

Reverse Total Shoulder Replacement in Patients with Severe Glenoid Bone Loss

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A commonly cited contraindication to reverse total shoulder arthroplasty is deficient glenoid bone stock. Deficient glenoid bone stock can lead to inadequate glenoid baseplate fixation and, eventually, glenoid component loosening and prosthesis failure. However, with improved prosthetic designs and increased surgeon experience, indications for use of reverse total shoulder arthroplasty continue to expand to include shoulders that would have previously seemed doomed to failure if treated with a reverse prosthesis. In this article, 3 cases are presented, 1 of cuff tear arthropathy and 2 of chronic anterior dislocations, in whom primary reverse total shoulder arthroplasty was performed despite the presence of severe glenoid bone deficiency. Corticocancellous bone grafting was used at the time of the reverse arthroplasty to augment the deficient glenoid and allow for simultaneous and adequate glenoid component fixation. All 3 cases showed excellent results in short-term follow-up, providing surgeons with an option for how to treat these difficult shoulders. Oper Tech Orthop 21:86-93 © 2011 Elsevier Inc. All rights reserved.

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Cuff tear arthropathy (CTA) is a relatively rare problem encountered in shoulders with a massive tear of the rotator cuff (RTC). Neer et al¹ coined the term “cuff tear arthropathy” in 1983 and estimated that it occurs in approximately 4% of patients with a complete tear. CTA is characterized by rotator cuff insufficiency, proximal humeral migration, and degenerative changes of the glenohumeral joint.² In addition, “acetabularization” of the acromion, “femoralization” of the humeral head, humeral head collapse, and superior glenoid erosion can occur.² Pain and loss of function, including pseudoparalysis, often results from these changes in the shoulder. CTA has historically proven to be a difficult entity to treat because of the importance of the rotator cuff as a dynamic stabilizer of the glenohumeral joint. Numerous treatment modalities for CTA have been largely unsuccessfully attempted throughout the past 3 decades, but recently reverse total shoulder arthroplasty (RTSA) has gained popularity as a treatment for this condition, especially in patients with severe functional impairment.³

Although acute dislocation of the glenohumeral joint is a commonly encountered problem, chronic glenohumeral dislocation is a much rarer entity. Some authors define “chronic” as 24 hours of dislocation, whereas others define it as longer than 6 weeks.⁴⁻⁷ Similarly, different authors use different terminology to describe the various types of glenohumeral dislocations, such as classifying a chronic dislocation as “unrecognized” or “locked.”^{4,7} In an attempt to provide some standardization, Goga⁴ proposed a classification system for chronic glenohumeral dislocations, with a minimum of 1 week of dislocation being the cut-off for a classification as “chronic” (Table 1).

Treatment for a chronic glenohumeral dislocation depends on several factors as outlined by Sahajpal and Zuckerman.⁷ These factors include the functional limitations, duration of the dislocation, size of the humeral head impression fracture, presence and extent of glenoid bone erosion, and status of the articular cartilage.⁷ On the basis of these factors, treatment approaches include nonoperative management, closed reduction, open reduction with or without a concurrent procedure to restore stability, and arthroplasty.⁷ Chronic glenohumeral dislocations may require arthroplasty if there is a large humeral head defect or significant degenerative joint changes.⁷ When there is also a massive RTC tear, a nonfunctioning RTC from greater tuberosity nonunion, or an irreparable subscapularis tear, then RTSA is indicated.⁸

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A commonly cited contraindication to RTSA is a significant glenoid defect resulting in inadequate bone stock for glenoid component fixation.⁹ CTA and chronic glenohumeral dislocations often cause significant glenoid bone loss, yet RTSA is often indicated for the treatment of these conditions.^{1,10,11} This presents a potential dilemma for the treating orthopaedic surgeon. In this article, we present 3 cases in which primary RTSA was performed on patients with severe glenoid bony deficiency by using a corticocancellous bone graft of the deficient glenoid. One of the patients had end-stage CTA, and the other 2 had chronic anterior dislocations.

Patient 1

S.K. was an 80-year-old right-hand-dominant woman who presented with progressively worsening right shoulder pain with associated loss of function during the previous 3 years. She had tried activity modification, physical therapy, and cortisone injections with no improvement and was told by several orthopaedic surgeons that nothing could be done for her because of the severity of her disease. She demonstrated “pseudoparalysis” with active range of motion of the right symptomatic shoulder of 10° of forward elevation, 0° of external rotation with the arm adducted, 0° of external rotation with the arm abducted to 90°, and internal rotation to the lateral side of the right hip. These movements elicited pain and crepitus in the right shoulder. Active range of motion in the unaffected left shoulder was 160° of forward elevation, 40° of external rotation with the arm adducted, 90° of external rotation with the arm abducted to 90°, and internal rotation to the twelfth thoracic vertebrae. There was a positive external rotation lag sign, as well as positive hornblower’s sign on the right side. There was atrophy of the supraspinatus and infraspinatus fossae.

True anteroposterior (AP) and axillary radiographs of the right shoulder demonstrated severe proximal humeral migration with erosion of the superior glenoid, acromion, and the lateral clavicle (Figs. 1 and 2). Coronal and axial computed tomography (CT) scan of the right shoulder demonstrated severe superior glenoid erosion and acromial thinning (Fig. 3), and erosion to the base of the glenoid with severe medialization (Fig. 4), respectively. Magnetic resonance imaging (MRI) showed a massive rotator cuff tear involving the supraspinatus and infraspinatus with grade IV Goutallier muscle atrophy.

At surgery, a deltopectoral incision was used and the subscapularis was found to be atrophic. The rest of the rotator cuff was irreparably torn and retracted. The glenoid had erosion of the proximal 50% of the glenoid superomedially; however, it was determined that there was enough bone



Figure 1 An 80-year-old RHD woman with end-stage CTA of the RIGHT shoulder. Preoperative AP x-ray shows severe bony destruction of the superior glenoid, acromion, and lateral clavicle with gross proximal humeral migration. (Figure courtesy of Center for Shoulder, Elbow and Sports Medicine.)

stock to proceed with the RTSA after bone grafting. The resected humeral head was used for the corticocancellous bone graft with the articular surface fashioned to sit flush in the glenoid defect. The graft was fixed with two 3.5-mm headless accutrak (Acumed, Portland, OR) screws strategically placed as to not interfere with the central stem or 2 screws of the baseplate. A 30-mm trabecular metal (TM) baseplate (Zimmer, Warsaw, IN) was secured into place, and a 36-mm glenosphere was tapped into position. The humeral reverse



Figure 2 Same patient—preoperative axillary x-ray demonstrating severe glenoid erosion and extremely thin acromion. (Figure courtesy of Center for Shoulder, Elbow and Sports Medicine.)

Table 1 Proposed Nomenclature (from Goga⁴)

Terminology	Age of Dislocation
Early chronic dislocation	>1 week but <3 weeks
Late chronic dislocation	>3 weeks but <12 weeks
Ancient chronic dislocation	>12 weeks

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