Proximal Humeral Fractures: Fixation as Primary Outcome

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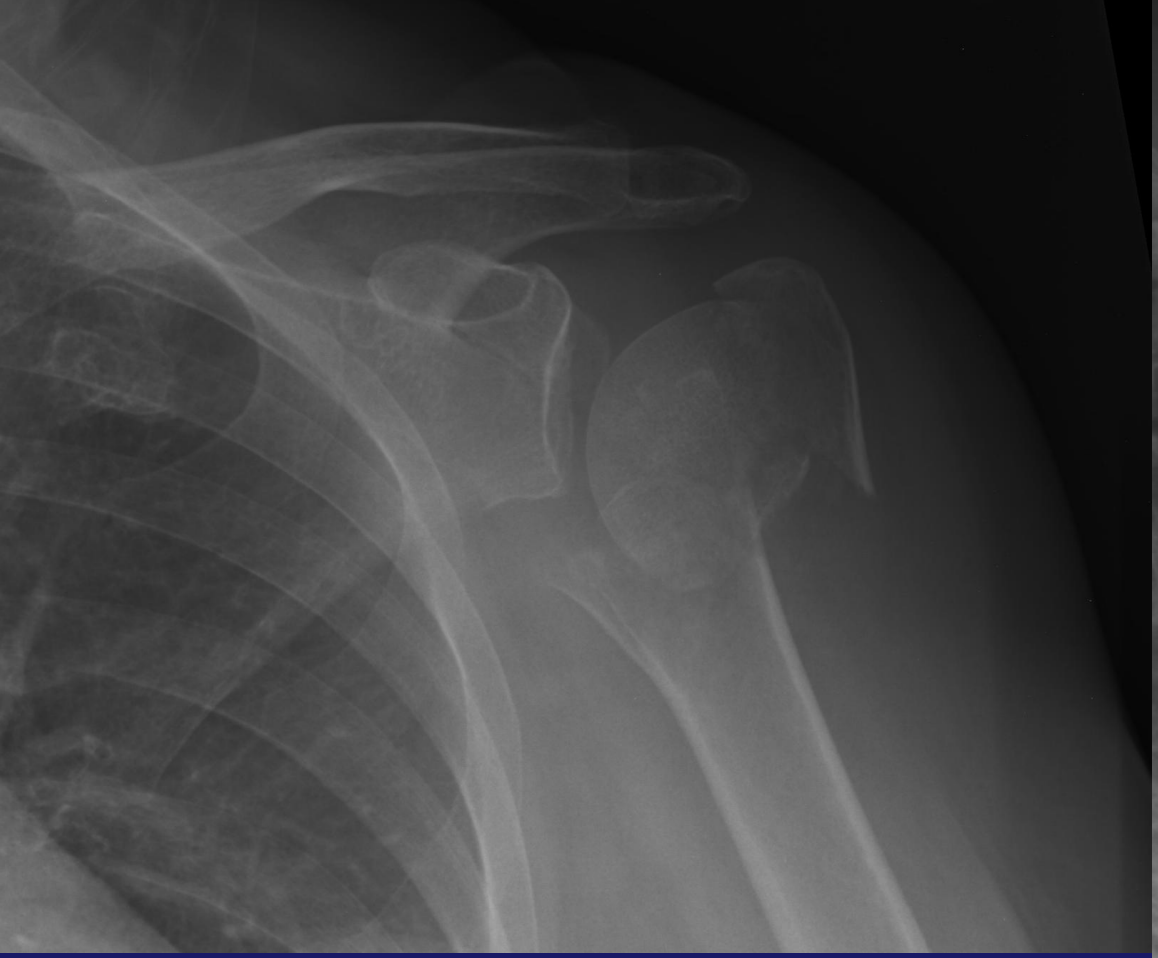
PH #'s: Ontario 2012-2016

Table 1: Two and Five Year Outcomes Following Initial Treatment of Proximal Humerus Fractures

Outcome *Group*	**Replacement**	**Fixation**	**Rotator cuff repair**	**Hardware removal**	**Repair**	**Irrigation & debridement**	**Total**
Two-Year Outcomes							
Non-operative (n= 25,104)	0 (0.0%)	111 (0.4%)	80 (0.3%)	8 (0.0%)	28 (0.1%)	21 (0.1%)	248 (1.0%)
Reduction (n = 3,258)	148 (4.5%)	274 (8.4%)	147 (4.5%)	33 (1.0%)	24 (0.7%)	0 (0.0%)	660 (20.3%)
Fixation (n = 2,979)	98 (3.3%)	160 (5.4%)	87 (2.9%)	412 (13.8%)	15 (0.5%)	19 (0.6%)	799 (26.8%)
Replacement (n = 1,419)	62 (4.4%)	14 (1.0%)	14 (1.0%)	20 (1.4%)	7 (0.5%)	0 (0.0%)	123 (8.7%)
Total (n = 32,760)	308 (0.9%)	559 (1.7%)	328 (1.0%)	473 (1.4%)	74 (0.2%)	45 (0.1%)	1787 (5.5%)
Five-Year Outcomes							
Non-operative (n= 25,104)	0 (0.0%)	123 (0.5%)	97 (0.4)	10 (0.0%)	0 (0.0%)	25 (0.1%)	286 (1.4%)
Reduction (n = 3,258)	157 (4.8%)	284 (8.7%)	156 (4.8%)	34 (1.0%)	24 (0.7%)	0 (0.0%)	689 (21.1%)
Fixation (n = 2,979)	115 (3.9)	182 (6.1%)	105 (3.5%)	447 (15.0%)	16 (0.5%)	20 (0.7%)	896 (30.1%)
Replacement (n = 1,419)	93 (6.6%)	24 (1.7%)	25 (1.8%)	33 (2.3%)	11 (0.8%)	0 (0.0%)	192 (13.5%)
Total (n = 32,760)	365 (1.1%)	613 (1.9%)	383 (1.2%)	524 (1.6%)	82 (0.3%)	52 (0.2%)	2019 (6.2%)

Group
Non-operative (n= 25,104)
Reduction (n = 3,258)
Fixation (n = 2,979)
Replacement (n = 1,419)
Total (n = 32,760)



- 78 yr old female, retired
- Lives by self, stable medical conditions

- 10 weeks post injury
- 130 degrees flexion
- Minimal pain, functional, independant

Prediction of Nonunion After Nonoperative Treatment of a Proximal Humeral Fracture

