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ORIGINAL ARTICLE

Outcomes for a large metaphyseal volume hemiarthroplasty in complex fractures of the proximal humerus

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Background: A large metaphyseal volume shoulder hemiarthroplasty has been in use within our department since 2008; however, no clinical outcome data are available for this prosthesis apart from the designer surgeon series.

Materials and methods: During a 5-year period, data were collected for 40 patients (30 women, 10 men) treated consecutively with the Zimmer Anatomical Shoulder Fracture hemiarthroplasty system (Zimmer, Warsaw, IN, USA).

Results: The final analysis included 26 patients. The median age was 79 years (range, 58-91 years), and the median follow-up was 3.7 years (range, 2.0-5.8 years). The median Constant Score was 34 points (range, 16-70 points), and the median Oxford Shoulder Score was 27 points (range, 5-46 points). The greater tuberosity healed satisfactorily in 12 patients. Resorption of the greater tuberosity was seen radiologically in 18 patients. The presence of resorption had no significant effect on the Constant Score ($P = .264$) or the Oxford Shoulder Score ($P = .469$). Three patients (12%) required revision.

Conclusions: This is the first report from a nondesigner center for outcomes for this prosthesis to date. The results demonstrate reduced functional performance compared with the designer series.

Level of evidence: Level IV; Case Series; Treatment Study

Keywords: Shoulder; humerus; trauma; fracture; hemiarthroplasty; Zimmer

The treatment of complex fractures of the proximal humerus is challenging, particularly in the elderly. The objective functional results of hemiarthroplasty generally tend to be unsatisfactory,[11,13,15,17,22,27] although patients often report improved subjective outcomes and pain control.[11,15,20,26] Anatomic healing of the greater and lesser tuberosity fragments appears to be a key determinant to a satisfactory outcome.[1,2,8] Displacement beyond 5 mm is associated with fatty infiltration of the rotator cuff muscles and a poor result.[8,12]

Various designs of prosthetic stems have been conceived to address the issue of tuberosity malposition and subsequent poor outcomes in shoulder hemiarthroplasty. A number of fracture stem designs exist that consist of a low-profile metaphyseal component that allows for tuberosity reconstruction and bone grafting around the shoulder of the prosthetic stem. These designs are engineered to allow better tuberosity apposition with the prosthetic stem and humeral shaft in a fracture setting. Although a number of stem configurations exist, there is no hard evidence to demonstrate a superior construct.[18]

Ethics approval was not required for our study.

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Table I Breakdown of patient data according to assessments performed

Variable*	All patients (n = 40)	Exclusions (n = 14)	Patients eligible for review (n = 26)	Radiographic and clinical review	
				Full (including CS) (n = 21)	Limited (excluding CS) (n = 5)
Length of follow-up, y	. . .	. . .	3.7 (2.0-5.8)	3.6 (2.0-5.8)	3.8 (2.0-4.7)
Age at operation, y	77 (58-91)	76 (61-88)	79 (58-91)	77 (63-91)	81 (58-86)
Sex					
Female	30	10	20	19	1
Male	10	4	6	2	4
Side					
Right	22	7	15	12	3
Left	18	7	11	9	2
Neer fracture type					
2-part	1	1	0	0	0
3-part	13	5	8	5	3
4-part	26	8	18	16	2
Fixation method					
Cemented	18	3	15	12	3
Uncemented	22	11	11	9	2

CS, Constant Score.

* Categoric values are presented as the number and continuous values are presented as median (range).

Conversely, a large-volume metaphyseal concept, the Anatomical Shoulder Fracture hemiarthroplasty system (Zimmer, Warsaw, IN, USA), was introduced in 2006 with the intent that anatomical reduction and healing of the greater tuberosity could be achieved with a metallic scaffold.[8] In theory, this would then lead to better functional outcomes. Our unit has used this prosthesis since May 2008. A recent publication has reported the 2-year outcomes for this implant from the designer-surgeon center.[8] No other institution has reported its experience with this system. Our intention was to retrospectively evaluate the clinical and radiologic outcomes of this prosthesis in all patients treated in our unit between 2008 and 2013.

Materials and methods

Between May 2008 and March 2013, 40 patients (30 women, 10 men) with a proximal humeral fracture were treated consecutively with the Zimmer Anatomical Shoulder Fracture hemiarthroplasty system. All procedures were performed by 1 of 4 shoulder surgeons in the shoulder unit. A final clinical and radiographic review was performed between March 2014 and March 2015, allowing for a minimum 2-year follow-up. The final analysis excluded 14 patients (8 died, 2 were revised to a reverse total shoulder arthroplasty, 3 failed to meet the minimum follow-up period of 2 years, and 1 was lost to follow-up), leaving 26 patients eligible for review. A radiographic and complete clinical review, including a Constant Score (CS), was available for 21 of these patients, and the remaining 5 patients received a radiographic review (5 patients declined to attend a further clinic appointment). The 5 patients who declined further physical review in the clinic completed a postal questionnaire that included the Oxford Shoulder Score (OSS) and a subjective shoulder value. A CS could not be performed for these patients (Table I).

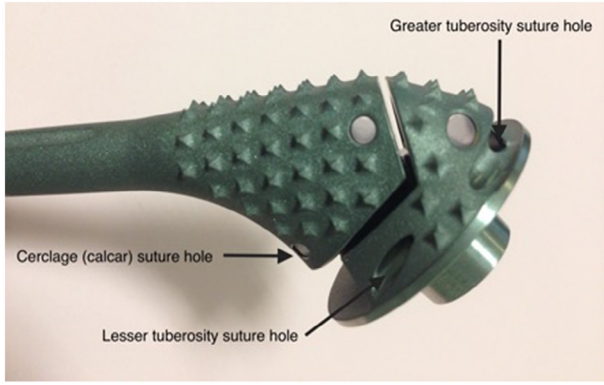

Figure 1 The Zimmer Anatomical Shoulder Fracture hemiarthroplasty system (Zimmer, Warsaw, IN, USA) with its associated suture holes.

All patients received general anesthesia with a regional plexus block and were operated on using a deltopectoral approach in a beach chair position. Prophylactic antibiotics consisted of 1.5 g cefuroxime on induction and 2 further doses at 8 and 16 hours postoperatively.

The tuberosity fragments were identified and tagged with nonabsorbable sutures. Assessment was made on the degree of soft tissue and capsular disruption from the head fragment before proceeding to hemiarthroplasty. The long head of the biceps tendon was tenotomized. Two sutures were used to attach each tuberosity fragment to the shaft (via drill holes) and to the suture holes on the prosthetic implant, respectively. A further 2 sutures were used: 1 as a circumferential suture around the repositioned tuberosities and another cerclage suture incorporating the medial suture hole on the calcar of the prosthesis (Fig. 1). The upper border of the pectoralis major tendon and the humeral calcar (when present) were used as reference guides to determine the height of the prosthesis and reconstruction of the tuberosities. An image intensifier was used in