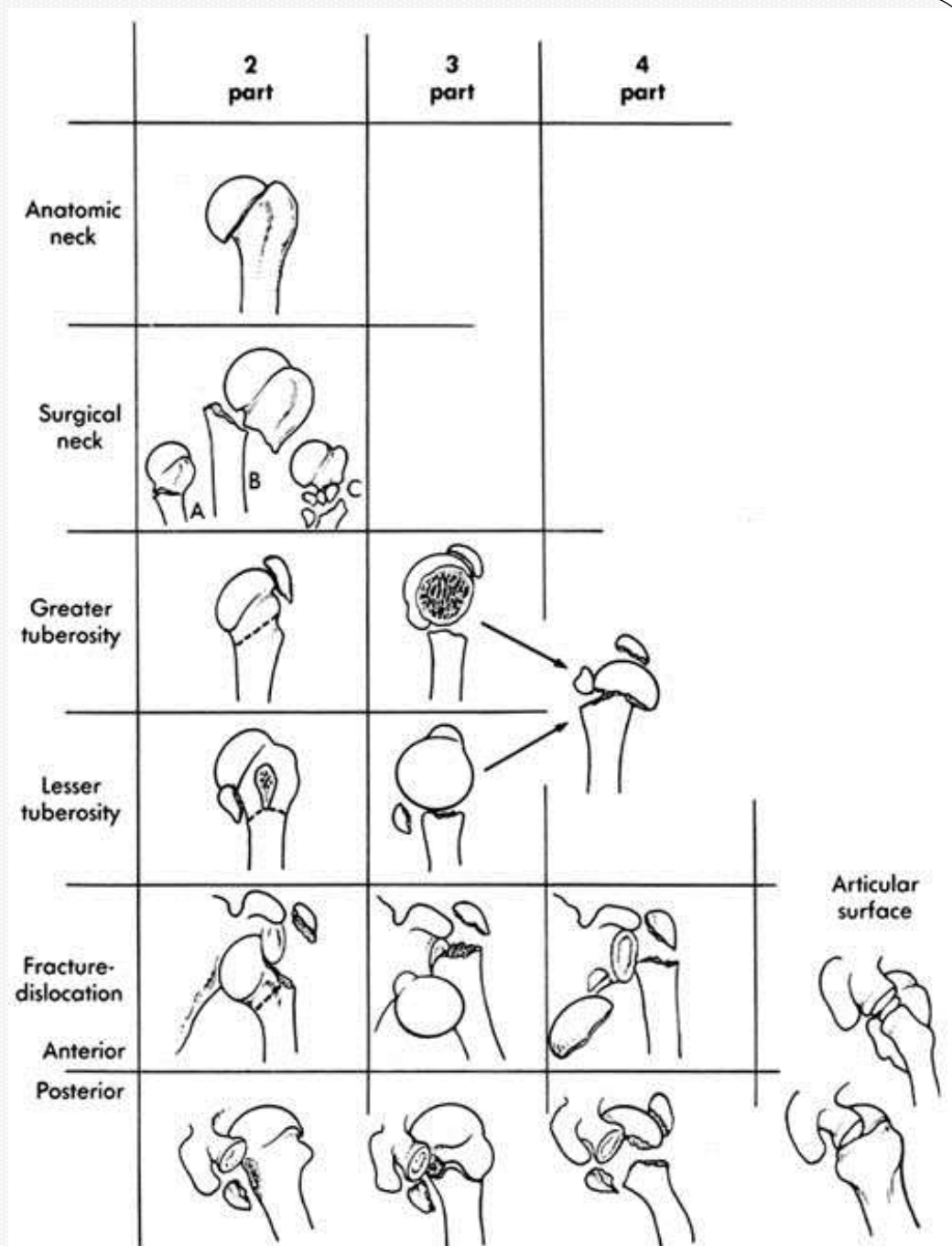
From Copeland: Operative Shoulder Surgery

Neer classification

(based on displacement of fragment)

Criteria: displacement >1 cm or angulation $>45^\circ$

Neer CS II. Displaced Proximal Humerus Fractures. Part I: Classification and Evaluation. JBS 1970;52-A:1077.