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Author Information

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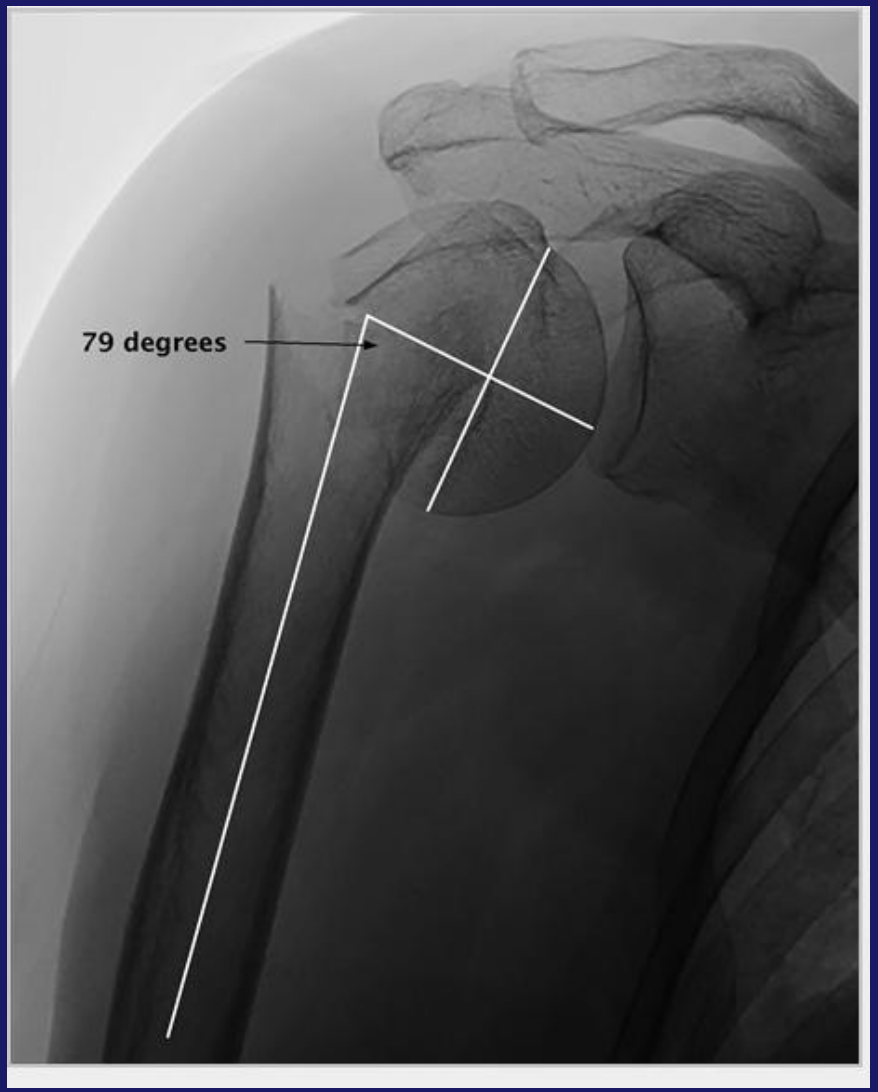
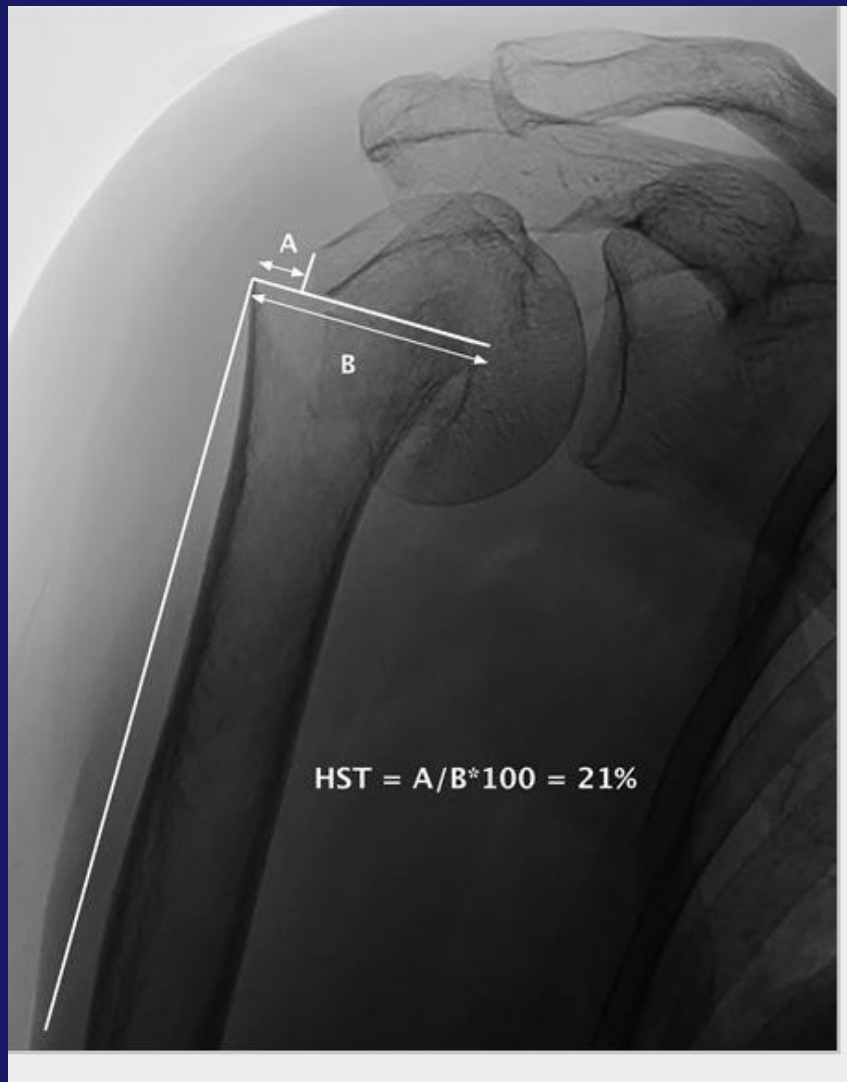
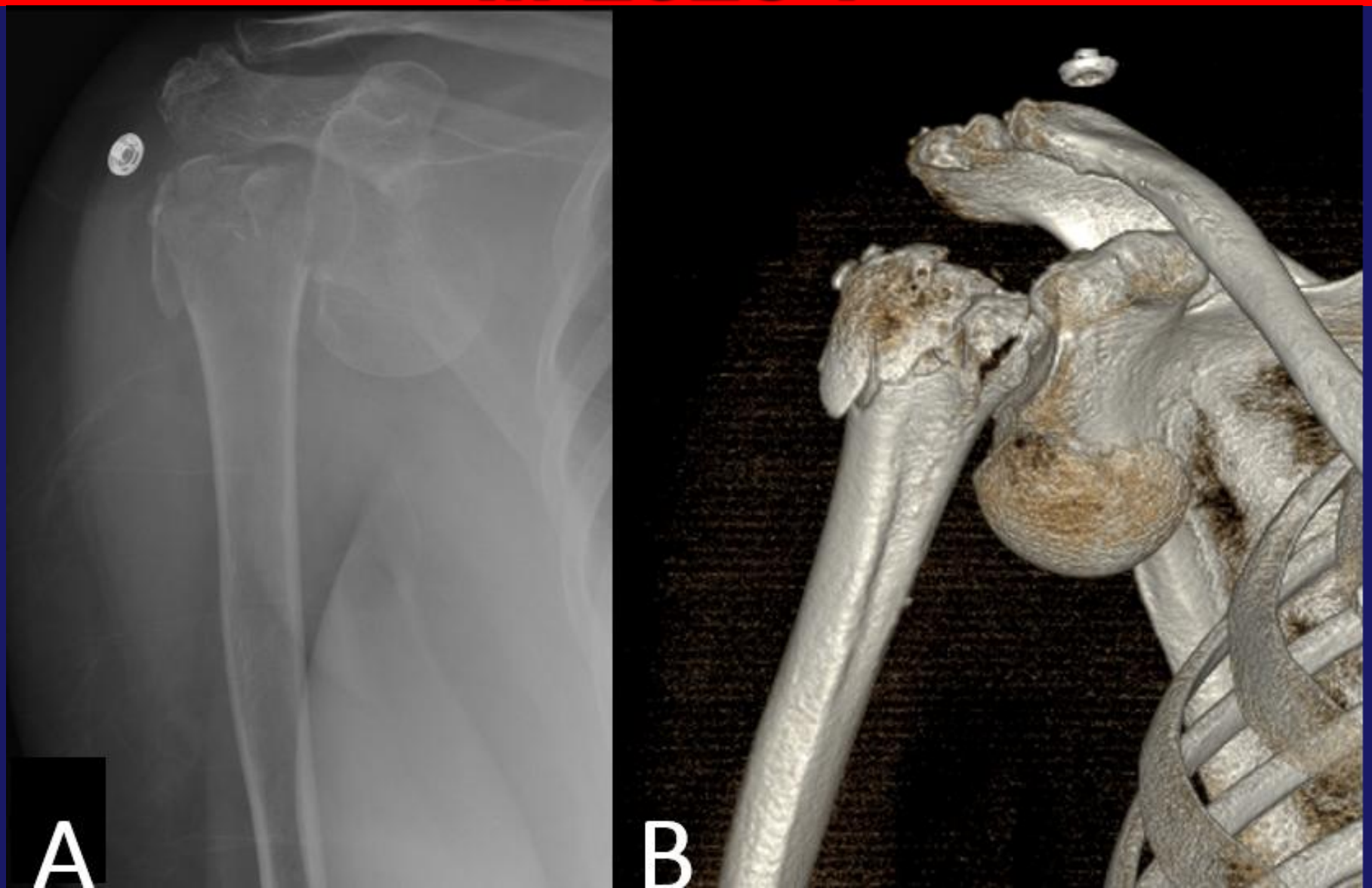
- 2230 patients
- 231 nonunions (11%)
- HSA (head shaft angle) > 140˚ good
- HST (head shaft translation) < 50% good
- Smoking bad
- PHARON developed to predict risk

