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ORIGINAL ARTICLE

Reverse shoulder arthroplasty in patients younger than 55 years: 2- to 12-year follow-up

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Background: This study reports the outcomes of reverse shoulder arthroplasty (RSA) in patients younger than 55 years with midterm to long-term follow-up.
Methods: Sixty-seven patients (average age, 47.9 years; range, 21-54 years) were identified who underwent RSA with an average 62.3 months of follow-up (24-144 months). There were 35 patients (group 1) who had a failed arthroplasty and 32 patients (group 2) who underwent primary RSA. Clinical outcomes included the American Shoulder and Elbow Surgeons (ASES) score, Simple Shoulder Test (SST) score, and range of motion. Complications included radiographic failures (fracture, dislocation, notching, loosening), infections, and nerve palsies.
Results: Group 1 showed significant improvements in flexion and abduction but not in external or internal rotation. Group 2 showed significant improvements in flexion, abduction, and internal rotation but not in external rotation. Both groups showed significant improvements in ASES and SST scores. In group 1, ASES score improved from 24.4 to 40.8 ($P = .003$), and SST score improved from 1.3 to 3.2 ($P = .043$). In group 2, ASES score improved from 28.1 to 58.6 ($P < .001$), and SST score improved from 1.3 to 4.5 ($P = .004$). The total complication rate was 22.4%. The total reoperation rate was 13.4%, and the revision rate was 8.9%. The implant retention rate was 91% at last follow-up.
Conclusion: RSA in patients younger than 55 years provides significant clinical improvements with high implant retention at up to 12 years. Patients undergoing revision RSA begin with worse function than those undergoing primary RSA, but they can expect similar degrees of improvement. Complications were higher but reoperation rates were lower in the revision group. No mechanical failures occurred in the primary group, with infection the cause of all revisions.
Level of evidence: Level IV; Case Series; Treatment Study

Keywords: Reverse shoulder arthroplasty; young patients; long-term follow-up; revision arthroplasty; primary arthroplasty; complications

The management of severe glenohumeral pathologic processes, such as arthritic conditions and rotator cuff deficiency, in the young adult has been a challenge in deciding the appropriate treatment. It has been shown that patients with glenohumeral arthritis younger than 50 years present with more

This study was determined to be exempt from review by the Western Institutional Review Board.

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complex disease, and the outcomes of arthroplasty in this population of patients are less predictable than those of arthroplasty performed in older patients with osteoarthritis.[1,2,5,17,18,22,23,25]

Glenoid erosion can lead to failure of hemiarthroplasty and the need for conversion to total shoulder arthroplasty.[7,11,12,22,27,28] Alternative techniques, such as glenoid biologic resurfacing and concentric reaming, have been suggested in combination with hemiarthroplasty to try to reduce the potential problems that may arise from the glenoid.[4,9,14,19,21,24,29] Conversely, glenoid component loosening has been a concern with total shoulder arthroplasty in this population of patients.[5,7,22,23,25]

Previous studies on arthroplasty in young patients have reported significantly improved long-term pain relief and range of motion (ROM); however, the results, as assessed by the Neer rating system, were unsatisfactory in nearly half of the patients.[27,28] Recent reports have suggested more favorable outcomes in short-term to midterm follow-up of total shoulder arthroplasty.[1,2,7,22,23]

In addition to arthritic processes, younger patients also present with rotator cuff deficiencies or failed arthroplasty operations that preclude the use of an anatomic shoulder arthroplasty.

There are few reports specifically evaluating the outcomes of reverse shoulder arthroplasty (RSA) in younger patients.[3,8,20,26] The purpose of this study was to report the clinical and radiographic outcomes of RSA in patients younger than 50 years and to discuss the complications, reoperation rates, and implant retention in midterm to long-term follow-up. Many of these young patients are still in the workforce and may have many working years remaining. Our goal was to evaluate the outcomes of RSA in these younger patients. Our hypothesis is that the results for primary and revision RSA in this population of patients will be similar to those reported in the literature.