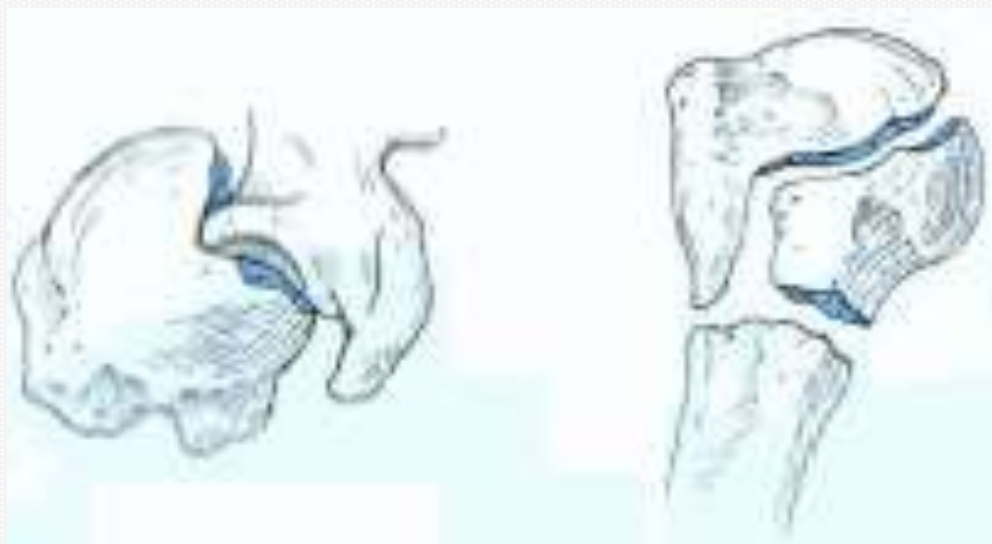
4 part fx



The greater the number of displaced fragments, the higher the risk of AVN ?



