Proximal Humerus Fractures
- Challenges:
  - Technically difficult
  - Reconstruct normal anatomy
  - Face w poor quality bone
  - Often comminuted fragments
  - Obtain Tuberosity healing
  - Restore Cuff function

Evolution of Treatment Concepts
- ORIF
  - Locking plates, deltoid splitting approach
- Percutaneous Pinning
  - Limited indications
- Applicable to certain fracture types
- Hemiarthroplasty
- Fracture specific prostheses
- Reverse for fracture

Severe Proximal Humerus Fractures

Reasons Hemi Has a Role
1. Some reported outcomes equivalent
2. Reverse implants more expensive (relative)
3. Complications historically lower!!
   - Risk analysis-Superior outcomes with Reverse evolving
   - Related to developing technology/Implant design
   - Related to Surgeon Experience
   - Related to Patient factors/co-morbidities

Head Replacement for Fracture
- Goals:
  - Must be done correctly!!
  - Restore soft tissue anatomy
  - Restore bone anatomy
  - Tuberosity Healing
  - Fracture specific stems

Hemiarthroplasty
- Failure of tuberosity healing
- Common indication for reverse TSA!
- Prominent humeral head
- Superior instability
- Pain!!

Reverse TSA
- Traditional Indications
  - Fracture sequelae
    - Nonunion
    - Malunion
  - AVN
  - Tuberosity Osteotomy
  - Boileau, BBR

Reverse SR Indications
- Have expanded
  - Massive rotator cuff tears in elderly
  - Failed shoulder (hemiarthroplasty/Glenoid
  - Acute proximal humerus fractures in elderly
  - Proximal humeral fracture sequelae: malunion & nonunion
  - Risk of rotator cuff deficiency w arthritis
  - Fatty substitution of SSP and ISP – grade 2
  - B2 Glenoid osteoarthritis w/ decentering
  - Chronic dislocation/instability
  - Proximal humeral bone loss/trauma

Tuberosity Reconstruction:
- Vertical Fixation

Acknowledgement (scheduled to give this talk)
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Hemiarthroplasty versus Reverse shoulder arthroplasty: a comparative study of functional and radiological outcomes in the treatment of acute proximal humeral fractures

Bauml, Campochiaro, Serafini et al.
Musculoskeletal Surgery April 2014

Retrospective Cohort Study
2008-2012 – 43 Patients treated with HHR or RSA
Evaluated 53 cases with an average follow-up of 27.5 months
28 patients (mean age 71.4) treated with HHR
25 patients (mean age 77.5) treated with RSA

Constant, ASES, DASH scores, Abduction Strength, ER1, ER2, and 5-S Ways

Conclusion: No significant difference in functional outcomes or revision rates between RSA and Hemi for acute proximal humerus fractures

Surgical vs Nonsurgical Treatment of Adults With Displaced Fractures of the Proximal Humerus: The PROFHER Randomized Clinical Trial

Van der Hoeve M, van Honkma CJA, de Boer MF, et al. JAMA; April 2017

Hemiarthroplasty or Reverse shoulder arthroplasty: a comparative study of functional and radiological outcomes in the treatment of acute proximal humeral fractures

Baued, Campochiaro, Serafini et al.
Musculoskeletal Surgery April 2014

Trends in Reverse TSA in US

- Reverse Shoulder Arthroplasty in the United States: A Comparison of National Volume, Patient Demographics, Complications, and Surgical Indications

Prospective observational study of 10,072 patients who underwent shoulder surgery:
- Reverse shoulder arthroplasty (RSA) vs. hemiarthroplasty (Hemi)

Reverse total shoulder arthroplasty versus hemiarthroplasty for proximal humeral fractures: A systematic review

Journal of Orthopaedic Trauma Jan. 2015; Ferrell, Trihal, Fletcher
Studies up until January 2014 reviewed
Studios with outcomes reported on human subjects with at least 1 year follow-up

Conclusions:
- RSA with better forward flexion (118 vs 108 in HHR)

No significant difference in either ASES (RSA 64.7 Hemi 63) or Constant Scores (RSA 54.9 Hemi 53)

RSA with higher rate of clinical complications (9.6%) but a lower revision rate (0.85%) compared with HHR

Complications
- Stem loosening
- 5 neurologic injuries
- 3 pain syndrome
- 1 dislocation
- 1 arthroplasty fracture
- 1 periprosthetic fx
- 1 deltoid dehiscence

Cost-Utility of RTSA for Proximal Humerus Fractures

JSES February 2014; Chalmers, Slikker, Mall, Gupta et al

Reverse total shoulder arthroplasty (RTSA) vs. hemiarthroplasty (Hemi) for proximal humerus fractures:
- A cost-utility analysis

Implant survival 88.9%
Mean age at surgery was 71.9 years
27 Patients who had HHR between 2001 & 2005 for 3 & 4-part humeral Fxs

Results: RTSA is cost-effective with an incremental cost-effectiveness ratio of $8100 per quality-adjusted life year

From a payer perspective, RTSA was cost-effective with an incremental cost-effectiveness ratio of $10,300 per quality-adjusted life year

Hemiarthroplasty compared with non-operative treatment in patient reported clinical outcomes at 3 years


Hemiarthroplasty: no difference in revision rates or complications compared with non-surgical treatment in patient-reported clinical outcomes at 3 years
**Trend of Reverse for Fracture**

- Hemi vs Reverse
  - Overall, results similar (if tuberosity healed)
  - Often pts w poor bone quality
- Hemi- results in 2 disparate groups
- Reverse finds “middle ground”
- Beware Complication Rate!!

**Proximal Humerus Fractures**

Reverse shoulder arthroplasty for treatment of proximal humeral fractures in older adults: a systematic review


- 504 Hemiarthroplasties vs. 317 RSAs
- 5.6 yr mean follow-up
- ASES 56 vs. 75
- Forward flexion 21 degrees greater RSA
- No difference in complication rate

**Proximal Humerus Fractures**

Functional outcomes of reverse shoulder arthroplasty compared with hemiarthroplasty for acute proximal humeral fractures

- New Zealand Joint Registry
- 55 RSAs vs. 313 Hemi
- 5 years results superior for RSA
- No difference in complication rate

**Issues to Consider**

1. What is best for the patient?
2. What is most cost-effective?
3. About magnitude of complications?