



# reversed **fx** clinical summaries & references

TORNIER REVERSED FRACTURE



## Reverse TSA Now a Logical Choice for Proximal Humeral Fractures

Hemiarthroplasty, the historical standard of care for proximal humeral fractures requiring replacement, fails most commonly because of nonunion. The reversed prosthesis has become the choice for glenohumeral osteoarthritis in a cuff-deficient shoulder. It allows restoration of mobility despite the loss of rotator cuff function. Therefore, in the face of poor bone quality, the reverse prosthesis has recently been a logical choice for acute fractures to improve postoperative mobility in elevation regardless of tuberosity healing.

*Sirveaux F, Navez G, Roche O, Molé D, Williams M. Reverse Prosthesis for Proximal Humerus Fracture, Technique and Results. Techniques in Shoulder & Elbow Surgery 2008; 9(1):15-22.*

## More predictable and Consistent Outcomes than Hemiarthroplasty for Proximal Humeral Fracture

15 Reversed for fracture cases, retrospectively reviewed

- Mean age of 78 years & Mean follow-up of 46 months

When compared to a series of elderly treated with hemiarthroplasty

- The mean AAE was similar but the distribution was different
  - Reverse Group — only 1 patient had less than 90° of AAE and 0 patients had greater than 150° AAE
  - Hemi Group — 50% of patients had less than 90° of AAE and 11 patients had greater than 150° AAE

Comparing both groups (Reverse and Hemi) when the tuberosity did not heal:

- Mean constant score
  - Reversed Group — 55 points
  - Hemiarthroplasty Group — 41 points
- Mean AAE
  - Reversed Group — 116°
  - Hemiarthroplasty Group — 75°

*Sirveaux F, Navez G, Roche O, Molé D, Williams M. Reverse Prosthesis for Proximal Humerus Fracture, Technique and Results. Techniques in Shoulder & Elbow Surgery 2008; 9(1):15-22.*

## Better Active Elevation

"Preliminary results of a prospective study showed that the patients treated with a reverse prosthesis in the case of acute fracture achieved an average of 113 degrees of active elevation compared with 88 degrees with hemiarthroplasty."

*Sirveaux F, Molé D, Boileau P. The reversed prosthesis. In: Warner JJ, Iannotti JP, Flatow E, eds. Complex and Revision Problems in Shoulder Surgery. Philadelphia: Lippincott Williams and Wilkins; 2006:497-511.*

## Better External Rotation

The recovery of active external rotation was better when the greater tuberosity healed anatomically. Compared with conventional hemiarthroplasty, satisfactory mobility was obtained despite frequent migration of the tuberosities.

- 43 cases with a mean age of 78
- Tuberosities fixed around prosthesis
- Mean follow-up was 22 months
- AAE = 97 degrees
- Constant Score Avg = 44 points
- ER in abd = 30 degrees

*Buřquin T. et al. Reverse shoulder arthroplasty for the treatment of three- and four-part fractures of the proximal humerus in the elderly: A prospective review of 43 cases with short term follow-up. J Bone Joint Surg Br. 2007;89:516-520.*

## 120° Elevation and Better External Rotation when Tuberosities Fixed

In 2006, Cazeneuve and Cristofari reported their experience of 23 cases of reversed prostheses for acute fracture. Sixteen cases were reviewed at an average follow-up of 86 months. The mean age of the patients was 75 years. Tuberosities were sutured in 5 of the cases. The mean constant score was 60 points and the active anterior elevation was more than 120 degrees in all but two cases. The recovery of active external rotation was better in cases where the tuberosities had been fixed.