valgus-impacted four-part fracture



Impression fracture

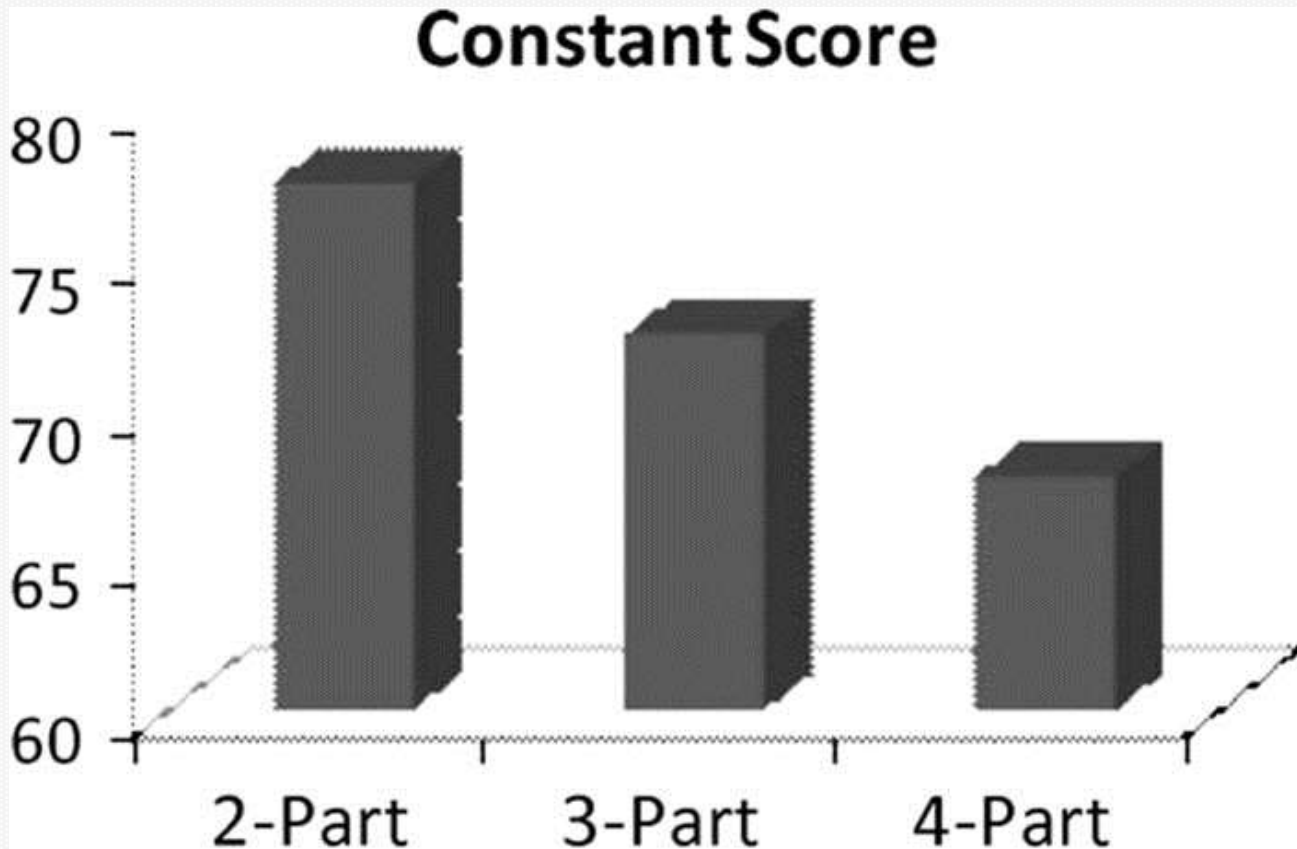
Head splitting

Reliability/Utility of Neer Classification

- interobserver and intraobserver reliabilities
 - kappa value (0 – 1)
- **interobserver reliability → 0.21 - 0.64**
- **intraobserver reliability → 0.5 - 0.8**

Sidor ML, et al. The Neer classification system for proximal humeral fractures: an assessment of interobserver reliability and intraobserver reproducibility. J Bone Joint Surg Am. 1993;75:1745–1750

correlation between the Neer classification and clinical outcome scores



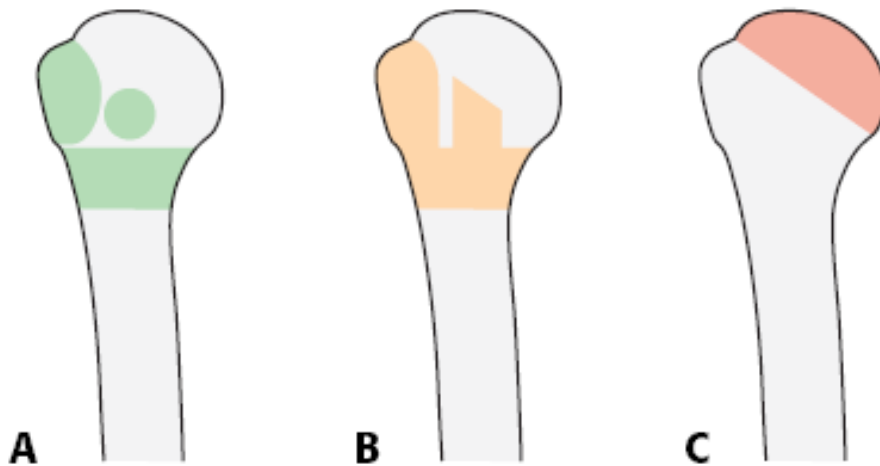
Sproul RC, Iyengar JJ, Devcic Z, Feeley BT. A systematic review of locking plate fixation of proximal humerus fractures. *Injury*. 2011;42:408–413.)

AO classification

(based on location of fracture)

proximal humerus (11-):

- Type A extra-articular unifocal
- Type B extra-articular bifocal
- Type C articular



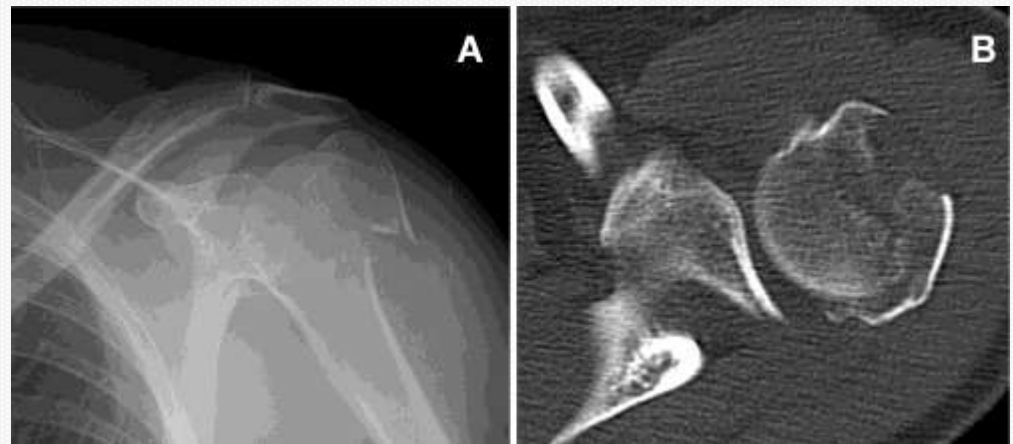
AO Principles of Fracture Management.
Chap 1.4; Thieme, New York 2000



