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ORIGINAL ARTICLE

Classification of instability after reverse shoulder arthroplasty guides surgical management and outcomes

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Background: Revision of unstable reverse shoulder arthroplasty (RSA) remains a significant challenge. The purpose of this study was to determine the reliability of a new treatment-guiding classification for instability after RSA, to describe the clinical outcomes of patients stabilized operatively, and to identify those with higher risk of recurrence.

Methods: All patients undergoing revision for instability after RSA were identified at our institution. Demographic, clinical, radiographic, and intraoperative data were collected. A classification was developed using all identified causes of instability after RSA and allocating them to 1 of 3 defined treatment-guiding categories. Eight surgeons reviewed all data and applied the classification scheme to each case. Interobserver and intraobserver reliability was used to evaluate the classification scheme. Preoperative clinical outcomes were compared with final follow-up in stabilized shoulders.

Results: Forty-three revision cases in 34 patients met the inclusion for study. Five patients remained unstable after revision. Persistent instability most commonly occurred in persistent deltoid dysfunction and postoperative acromial fractures but also in 1 case of soft tissue impingement. Twenty-one patients remained stable at minimum 2 years of follow-up and had significant improvement of clinical outcome scores and range of motion. Reliability of the classification scheme showed substantial and almost perfect interobserver and intraobserver agreement among all the participants ($\kappa = 0.699$ and $\kappa = 0.851$, respectively).

Discussion: Instability after RSA can be successfully treated with revision surgery using the reliable treatment-guiding classification scheme presented herein. However, more understanding is needed for patients with greater risk of recurrent instability after revision surgery.

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

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

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Keywords: Instability; reverse shoulder arthroplasty; complications; classification; dislocation; prosthesis

The number of reverse shoulder arthroplasties (RSAs) performed for various pathologic processes continues to rise annually.^{1,4,9,10,14,24} Subsequently, the prevalence of its complications may also emerge in higher proportion.^{7,34} Of these complications, instability after RSA has been reported in up to 31% of cases⁷ and can be difficult to manage. If instability persists, patients can be rendered disabled. Currently, there is a paucity of literature available for this difficult issue,^{2,6,13,20,22} and there is no standardized method of approaching these instability cases surgically.

Many factors have been associated with instability after RSA. Previous studies have speculated that surgical approach and subscapularis deficiency have roles in instability.^{12,27,31,34} Others have related patient demographics such as male gender, body habitus, and previous operations with early dislocations,⁶ but these findings do not help identify etiology or guide treatment. Other predisposing factors include inadequate soft tissue tensioning, deltoid weakness, axillary nerve palsy, acromial fractures, undersized implants, prosthetic malpositioning, impingement, polyethylene wear, and mechanical failure.^{2,3,7,20,22,27,34} Many of these can be related to the inability to maintain glenosphere-humerosocket compressive forces necessary for RSA stability¹⁶ or the lack of impingement-free arc of motion.^{7,15,27,29}

Currently, treatments are individualized for each case as no clear well-defined management algorithm exists. The purpose of this study was to determine the reliability of a new classification that guides treatment for instability after RSA. In addition, we describe the clinical outcomes of patients sta-

bilized operatively and identify those with higher risk of recurrence on the basis of this new classification.

Methods

We retrospectively reviewed our shoulder arthroplasty registry for all revision cases performed by a single surgeon between July 2004 and August 2014. During this study period, a total of 1426 RSA procedures were performed including 143 revisions. Each revision case was reviewed to determine the indication for revision and to identify those cases resulting from instability. Exclusions included revisions that were performed for indications other than instability, such as hematomas, infections, and periprosthetic fractures or aseptic loosening without dislocation of the glenohumeral articulation. We also excluded RSA dislocations successfully treated with closed reduction and patients not amenable to surgical treatment because of severe comorbidities. A total of 43 operations performed for instability after RSA in 34 patients met the criteria for study (Fig. 1).

Patients were separated into those who regained stability and those who remained unstable after revision surgery, which were classified as failures. We identified the primary mode of failure for each. For those patients whose shoulders were stable after revision surgery at a minimum 2 years of follow-up, American Shoulder and Elbow Surgeons (ASES) scores, Simple Shoulder Test (SST) scores, visual analog scale (VAS) scores for pain, and active range of motion collected with a video goniometer were extracted from the database. Eight patients were excluded because of lack of 2-year follow-up. We also reviewed intraoperative data including methods of correction, implant sizing changes used during revisions to gain stability,

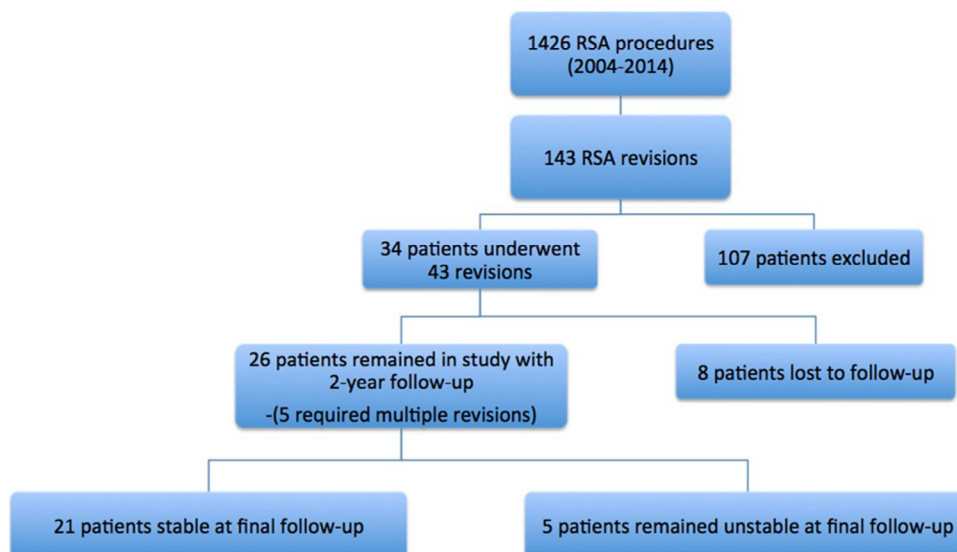


Figure 1 Study population. RSA, reverse shoulder arthroplasty.

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