J Shoulder Elbow Surg (2018) ■■, ■■–■■

ELSEVIER

Journal of Shoulder and Elbow Surgery

www.elsevier.com/locate/ymse

ORIGINAL ARTICLE

Revision of failed hemiarthroplasty for painful glenoid arthrosis to anatomic total shoulder arthroplasty

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Background: The impending burden of revision shoulder arthroplasty has increased interest in outcomes of revision procedures. Painful glenoid arthrosis following hemiarthroplasty is a common cause of reoperation, and conversion to anatomic total shoulder arthroplasty is one option.
Methods: We identified patients who underwent revision of painful hemiarthroplasty to total shoulder arthroplasty over a 15-year period in a single tertiary-care health system. Presurgical and operative data were analyzed for 28 patients who met the inclusion and exclusion criteria. Patients were contacted at a minimum of 2 years' follow-up after revision surgery for functional outcome scores, reoperations, and implant survival.
Results: The 2- and 5-year implant survival rates were 93% and 86%, respectively. Functional outcomes were obtained from 21 patients with surviving implants. The mean American Shoulder and Elbow Surgeons score, visual analog scale score for pain, and Single Assessment Numerical Evaluation score were 78 ± 20, 2.3 ± 2.6, and 71 ± 24, respectively. The mean Short Form 12 mental and physical scores were 49 ± 10 and 43 ± 9, respectively. Of the patients, 17 (81%) were either satisfied or very satisfied with their outcome. Complications were seen in 10 patients (36%), and 6 patients (21%) required reoperation.
Conclusions: Anatomic total shoulder arthroplasty following hemiarthroplasty can achieve successful outcomes and implant survival rates. Given our poor understanding of reverse shoulder arthroplasty longevity, this procedure should remain an option for patients with glenoid arthrosis and an intact rotator cuff.
Level of evidence: Level IV; Case Series; Treatment Study

Keywords: Revision shoulder arthroplasty; hemiarthroplasty; anatomic total shoulder arthroplasty; complications; reoperations; painful glenoid arthrosis; failed hemiarthroplasty

The increasing use of shoulder arthroplasty[20] will increase the burden of revision surgery, placing an emphasis on understanding outcomes of these procedures. While the popularity of hemiarthroplasty (HA) has waned in recent years owing to accumulating evidence that anatomic total shoulder arthroplasty (aTSA) provides superior pain relief and

The institutional review board of Thomas Jefferson University Hospitals has approved this study (15D.417).

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1058-2746/$ - see front matter
https://doi.org/10.1016/j.jse.2018.03.018

functional outcomes,[3,6,11] aTSA is limited by the risk of glenoid component loosening and alterations in glenoid bone stock that can complicate revision surgery. Primary HA is often performed in young patients to avoid these complications. HA has also been shown to be a reasonable option in certain etiologies of glenohumeral arthrosis, such as osteonecrosis[12,18,27] and rheumatoid arthritis,[4,12] and remains an option in the treatment of complex proximal humeral fractures.[17]

Despite these roles, HA can result in glenoid erosion, which is the main cause of clinical deterioration and short- and medium-term revisions.[13,21,26,29] Placement of a glenoid component with conversion to an aTSA is an option for treatment of failed HA; however, the results of this operation are not commonly reported. Given that both HA and aTSA are likely to fail within the life span of young patients, it is important to determine the outcomes of revision procedures to properly counsel patients during their initial surgical decision making. The purpose of this study was to report and analyze the indications, results, implant survival rates, and complications in a series of patients who underwent revision of a failed HA to an aTSA.