- The Neer and AO-ASIF classifications
 - low reproducibility and reliability specially in 3 or 4 parts, if assess by X-ray



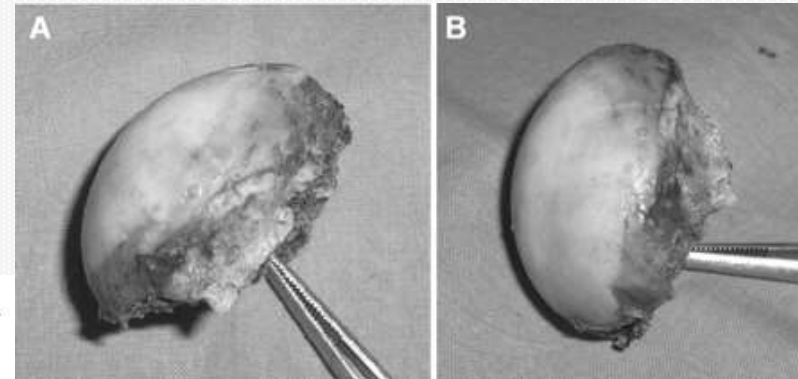
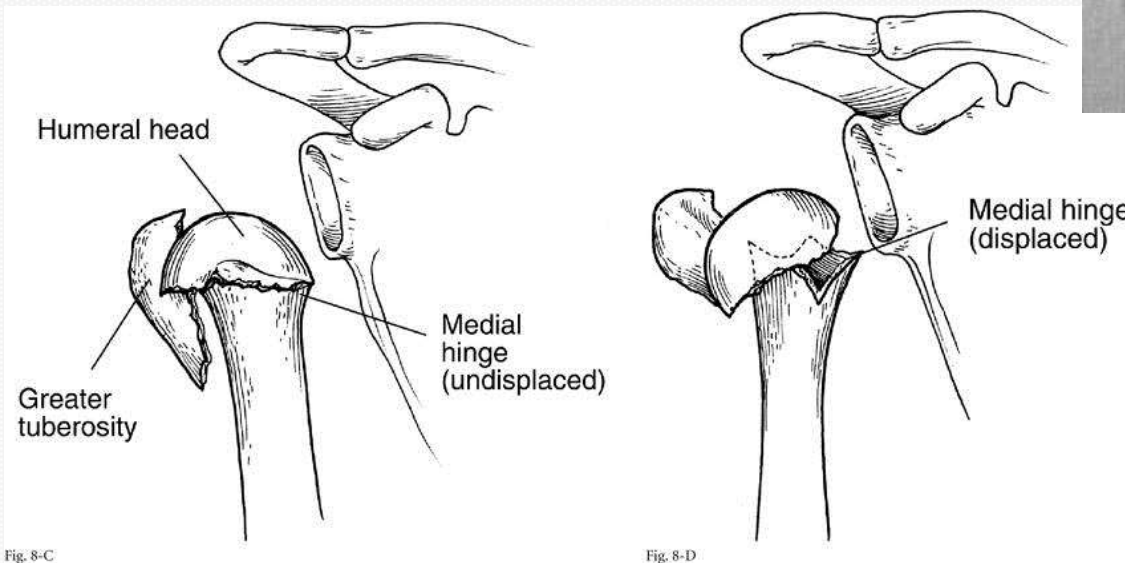
CT Scan for correct pre-operative diagnosis



Gumina S, et al. Comparison between two classifications of humeral head fractures: Neer and AO-ASIF. Acta Orthop Belg. 2011 Dec;77(6):751-7.