HSA 79˚ HST 21% Nonunion Risk 67%

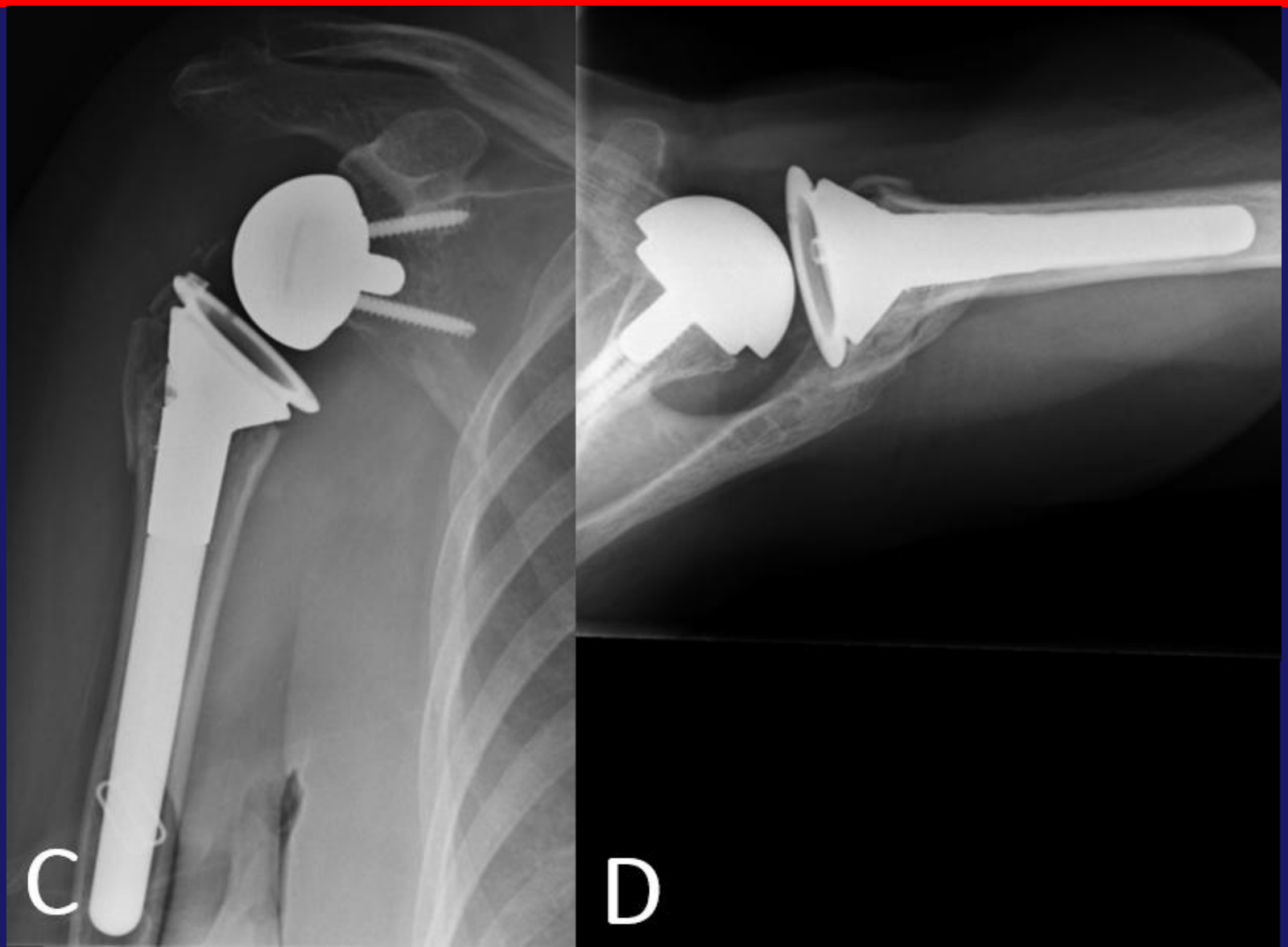




What is the role of Reverse TSA in 2026 ?



Reverse TSA



Quality of Reduction Influences Outcome After Locked-Plate Fixation of Proximal Humeral Type-C Fractures

Marc Schnetzke, MD, Julia Bockmeyer, Felix Porschke, MD, Stefan Studier-Fischer, MD, Paul-Alfred Grützner, MD, and Thorsten Guehring, MD

Investigation performed at the Department of Trauma and Orthopaedic Surgery, BG Trauma Center Ludwigshafen at the University of Heidelberg, Ludwigshafen on the Rhine, Germany

Background: The aim of this study was to determine if fracture reduction, fracture pattern, and patient-related factors influence clinical outcome after locked-plate fixation of displaced proximal humeral fractures.

Methods: Ninety-eight patients (mean age, 61.1 ± 11.2 years) with a proximal humeral fracture involving the anatomical neck (type C according to the OTA/AO classification system) were included. Clinical outcome was determined by age and sex-adjusted Constant score (CS%) and the Disabilities of the Arm, Shoulder and Hand (DASH) score. Fracture reduction was quantitatively determined by 3 parameters (head-shaft displacement, head-shaft alignment, and cranialization of the greater tuberosity), and patients were divided into groups according to anatomical reduction, acceptable reduction, or malreduction. Relative risk (RR) for complications, revision surgery, and inferior clinical outcome (CS of <50%) was determined according to the quality of fracture reduction and fracture pattern (disruption of the medial hinge; type-C3 fracture) and patient-related factors (age; comorbidities).

Results: After a mean of 3.1 ± 1.5 years, the mean CS% and DASH score were 54.8% ± 28.0% and 31.9 ± 24.8, respectively. The complication rate was 32.7% (n = 32), and 27 patients (27.6%) required revision surgery. Anatomical or acceptable fracture reduction was achieved in 40 (40.8%) of the patients. This resulted in a significantly lower complication rate (20.0% compared with 41.4% among the patients with malreduction; p = 0.027), a trend of lower revision rate (20% compared with 32.8%; p = 0.165), and better clinical outcome (mean CS% of 65.4% ± 28.2% compared with 47.6% ± 25.7%; p = 0.002) without a higher risk for osteonecrosis of the humeral head (5% compared with 10.3%). Cranialization of the greater tuberosity of >5 mm (n = 25), head-shaft displacement of >5 mm (n = 50), and valgus head-shaft alignment (n = 12) all increased the RR for inferior clinical outcome by twofold to threefold. Conversely, a patient age of >65 years (n = 31) and an OTA/AO type-C3 fracture pattern (n = 38) were not significantly associated with complications and inferior clinical outcome (RR, 0.9 to 1.8).