Methods

We identified patients who underwent revision shoulder arthroplasty in a single tertiary-care health system from 2000 to 2015. Cases were identified by Current Procedural Terminology codes 23470 (HA), 23472 (total shoulder arthroplasty), 23473 (revision of total shoulder arthroplasty, humeral or glenoid component), and 23474 (revision of total shoulder arthroplasty, humeral and glenoid component). The inclusion criteria included revision of an HA to an aTSA for the indication of painful glenoid arthrosis, an intact rotator cuff, and a minimum of 2 years' clinical follow-up. If patients underwent revision of the aTSA prior to 2-year follow-up, they were included in the survival analysis but functional outcome scores were not obtained. We excluded patients undergoing conversion of an antibiotic spacer to an aTSA and cases with preoperative clinical or radiographic signs of infection.

Preoperative variables were collected by retrospective chart review. Variables included age, sex, dominant-sided surgery, Charlson Comorbidity Index score,[9] and diagnosis for the original HA. Operative notes were reviewed to evaluate rotator cuff status, concomitant procedures (including biological resurfacing, glenoid reaming, bone grafting, component type, and stem revisions), and intraoperative complications.

Direct patient contact and retrospective chart review were used to determine implant survival, reoperations, and postoperative complications. For surviving implants, patient-reported outcome measures including the American Shoulder and Elbow Surgeons (ASES) score,[16] Single Assessment Numerical Evaluation,[32] visual analog scale for pain (10-point scale),[5] Short Form 12 Health Survey,[7] and patient satisfaction (on a scale of 1-5, with 1 being very dissatisfied and 5 being very satisfied) were obtained. Implant survival was calculated using Kaplan-Meier analysis, with survival being defined as retention of components that were placed at the time of conversion from HA to aTSA.

Statistical analysis

Outcome scores following revision aTSA were analyzed for measures of central tendency and variation. Implant survival following aTSA was summarized using the Kaplan-Meier method as a function of time elapsed from revision surgery.

Results

During the study period, 618 patients underwent revision shoulder arthroplasty at our institution and 47 patients underwent glenoid component placement following HA. After applying the inclusion criteria, we retrospectively reviewed the medical records of 28 patients (60%) who underwent conversion of an HA to an aTSA.

The mean age at the time of the index HA was 52 ± 12 years (range, 30-75 years); 12 patients were younger than 50 years (Table I). There were 7 women and 21 men. The dominant extremity was involved in 17 patients. The mean Charlson Comorbidity Index score was 2.1 (range, 0-6). Three patients underwent multiple non-arthroplasty surgical procedures prior to index HA. The indications for the primary HA included osteoarthritis (19), osteonecrosis of the humeral head (6), post-traumatic arthritis (2), and fracture (1). The primary HA was stemmed in 19 patients, and a resurfacing implant was used in 9 patients; concomitant procedures included concentric glenoid reaming (2), glenoid biological resurfacing (2), and glenoid bone grafting (1).

All patients were indicated for revision to aTSA because of painful glenoid arthrosis. In addition, 3 patients were found to have small, repairable rotator cuff tears (2 supraspinatus and 1 subscapularis, all of which were full thickness) at the time of surgery, and 1 patient had a nonunion from a prior lesser tuberosity osteotomy at the time of surgery. The mean time from HA to aTSA was 4.8 ± 3.7 years (range, 0.7-12.3 years). The mean age at the time of revision to aTSA was 57 ± 12 years (range, 33-77 years).

Operative findings and techniques

All patients underwent glenoid component implantation (25 cemented all-polyethylene glenoid components and 3 all-polyethylene posteriorly augmented glenoid components). All 9 patients with resurfacing HA underwent stem implantation, and 8 standard-length stems (42%) were revised because of component malpositioning. Two patients underwent glenoid allograft impaction for contained defects, and one patient required a bulk allograft for a large, uncontained posterior defect. All 3 rotator cuff tears were repaired at the time of surgery, and the lesser tuberosity nonunion was also repaired. Cultures were obtained in a standard fashion in all cases and demonstrated bacterial growth in 3 patients, all with *Cutibacterium* (formerly *Propionibacterium*) *acnes*. These cases underwent infectious disease consultation and appropriate antibiotic treatment.