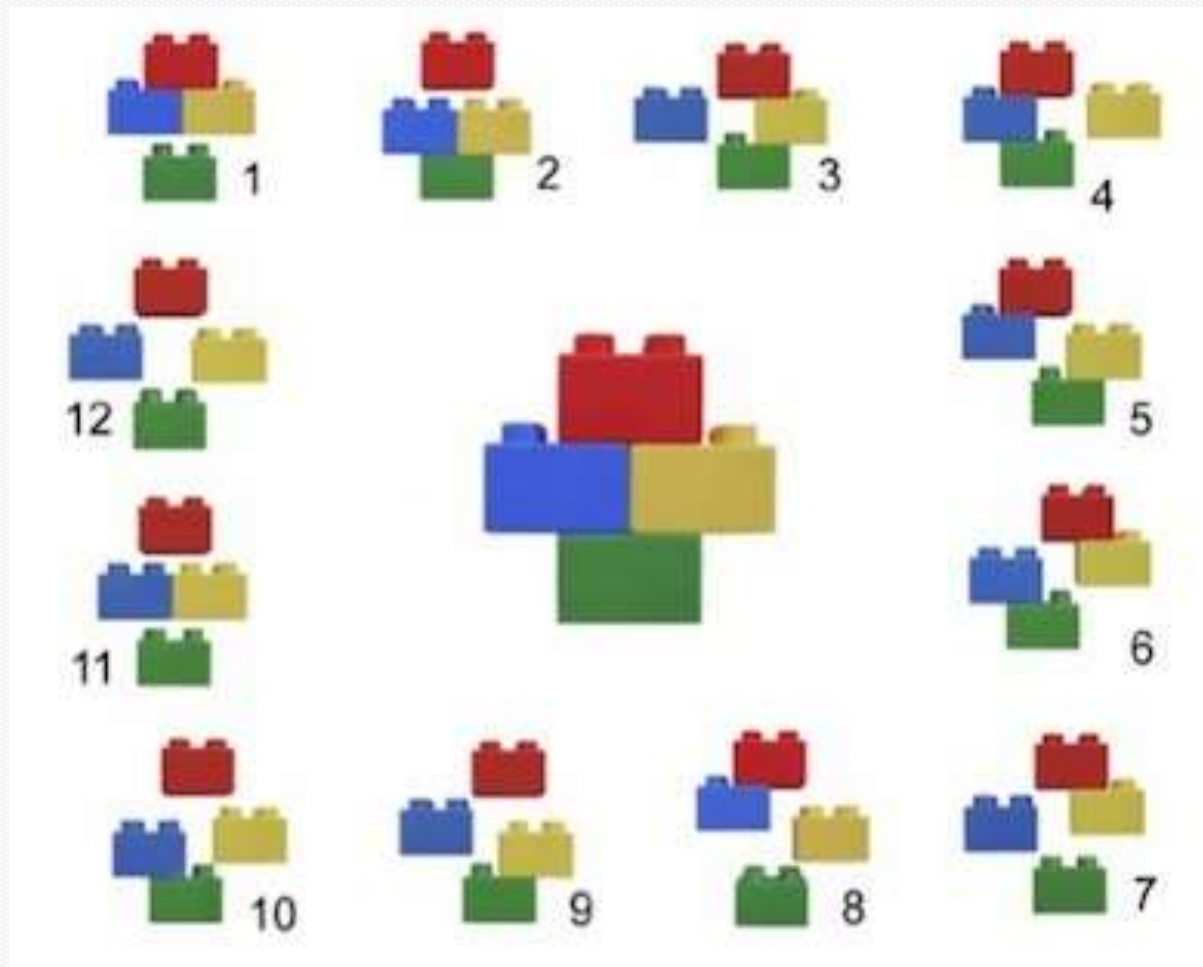
(Hertel et al)

The length of the dorsomedial metaphyseal extension and integrity of the medial soft tissue more important than number of "parts" and degree of displacement in development of osteonecrosis



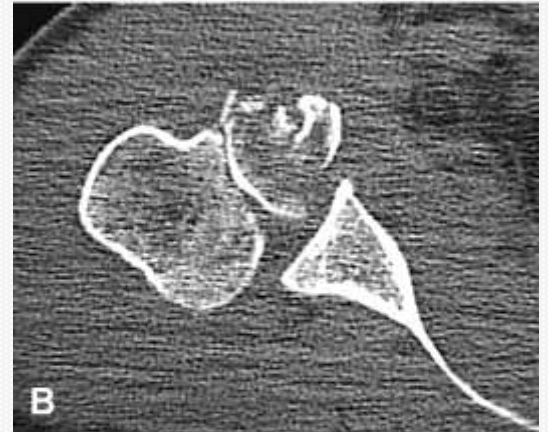
Hertel R, Hempfing A, Stiehler M, Leunig M. Predictors of humeral head ischemia after intracapsular fracture of the proximal humerus. J Shoulder Elbow Surg. 2004;13:427–33.)