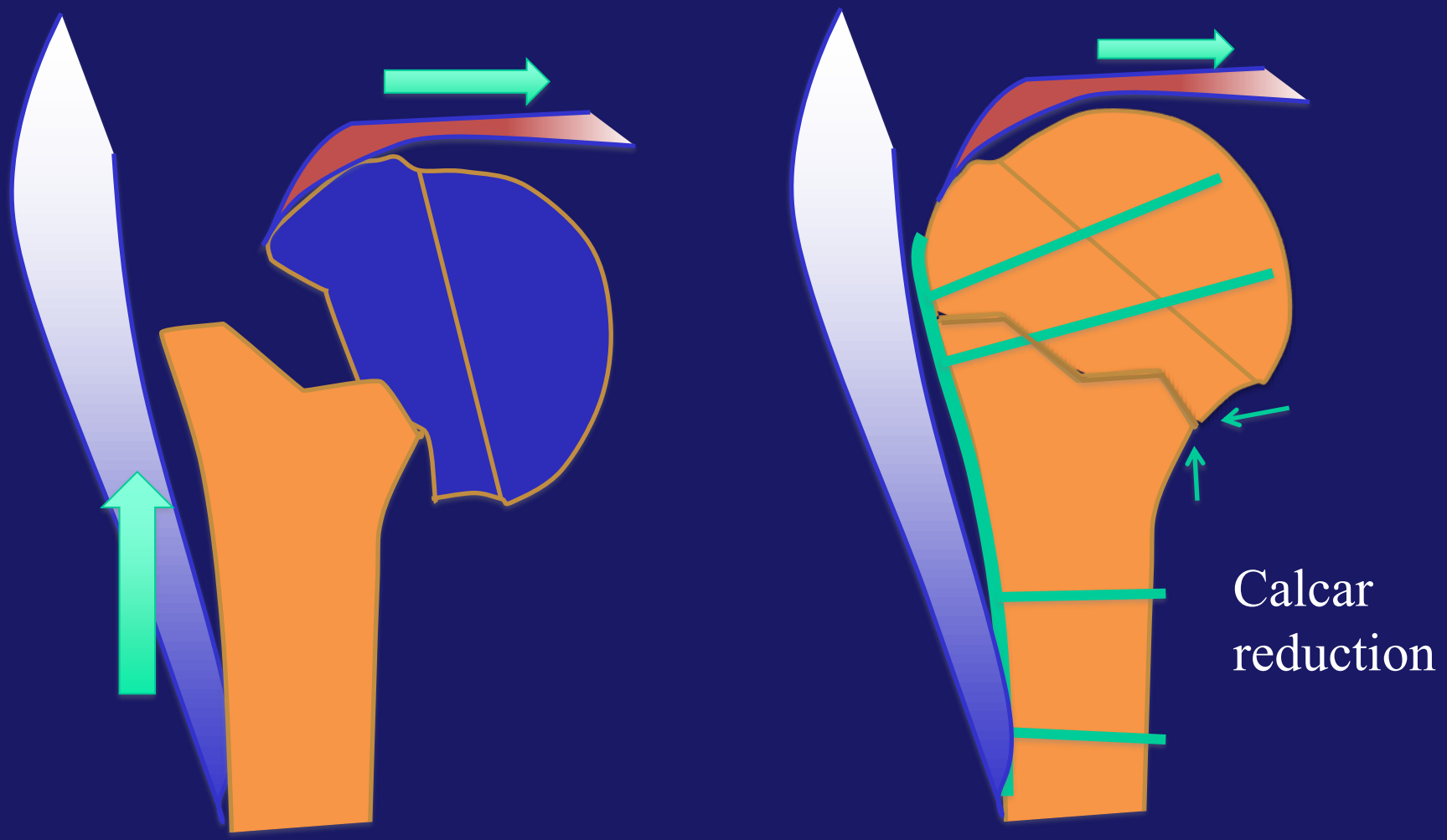
Conclusions: Anatomical fracture reduction with a locked plate significantly improved the clinical outcome of unstable and displaced proximal humeral fractures involving the anatomical neck.

Level of Evidence: Therapeutic Level IV. See Instructions for Authors for a complete description of levels of evidence.

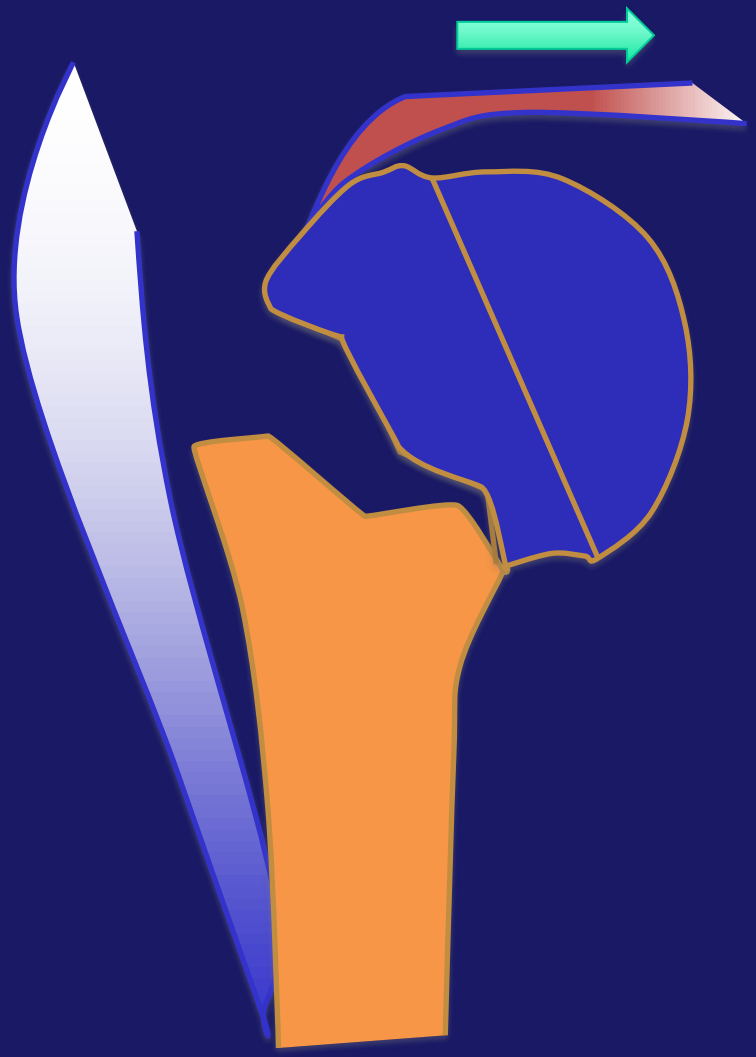
If ORIF is Chosen, How to Maximize Success?

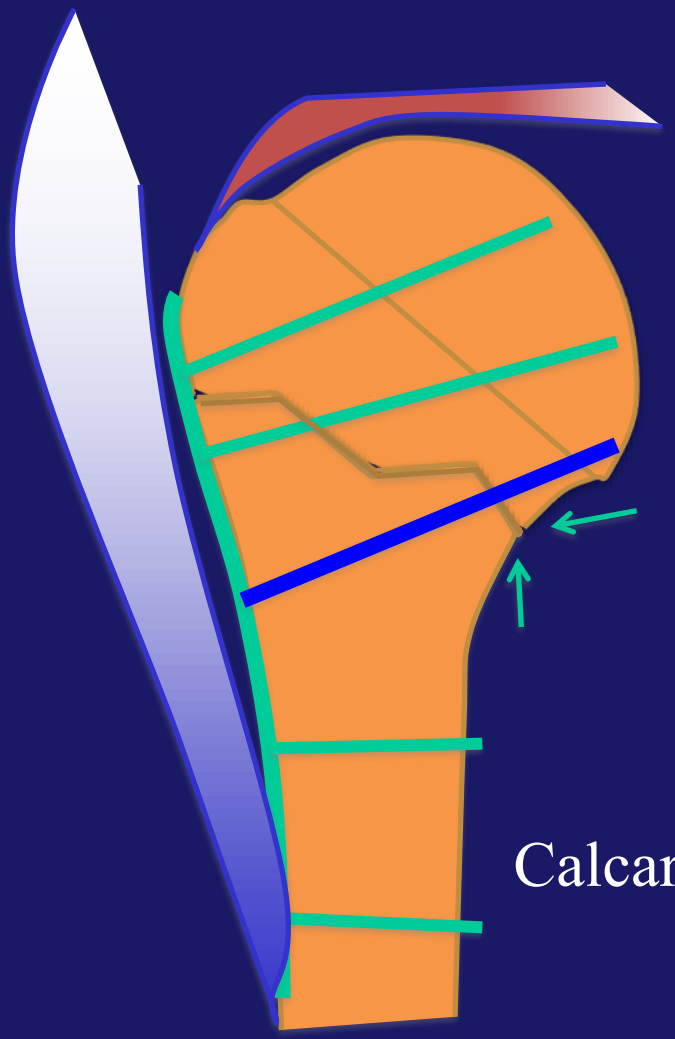
- 1. Calcar reduction
- 2. No varus
- 3. Calcar screw
- 4. Suture greater tuberosity

