

Surgical Complication & Pitfall In Management of Proximal Humerus Fractures



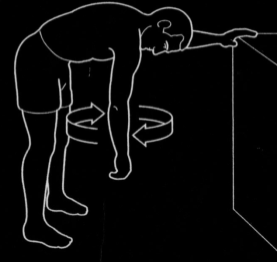
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OUTLINE

- Pitfalls in initial survey and diagnosis
- Treatment options
- Pre-OP evaluation and surgical tips
- Tricks of reduction and fixation
- Complications of locking plate
- Hemiarthroplasty

Non-Surgical Treatment

- Short period immobilization
 - Stable fracture : gentle ROM exercises may begin after 7-10 days
- Early passive range of motion exercise within 14 days
 - 77%: with good to excellent results



- Zuckerman JD, 1995

Radiographic Assessment

- Three orthogonal planes
 - scapular AP, scapular Lat & axillary views
- The displacement, not the number of fracture lines, is more important
- Carefully looking for surgical neck when tuberosity fractures identified



Computed Tomography Scan

ARS

Q Is there a role for CT scan in the classification and management ?

A Evidence-based:

- **Improve** the reliability of classification
 - better with 3-D than 2-D
- **Uncertain**: more reliable classification leads to accuracy or better outcome ?



- BMC Musculoskelet Disord 2009
- Injury 2010

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Risk Factors

- Consideration of risk factors
 - Osteoporosis
 - Concomitant injury
 - Poor post-op compliance
 - Patient factors (alcoholism, systemic disease & functional demands)



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Humeral Head Viability

- Ischemia of the humeral head correlated with
 - *posteromedial* metaphyseal extension < 8 mm
 - disruption of the medial hinge (> 2 mm)

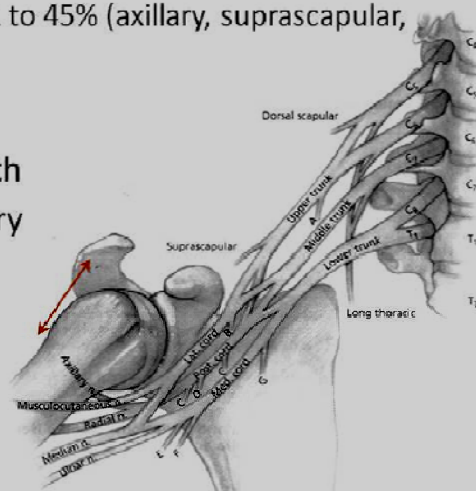
- Hertal R, et al
J Shoulder Elbow Surg 2004




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Neurovascular Assessment

- All require complete neurovascular examination
 - Nerve injury incidence: 21 to 45% (axillary, suprascapular, radial & MC nerve)
 - Persistent motor loss: 8%
- Anatomical variations with respect to iatrogenic injury
 - Kamineni S, et al; Injury 2004
- Axillary nerve as closed as 31mm
 - J Shoulder Elbow Surg 1992



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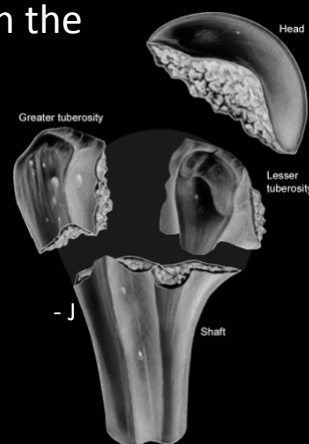
Surgical Treatment

- Open reduction : popular for most of fractures and fracture-dislocation
 - optional for 4-part fracture
- Closed reduction and percutaneous fixation
 - Selective cases
- Prosthesis replacement



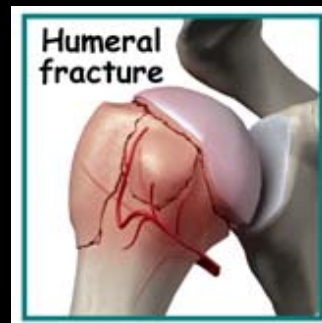
Complex Fractures (3 & 4-part)

- About 13% to 16%
 - Can be difficult to treat, even in the most experienced hands
 - Possibly with dislocation
 - 80% of posterior dislocation, missed initially
- Orthop Sci 2000



Open Reduction Internal Fixation

- The key to successful ORIF is **selecting the proper patient**
- AVN after surgery
 - 12 – 25% in 3-part
 - 41 – 59% in 4-part
- Watch for the 4-part equivalent pattern



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ORIF tips for fracture reduction