- 16 cases reviewed
- Tuberosities fixed in 5 cases
- Constant Score 60
- AAE 120° in 88% of cases
- ER better in those with fixed tuberosities

*Cazeneuve JF, Cristofari DJ. Grammont reversed prosthesis for acute complex fracture of the proximal humerus in an elderly population with 5 to 12 years follow-up. Rev Chir Orthop Reparatrice Appar Mot. 2006;92:543-548.*

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## Proximal Humeral Fractures Complications Often Related to Tuberosity Healing Problems

Replacement arthroplasty as a treatment of a proximal humeral malunion is one of the most challenging procedures for a surgeon, with a relatively high rate of complications. These complications are frequent and often related to rotator cuff and tuberosity healing problems and some degree of joint subluxation.

*Antuna S, Sperling J, Sanchez-Sotelo J, Cofield R. Shoulder arthroplasty for proximal humeral malunions: Long-term results. J Shoulder Elbow Surg 2002;11:1220-129.*

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## Function Results of Hemiarthroplasty are Directly Associated with Tuberosity Osteosynthesis

"Functional results after hemiarthroplasty for 3- and 4-part proximal humeral fractures appear to be directly associated with tuberosity osteosynthesis. The most significant factor associated with poor and unsatisfactory postoperative functional results was malposition of the tuberosities."

*Boileau P, Krishnan G, Tinsi L, Walch G, Coste J, Molé D. Tuberosity malposition and migration: Reasons for poor outcomes after hemiarthroplasty for displaced fractures of the proximal humerus. J Shoulder Elbow Surg 2002;11:401-12.*

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## Hemiarthroplasty Poor Outcomes are Directly Related to Tuberosity Malpositioning and Malunion/Nonunion

Failure to recreate proximal humeral anatomy can have serious, negative consequences. Retrospective work has demonstrated that final tuberosity malpositioning correlated with poor functional results and that intraoperative malpositioning of the prosthesis itself correlated with tuberosity malposition. Pejorative factors associated with poor outcomes include not only tuberosity malpositioning but also tuberosity malunion/nonunion.

*Krishnan S, Lin K, Burkhead W. Pins, plates, and prostheses' proximal humerus fractures: Current concepts in treatment. Curr Opin Orthop 2007; 18:156.*

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## Poor Results are Related to Greater Tuberosity Healing

The main complication causing these poor results is lack of greater tuberosity healing.

### Multiple factors influence tuberosity healing:

- Surgical Technique:
  - Position of the implant
  - Position of the tuberosities
- Osteosynthesis technique
- Physiologic Criteria:
  - Age and sex
  - Bone quality
  - Blood supply
  - Fracture type
  - Muscle structure (fatty infiltrated muscle)
- Rehabilitation protocol
- Implant design

*Boileau P, Sinnerton J, Chuinard C, Walch G. Arthroplasty of the shoulder. J Bone Joint Surg [Br] 2006; 88-B:562-75.*

*Boileau P, Krishnan G, Tinsi L, Walch G, Coste J, Molé D. Tuberosity malposition and migration: Reasons for poor outcomes after hemiarthroplasty for displaced fractures of the proximal humerus. J Shoulder Elbow Surg 2002;11:401-12.*

## Hemiarthroplasty for Sequelae of Proximal Humeral Fractures Fares Even Worse

The results of patients with old trauma or late sequelae of proximal humeral fractures have shown to be inferior to the results obtained in patients with recent 4-part fractures who are treated initially with humeral head placement.

*Mansat P, Guity M, Bellumore Y, Mansat M. Shoulder arthroplasty for late sequelae of proximal humeral fractures. J Shoulder Elbow Surg 2004;13:305-12.*

Author	Cases	Satisfactory %	AAE/ER
Neer et al (1982)	35	56%	NA
Tanner and Cofield (1983)	28	NA	112°/42°
Huten and Dupart (1986)	22	22%	NA
Frich et al (1991)	27	15%	NA
Habermeyer (1992)	18	32%	NA
Dines et al (1993)	20	70%	110°/31°
Norris et al (1995)	23	NA	92°/27°
Postel et al (1995)	48	19%	92°/22°
Bosch et al (1998)	14	NA	60°/18°
Beredjikian et al (1998)	24	72%	102°/34°
Boileau et al (2001)	71	42%	107°/20°



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