Varus



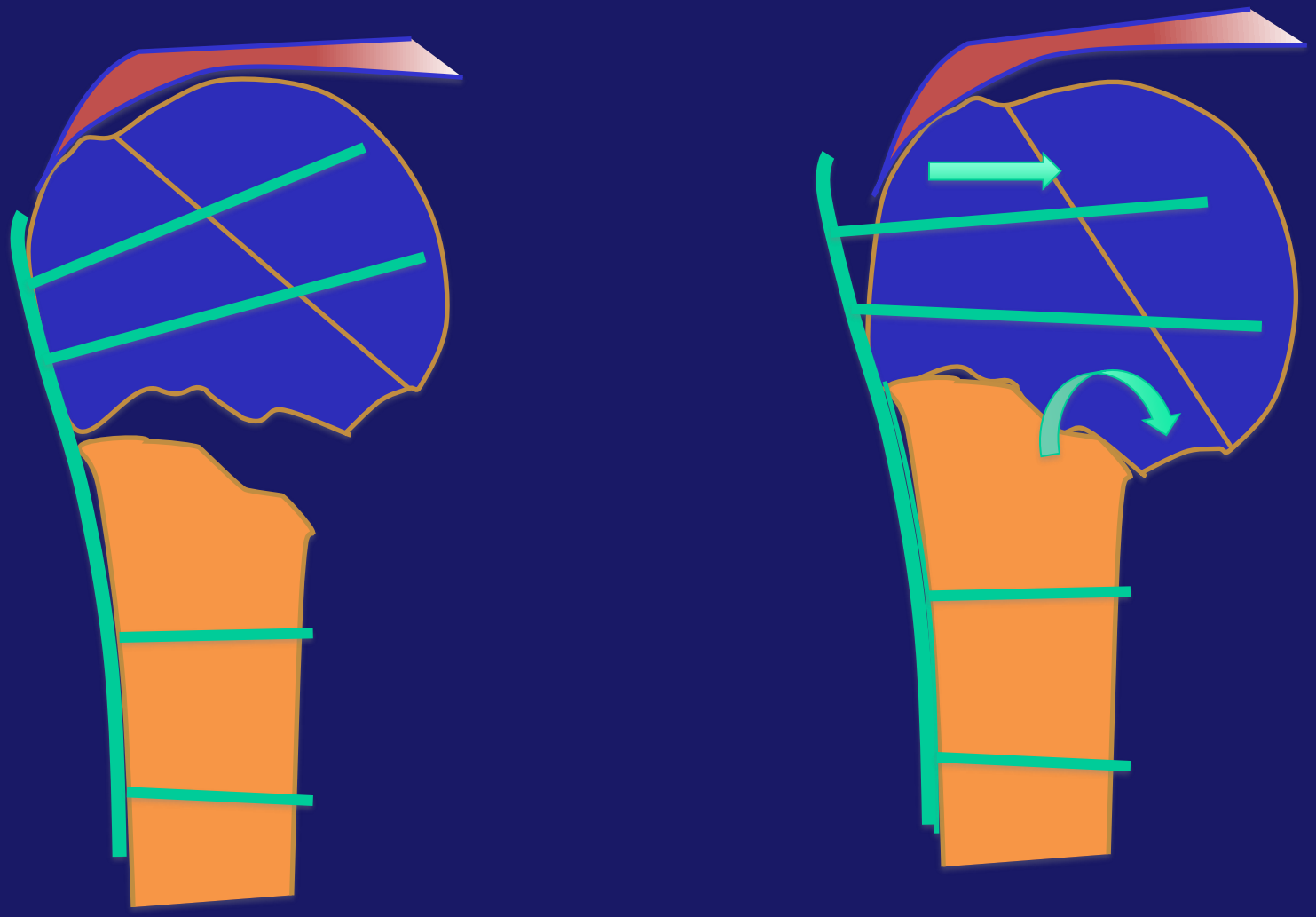
Varus



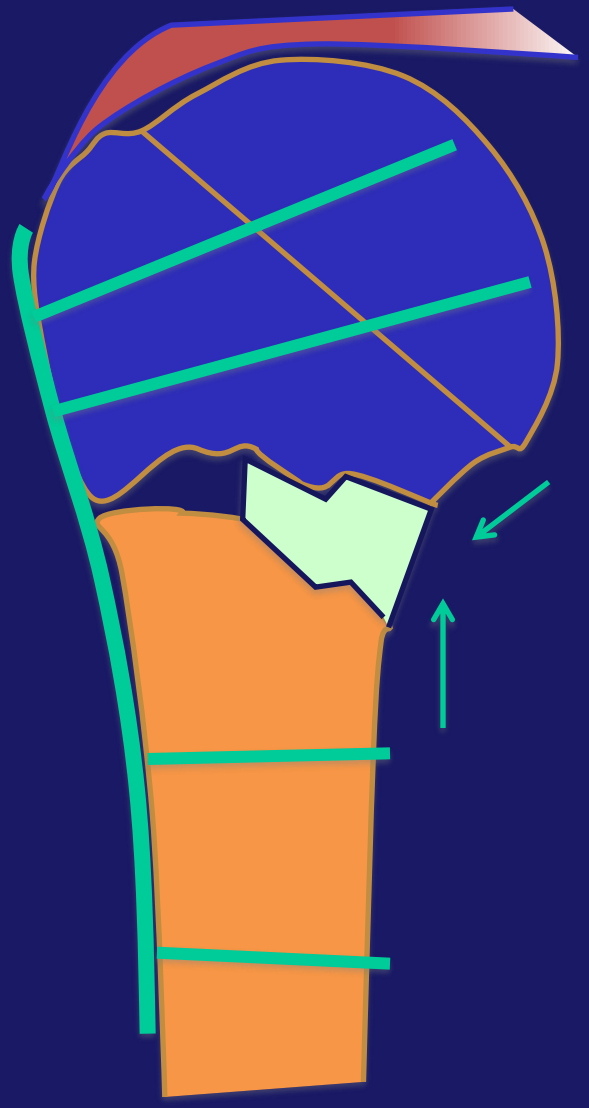


Calcar screw

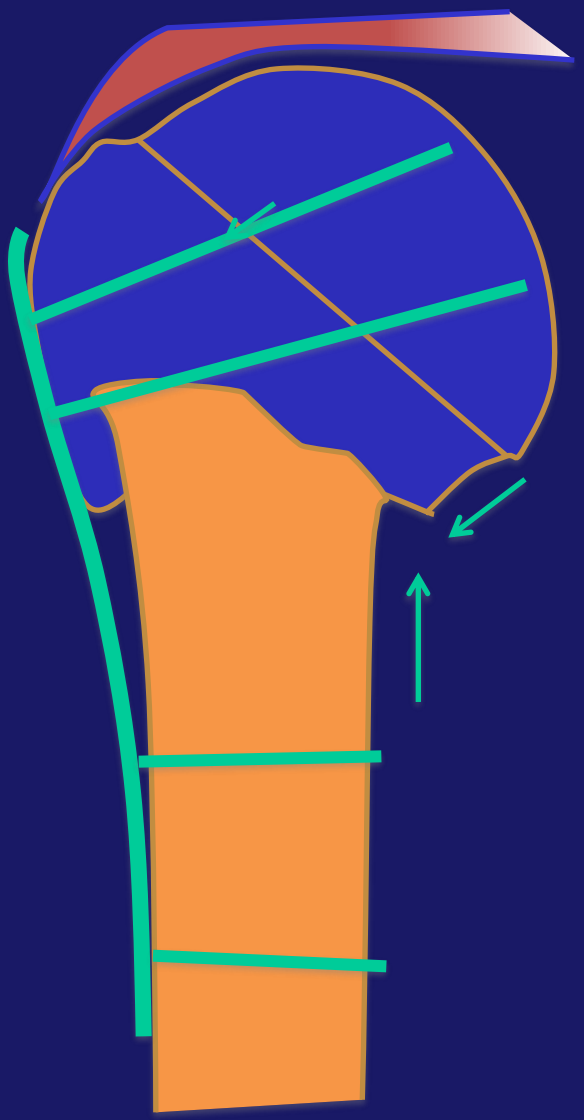
Varus



Varus

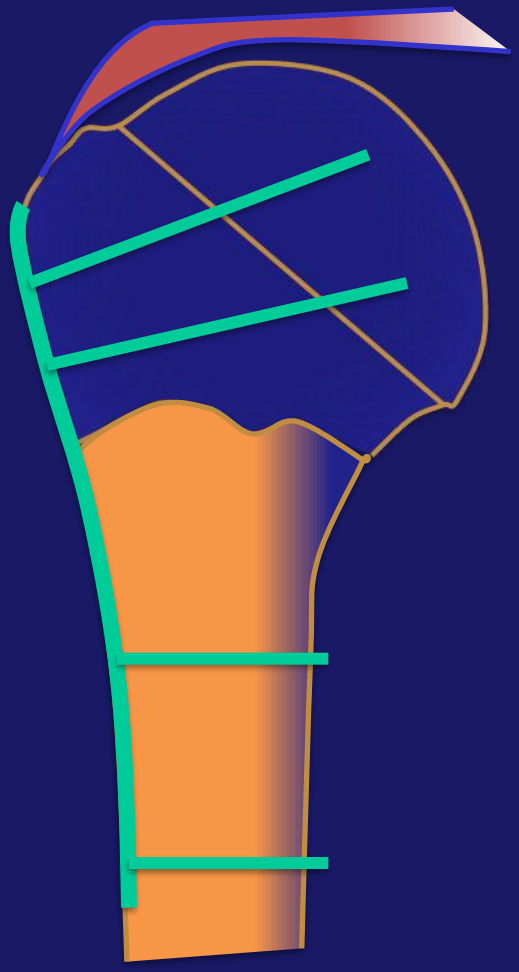


Structural graft

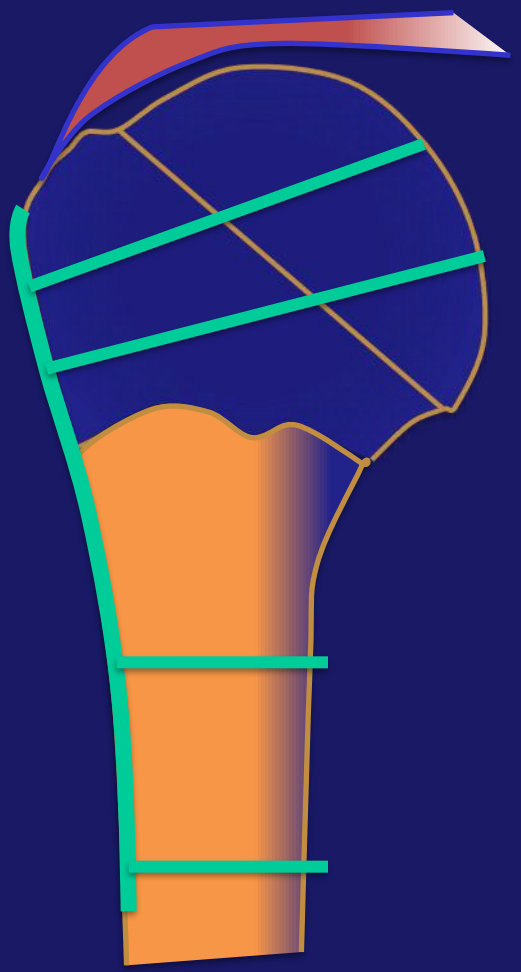


Compression -reduction

