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Surgical Treatment of Fractures of the Proximal Humerus

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Surgical Treatment of Fractures of the Proximal Humerus

INTRODUCTION

Despite recent advances in imaging and fixation techniques, the treatment of displaced fractures affecting the proximal humerus remains a challenge. Many such fractures occur in elderly patients who may have poor general health, poor bone quality, and poor postoperative compliance. The remainder tend to occur in younger patients with better bone quality who have experienced high-energy trauma that can cause associated severe soft-tissue injuries. Specifically, the labrum, capsule, rotator cuff, brachial plexus, peripheral nerves, and blood vessels can all be injured in cases of high-energy trauma. As with the treatment of almost any fracture, the goal remains to obtain and maintain an acceptable reduction while healing progresses. Although this goal often can be achieved with limited internal fixation and a period of prolonged immobilization, the subsequent stiffness can be disabling. Optimal treatment involves providing fixation that will withstand the stress of early passive movement, an ideal that cannot always be attained.

In situations in which the humeral head is not reconstructable, replacement arthroplasty may be indicated. However, unlike hemiarthroplasty of the hip for femoral neck fractures, successful humeral head replacement after trauma still requires bone-to-bone healing. The tuberosities must unite to the shaft if any degree of function is to be restored.

This manual will discuss surgical treatment of fractures of the proximal humerus, focusing on indications, approaches, specific techniques, and outcomes. The manual will conclude with a specific, detailed review of humeral head replacement in cases of acute fracture of the proximal humerus.

SURGICAL INDICATIONS

DISPLACED FRACTURES

Most fractures of the proximal humerus (approximately 80%) are minimally displaced, impacted, relatively stable, and able to be treated conservatively.¹ Fractures with displaced, unstable patterns are typical-

ly reduced, with either a closed or open method, and then stabilized or fixed with various types of implants.² Although Neer's classification system of fractures of the proximal humerus^{3,4} is well known, the central importance of displacement has probably not been emphasized enough.

Determining whether or not a patient's fractured bone segments are displaced to a significant degree requires high-quality radiographs, and these images can be difficult to obtain in acutely injured patients. Often, it is helpful for the operating surgeon to assist the radiology technician in supporting the arm, positioning the patient, and confirming appropriate trajectory of the beam. In most cases, high-quality radiographs will allow the fracture pattern to be understood. When they do not, thin-cut computed tomography (CT) scanning can be done. This modality allows the option of 3-dimensional reformatting, which can be particularly helpful in the evaluation of complex fractures and malunions.

NEER'S CLASSIFICATION SYSTEM

If the necessary high-quality radiographs are obtained, Neer's classification system^{3,4} is a practical and useful guide to treatment, particularly when applied to fractures of the surgical neck. Fractures with less than 1 cm of displacement or 45 degrees of angulation of the head fragment (relative to the shaft) can generally be treated by a closed method. However, these traditional guidelines^{3,4} may not apply to the greater tuberosity. Others have suggested that less than 1 cm of displacement of the greater tuberosity (approximately 5–10 mm) may be significant in some patients.^{5–7} This small degree of displacement can be difficult to determine, given the variability in individual anatomy. Therefore, comparison views of the opposite shoulder with the arm held in a similar degree of external rotation can be useful.

The most common fracture patterns that require surgical treatment are 2-part fractures (with shaft displacement), 3-part fractures (with shaft and tuberosity displacement), and 4-part fracture-dislocations (typically occurring in elderly patients). Less common patterns include the isolated 2-part greater tuberosity fracture, the 2-part anatomic neck fracture (with displacement of the head segment only), and the so-called valgus-impacted pattern.