Mild Greater Tuberosity Malunion Produces Acceptable Functional Outcomes Following Reverse Shoulder Arthroplasty For Acute Proximal Humerus Fracture

Stefan Hanish, Matthew Colatruglio, Tyler James Brolin, Thomas Ward Throckmorton, Jeffrey Alan Murphy

INTRODUCTION:

Reverse shoulder arthroplasty (rTSA) has demonstrated promising results for management of complex 3- and 4-part proximal humerus fractures, especially in elderly populations. While intraoperative repair of the greater tuberosity is standard, radiographic studies show anatomic union of just 15-63%. Despite strong evidence demonstrating superior outcomes with anatomic union, evidence exists demonstrating non-inferior outcomes when malunion is present, as rTSA preserves biomechanical function through the deltoid. No literature exists to support a tolerable degree of malunion that still yields good functional outcomes. This study aims to determine a threshold of malunion at which non-inferior outcomes are achievable.

METHODS:

A retrospective cohort study of 127 patients from a single academic institution who underwent rTSA for acute proximal humerus fracture (<8 weeks from injury) between September 2009 and February 2024 was performed. Primary outcomes measured were degree of radiographic union, SANE, VAS, ASES, ROM (forward elevation, external rotation, internal rotation), and complications at 3-months, 1-year, and 2-years postoperative. Anatomic union was radiographically assessed by two independent reviewers at 1-year postoperative. Union was defined as anatomic, <10mm (mild) malunion, >10mm (severe) malunion, or nonunion (absent/resorbed). Additional variables recorded included strength at 2-years postoperative, subscapularis management, number of sutures for repair, operative time, estimated blood loss (EBL), and reoperation.

RESULTS:

ASES scores at 3-months postoperative demonstrated a statistically significantly difference ($p = 0.0287$; Anatomic = 66.4, Mild Malunion = 59.3, Severe Malunion = 51.9, Absent = 60.64). Patients with severe malunion of the greater tuberosity demonstrated the lowest ASES scores at 3-months postoperative. There was a statistically significant difference in forward elevation at 3-months postoperative ($p = 0.0029$; Anatomic = 116.5, Mild Malunion = 118.2, Severe Malunion = 95.1, Absent = 93.6). Patients with anatomic union and mild malunion of the greater tuberosity demonstrated the highest scores for forward elevation at 3-months postoperative. Additionally, there was a statistically significant difference in forward elevation at 1-year postoperative ($p = 0.049$; Anatomic = 137.7, Mild Malunion = 133.6, Severe Malunion = 134.0, Absent = 112.5). Patients with nonunion of the greater tuberosity demonstrated the lowest scores for forward elevation at 1-year postoperative. Lastly, estimated blood loss (EBL) during surgery differed significantly between groups ($p = 0.0366$; Anatomic = 210.0, Mild Malunion = 159.9, Severe Malunion = 231.3, Absent = 305.4). Patients with nonunion and severe malunion of the greater tuberosity demonstrated the highest EBL.

DISCUSSION AND CONCLUSION:

Anatomic union and mild malunion of <10mm of the greater tuberosity were associated with superior functional outcomes following rTSA for acute proximal humerus fracture. This study demonstrates that patients can tolerate up to 10mm of greater tuberosity malunion without experiencing decline in functional outcomes.