Screw Technique



Poor purchase but ”safe”



Better purchase but ”risky”

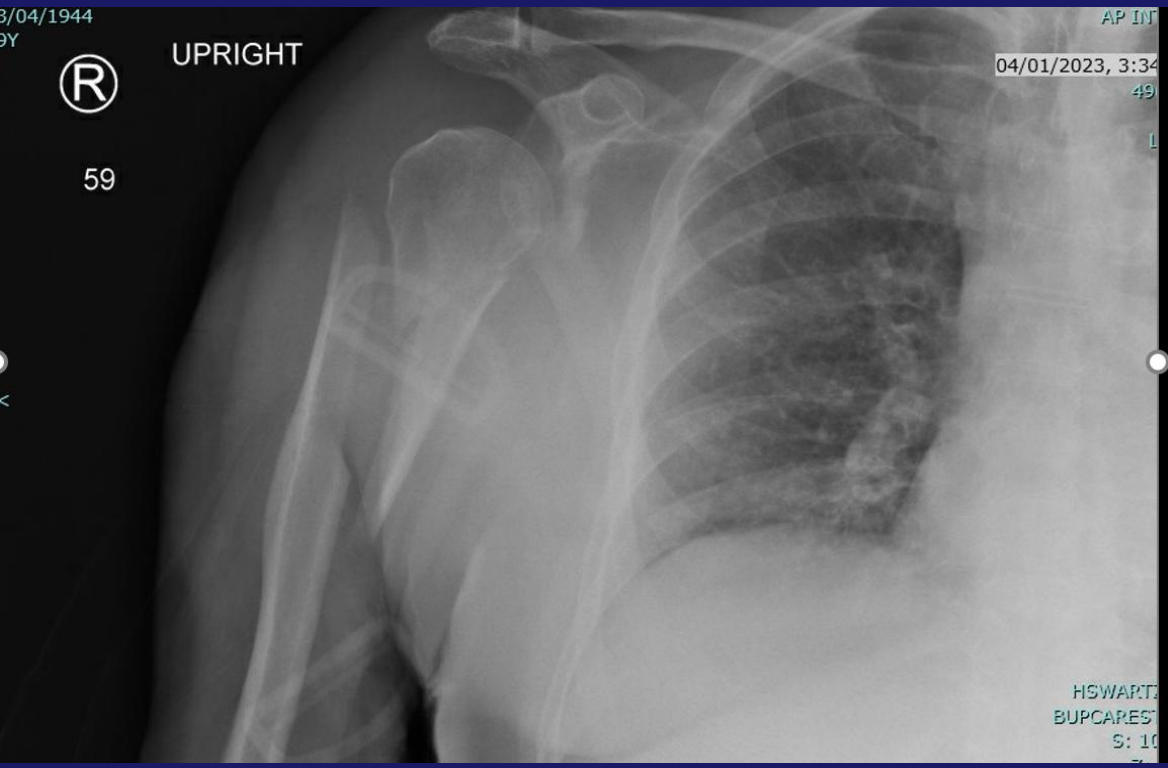
Technique

Structural support

- Fibular strut graft (Lorich)
- Calcium phosphate (Egol, Zuckerman)
- Allograft femoral head (JP Warner)
- Medial plate (Wang and He)
- Other……..