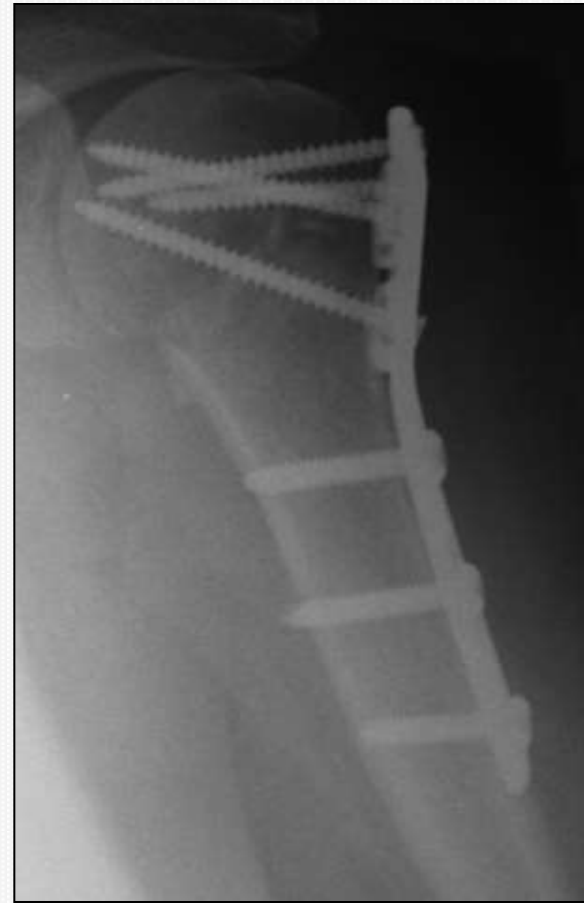
Hertel's Binary or Lego description system for proximal Humerus fractures



Unusual pattern of fx

Classification ?



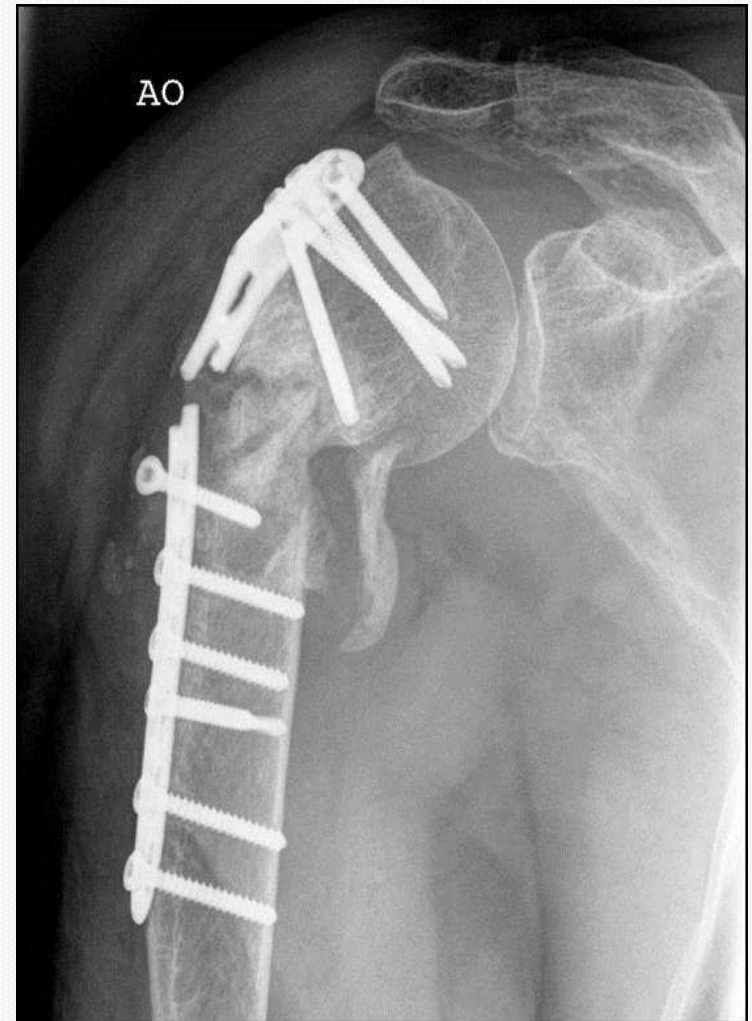


age as the most important prognostic after operative fixation

Problems in old patients

- **Missing med support**
- **Osteoporosis**
- **Healing potency**

➔ **Failure of treatment**



Conclusion

- **Common Fx in elder patients**
 - Consider anatomical points
- **Neer classification**
 - a useful framework for clinical assessment
- **pattern of fracture displacement**
 - affect prognosis
- **Age of patient**
 - important in prognosis



Thank you for attention