Reverse Shoulder Prosthesis for Acute Four-Part Fracture: Tuberosity Fixation Using a Horseshoe Graft

Jonathan C. Levy, MD* and Brian Badman, MD†

Summary: Results of hemiarthroplasty for complex four-part proximal humerus fractures in the elderly have been unreliable. Although patients often achieve pain relief, return of above-shoulder level function can be challenging, because tuberosity nonunion, malunion, and/or resorption is quite common. The reverse shoulder replacement has been advocated as a reliable alternative for these patients. Preliminary studies have suggested that tuberosity healing is critical for achieving external rotation strength after reverse shoulder arthroplasty. We describe a technique of tuberosity repair using a wedge horseshoe graft, which can provide improved surface area for tuberosity healing. A clinical series of seven patients treated with this technique is reported with a minimum follow-up of 12 months (range, 12–23 months). The tuberosity union rate was 86% (six of seven patients). Average active forward elevation was 117° (range, 95°–150°), and active external rotation was 19° (range 0°–30°). Visual analog scale pain scores averaged 0.6 (range, 0–1), visual analog scale function averaged 8.7 (range, 7–10), mean American Shoulder and Elbow Surgeons pain was 47.1 (range, 45–50), and mean American Shoulder and Elbow Surgeons function was 39.2 (range, 31–50). Subjective satisfaction ratings were excellent for four patients, and good for two, and satisfactory for one. No patients were unsatisfied with their outcomes. The horseshoe graft technique provides a reliable means for anatomic restoration of the tuberosities, facilitating the return of shoulder function in elderly patients with complex four-part proximal humerus fractures treated with a reverse total shoulder.

Key Words: reverse shoulder prosthesis, four-part proximal humerus fracture, horseshoe graft

(J Orthop Trauma 2011;25:318–324)

INTRODUCTION

Elderly patients older than 70 years treated with a hemiarthroplasty for complex four-part fractures of the proximal humerus have demonstrated unreliable improvements in functional outcomes and overall satisfaction ratings.1,2 This has been attributed to a variety of issues related to age, including poor bone quality and difficulties adhering to postoperative rehabilitation protocols. High rates of tuberosity malunion, nonunion, and/or resorption have been reported, resulting in functional rotator cuff deficiency.3,4 Recently, reverse shoulder arthroplasty has been introduced as a treatment option for four-part fractures in this patient population.3–7 Using the reverse arthroplasty, patients have regained a reasonable amount of function, thereby preserving their ability to perform activities required for independent living.5–7

Preliminary data suggest that restoration of external rotation strength depends on the healing of the greater tuberosity segment.5 Secure tuberosity fixation is therefore critical. The purpose of this technical tip is to describe a reproducible surgical technique of tuberosity repair using a wedge horseshoe graft, which can easily be secured to the metaphyseal body segment of the prosthesis. This technique provides a means for fixation of the tuberosities in a more anatomic position without undue tension on the repair and an improved surface area for tuberosity healing.

PATIENTS AND METHODS

Patient Selection

Patient selection is paramount. Fractures considered for reverse shoulder arthroplasty must be those that cannot be reconstructed using modern fracture fixation techniques. Typically these patients are older than age 75 years with complex four-part proximal humerus fractures or fracture–dislocations. Additional relative indications include elderly patients with inadequate social structure for the extensive rehabilitation required after hemiarthroplasty and patients with acute proximal humerus fractures with pre-existing rotator cuff deficiency.

A thorough history and physical examination should be performed with careful attention paid to the neurovascular status of the individual. Suprascapular and/or axillary nerve injuries have been reported in up to 82% of patients with displaced proximal humerus fractures and pulse asymmetry can alert the treating surgeon to the potential for an associated axillary arterial injury, which may necessitate vascular