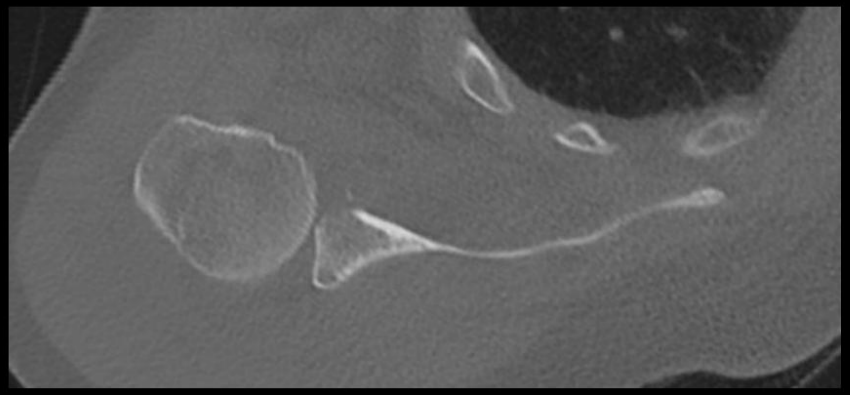
Void fillers / Structural support

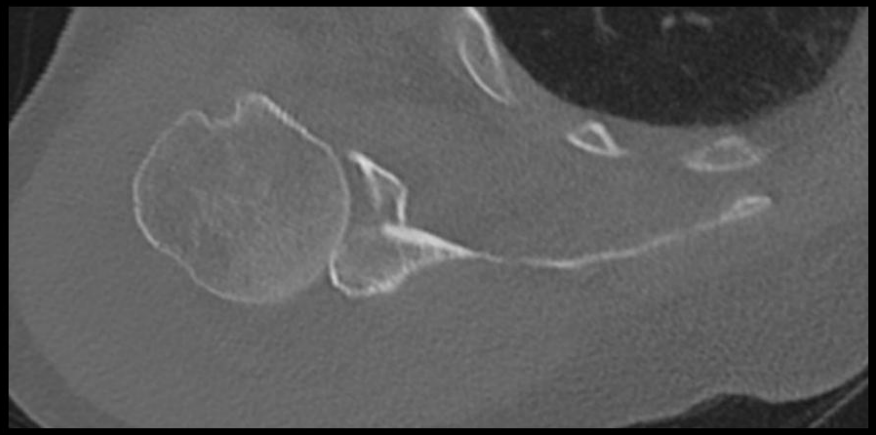
79 year old male

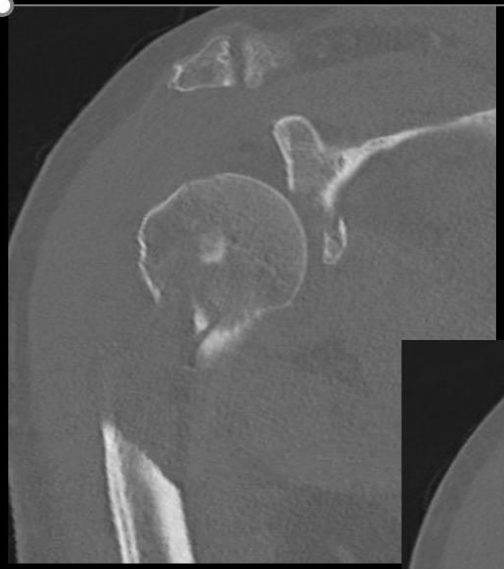



R GWD
CROSS-TABLE
03/2

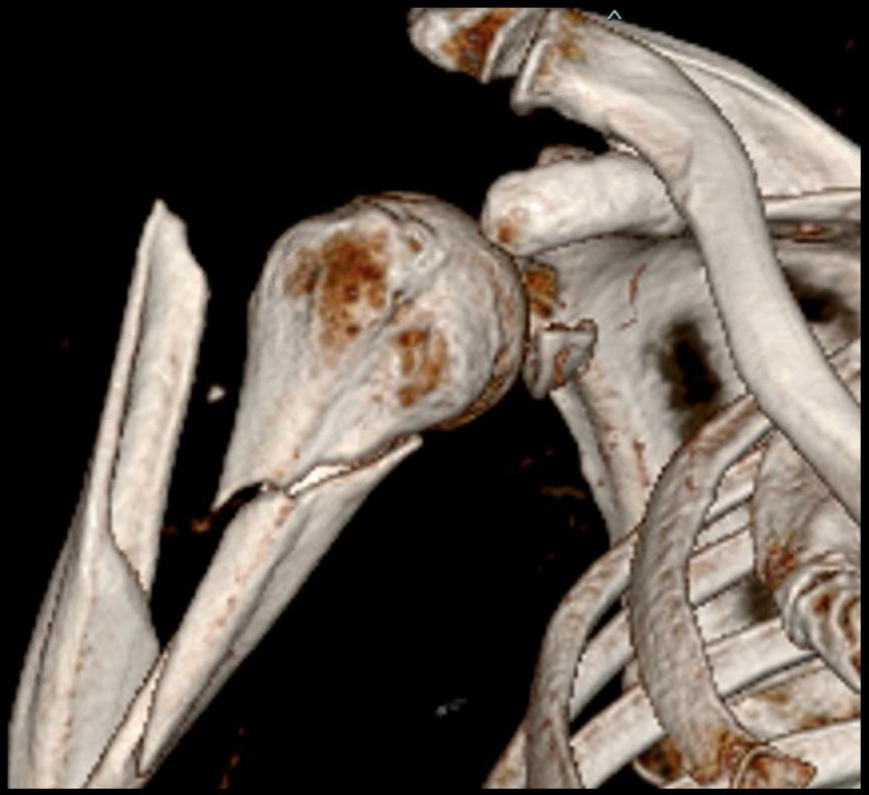
RS 79M

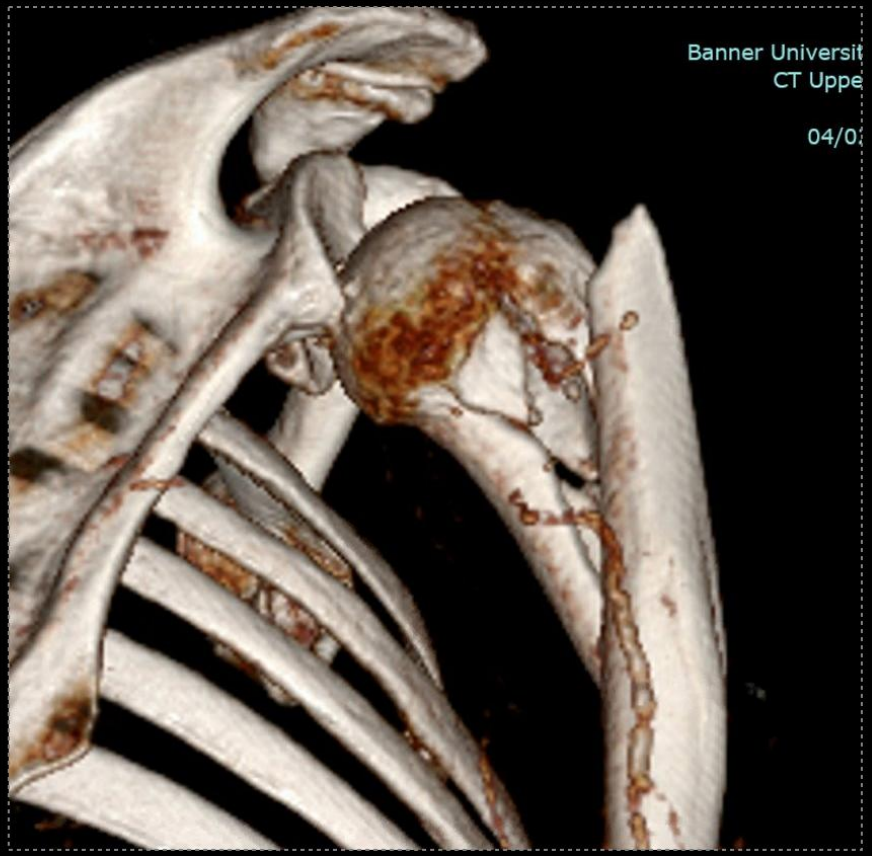


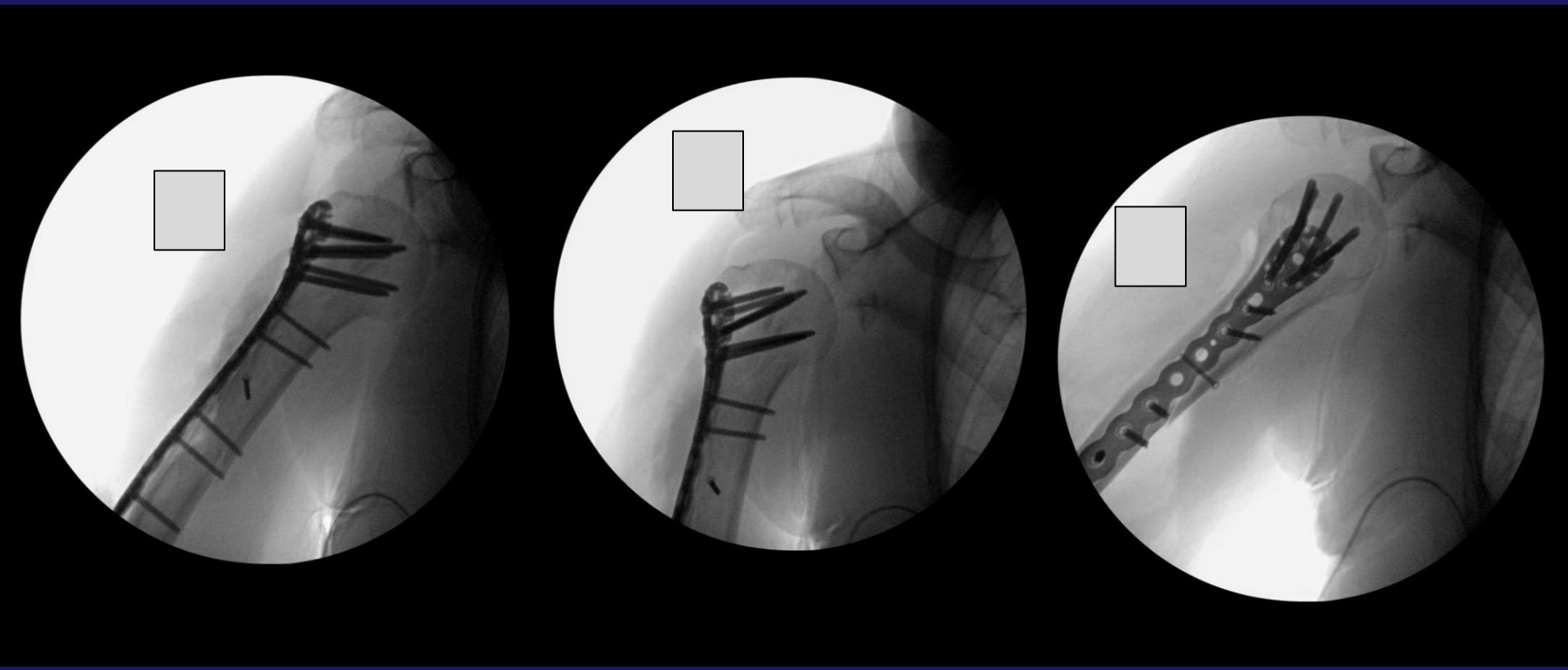




3D CT Scan





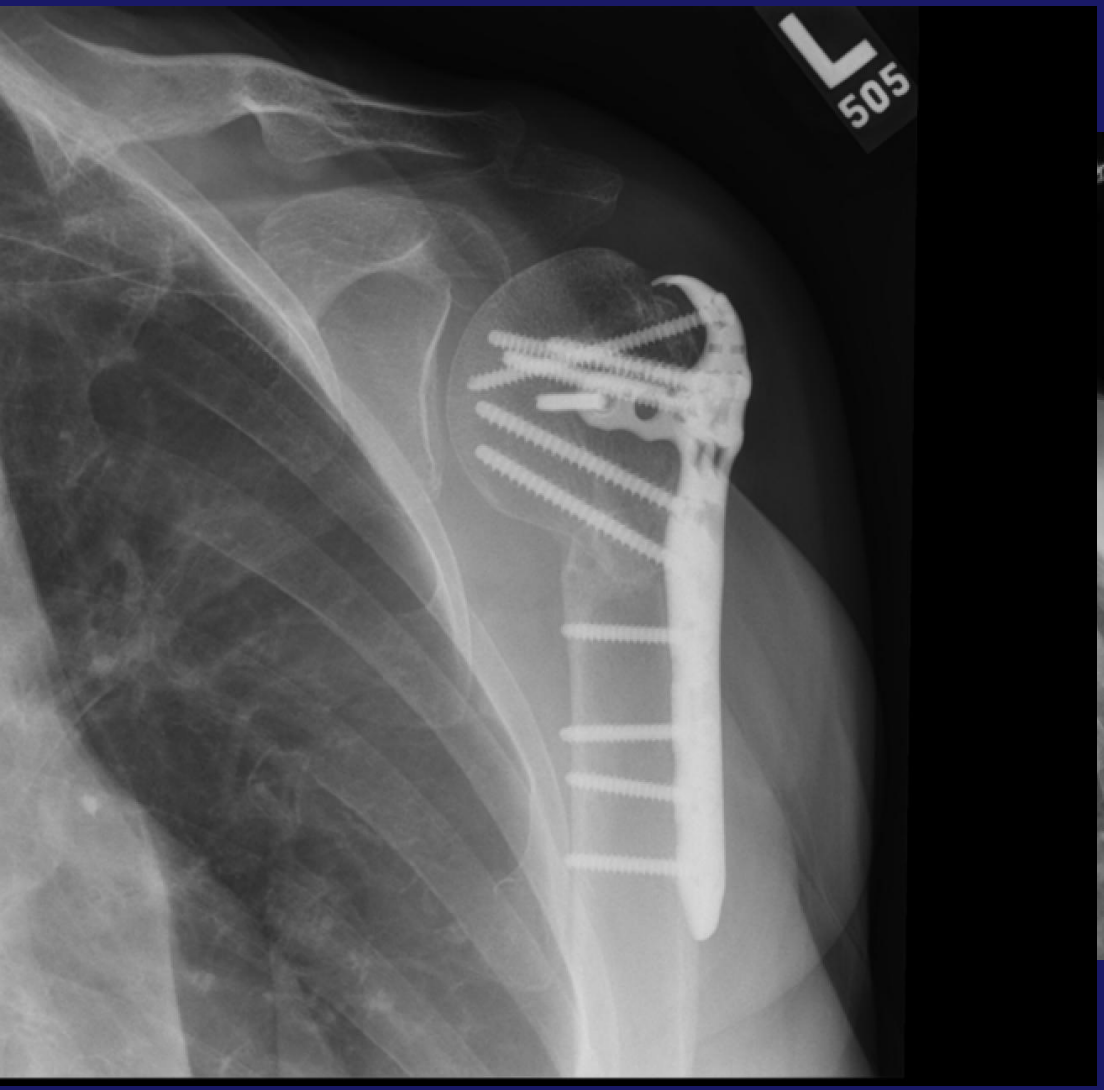


- **Intraoperative radiograph following fixation of proximal fracture**

Final

3 Part Proximal Humeral Fracture

- ex-ballerina
- Fall down stairs
- Teaches ballet
- Isolated , NV intact
- Demands “perfect” shoulder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Proximal Humeral Fractures: Conclusions

- Most patients (especially the elderly) can and should be treated non-operatively
- This is some literature that helps predict nonunion risk
- If ORIF is chosen, several well – established principles are important to maximize success with the use of current proximal humeral locking plates
- More complex fractures / dislocations will benefit from arthroplasty