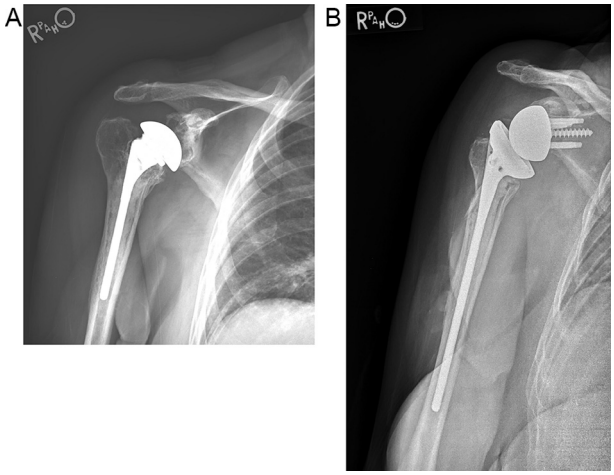

Figure 1 (**A**) A 53-year-old woman with a failed right total shoulder arthroplasty for a proximal humerus malunion and posttraumatic arthritis. (**B**) The same patient after revision to a reverse shoulder arthroplasty at last follow-up.

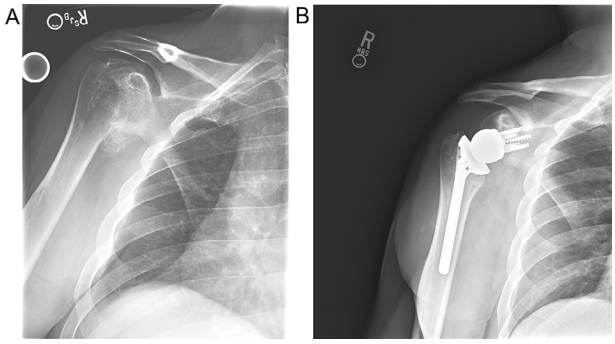

Figure 2 (**A**) A 49-year-old man with right shoulder advanced glenohumeral arthritis and a rotator cuff tear. (**B**) The same patient with a right reverse shoulder arthroplasty at last follow-up.

Methods

A retrospective analysis of a prospectively collected database was performed on 1809 RSAs performed from 2001 to 2013. The analysis included patients younger than 55 years at 2 institutions.

Inclusion criteria for this study included (1) patients who underwent RSA before the age of 55 years and (2) minimum of 24-month follow-up. Exclusion criteria included (1) follow-up <24 months, (2) incomplete clinical or radiographic data, and (3) history of motor or sensory deficit of the involved extremity, such as brachial plexopathy.

The analysis revealed 67 patients younger than 55 years (average age, 47.9 years; range, 21-54 years) who underwent RSA with a minimum 2-year follow-up (average, 62.3 months; range, 24-144 months). These patients were separated into 2 groups. Group 1 included 35 patients with failed arthroplasty surgery converted to RSA (Fig. 1) Group 2 included 32 patients undergoing a primary RSA (Fig. 2).

All patients underwent RSA by 2 fellowship-trained surgeons using the Reverse Shoulder Prosthesis (DJO Surgical, Austin, TX, USA). All primary surgeries were performed using a standard deltopectoral approach as previously described.[10] Revision surgeries were performed through the previous incision if possible; otherwise, a new deltopectoral incision was made. Four revision cases with proximal humeral bone loss underwent proximal humeral bone grafting with a proximal humeral allograft, as previously described.[6] Cases with glenoid bone loss requiring bone graft were reconstructed with autograft from the native humeral head in primary cases and femoral head allograft in revision cases by techniques previously described.[13] There were 6 cases that required glenoid bone grafting. All cases had rotator cuff deficiencies preventing the use of an anatomic shoulder prosthesis.

Clinical and radiographic data were obtained at intervals of 1 week, 6 weeks, 3 months, 6 months, 1 year, and yearly thereafter. Clinical outcome scores included the American Shoulder and Elbow Surgeons (ASES) shoulder score, the Simple Shoulder Test (SST) score, and patient satisfaction scores. The patient's ROM was assessed with clinical examination and video goniometer. Radiographic data consisted of a complete 4-view shoulder series consisting of anteroposterior, Grashey, scapular Y, and axillary lateral views. Radiographs were reviewed for notching, fracture, instability, polyethylene wear, and implant loosening.

Complications were recorded, including radiographic failures, infections, and nerve palsies. Implant retention rates were performed