- Avoiding varus deformity, instability and re-displacement
 - Lee CW; J Shoulder Elbow Surg 2009
 - Owsley KC ; J Bone Joint Surg Am 2008
- Structural autograft / allograft
 - improve stability in varus displacement & loss of posteromedial calcar
 - Robinson CM; J Bone Joint Surg Br 2010




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ORIF tips for fracture reduction

- Greater tuberosity reduction is critical
- Functional outcome correlated with correct reduction with > 5 mm shifted greater tubercle

– Kettler M; Unfallchirurg 2006

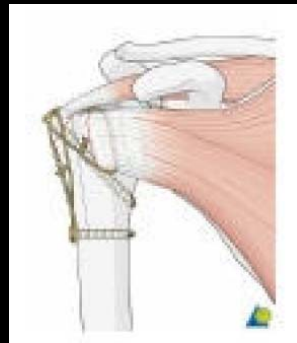


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Fixation in Osteoporotic Bone

- Importance of dynamic and flexible osteosynthesis is increased
- Avoidance of over-sized osteosynthesis device

- Arch Orthop Trauma Surg 2003



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Open Reduction and Internal Fixation of Proximal Humeral Fractures with Use of the Locking Proximal Humerus Plate. Results of a Prospective, Multicenter, Observational Study

N. Stüdkamp, J. Bayer, P. Hepp, C. Voigt, H. Oestern, M. Kääh, C. Luo, M. Plecko, K. Wendt, W. Köstler and G. Konrad
J Bone Joint Surg Am. 2009;91:1320-1328. doi:10.2106/JBJS.H.00006

- Complications in 52 / 155 patients (34%)
- Totally 62 complications
 - 37 (60%) within 3 months after surgery
 - 34 (55%) directly related the initial surgical procedures

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Minimally invasive reduction and percutaneous fixation

- Advantages: cosmetic, reduce blood loss, pain, infection
- Satisfactory results were reported
 - Resch H, Injury 2001
 - Dimakopoulos P, JBJS 2007



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Disadvantages

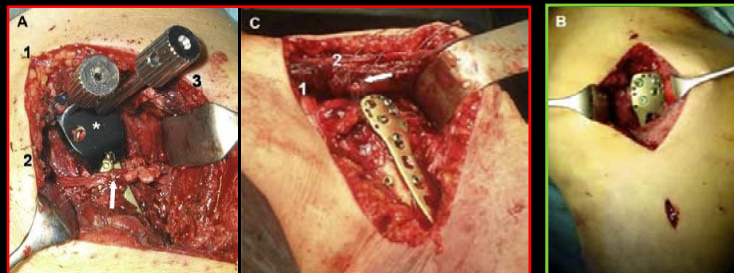
- Steep learning curve
- Risk of neural (axial n.) / vascular injury
- Less stable (or reliable) fixation

– Murray IR, JBJSB 2011


Surgical Approach & Pitfalls

- Hepp P; J Shoulder Elbow Surg 2008


- Traditional deltopectoral approach
 - Extensive dissection & devascularization
- Anterolateral deltoid splitting approach
 - Axillary nerve 5~7 cm distal to the acromion




	Pierre Hepp, et al		Chen, et al
Patient Demographics	DS (N=39)	DP (N=44)	N = 20
Age (year)			
Mean ± SD	64	65.5	57.1 ± 12.7
Range	18-88	25-84	42-77
Sex			
Female	27	37	15
Male	12	7	5
Injury pattern			
Motor vehicle accident	N/A; 30 (79.9%) were retired	N/A; 31 (70.5%) were retired	12
Other			8
Injury to OP Time (week)			
Mean ± SD			5.6 ± 11.8
Range			0-17

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Constant Score		Pierre Hepp, et al				Chen, et al	
Neer	Total	Group DS		Group DP		Group DS	
		No.	CS	No.	CS	No.	CS
2-part	18	12	71	6	81	10	83
3-part	53	22	76	31	85	7	81
4-part	12	5	63	7	64	3	61

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Complications	Pierre Hepp, et al		Chen, et al
	DS : 12/39 (31%)	DP : 19/44 (43%)	5/20 (25%)
Implant breakage	1	0	0
Screw perforation of head *			
Initial	1	4	1
Secondary	3	4	0
Varus alignment	2	1	2
G-tuberosity migration	1	0	0
Subacromial impingement	1	1	0
Nonunion *	0	2	0
Avascular Necrosis *	1	3	1
Re-op within 12 months	5	4	1

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Taking Home Messages

- Outcome depends on the ability to achieve both osseous and soft tissue healing
- Thorough pre-OP counseling & optimized surgical planning
- Current trends
 - Less invasive surgery
 - Dynamic and flexible osteosynthesis
 - Extended indications with RSR
- ! Patient's compliance