Augmented Baseplates Yield Optimum Outcomes when Compared to Bone Graft Augmentation for Managing Glenoid Deformity During Reverse Total Shoulder Arthroplasty—A Retrospective Comparative Study

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INTRODUCTION: Over recent decades, reverse total shoulder arthroplasty (rTSA) has undergone design developments that have improved outcomes and expanded indications, resulting in more widespread utilization. Accurate glenoid baseplate placement with stable fixation are keys to the success of rTSA, making preoperative glenoid erosion an important challenge. For example, excessive medialization can result in inadequate soft tissue tensioning, increase the risk of scapular notching, a predisposition to polyethylene wear secondary to impingement, and medialization of the humerus causing decreased deltoid wrapping. Superior tilting results in increased shear forces and an increased risk of aseptic loosening. Many of these factors related to glenosphere and baseplate positioning in the setting of glenoid deficiency can also increase the risk of instability. Methods to address glenoid deficiency include eccentric reaming, using an alternate centerline, glenoid bone grafting, and off axis reaming with the use of augmented glenoid baseplates. Eccentric reaming results in loss of glenoid bone stock and joint line medialization with the aforementioned implications. Glenoid bone grafting in rTSA can preserve native bone but is technically challenging and introduces an additional potential mode of failure. Still, bone grafting can allow for joint line restoration and correction of multi-planar defects with encouraging results in some studies. Multiple rTSA glenoid baseplate augmented designs are available to treat various defects. Augments share the advantages of preserving bone stock, allowing restoration of the joint line and rotator cuff tension, and can be more technically straightforward than bone grafting. However, there are few long-term studies reporting the survivorship of augmented glenoid baseplates in rTSA. The purpose of this study was to compare the clinical and radiographic outcomes of primary rTSA utilizing glenoid bone grafting to augmented glenoid baseplates with a minimum 2 year follow up.

METHODS:

A total of 520 primary rTSA patients treated with 8° posterior glenoid augments (n=246), 10° superior glenoid augments (n=97), or combined 10° superior/8° posterior glenoid augments (n=177) were compared to 47 patients undergoing glenoid bone grafting for glenoid bone insufficiency (BG rTSA group) with a mean follow up of 37.0 (±16) and 53.0 (±27) months, respectively. Outcomes were assessed preoperatively and at the latest follow up with shoulder range of motion and the use of six validated outcome scores. Radiographs were analyzed for baseplate failure and other complications. The incidence of postoperative complications as well as revision were recorded for each cohort.

RESULTS:

The glenoid augment rTSA group (Aug rTSA) had greater improvements in patient-reported outcome measures (PROMs) and range of motion when compared to the BG rTSA group at a minimum of 2 year follow up including: simple shoulder test (SST) ($p=0.002$), Constant Score ($p<0.001$), American Shoulder and Elbow Surgeons (ASES) score ($p=0.005$), University of California Los Angeles (UCLA) score ($p<0.001$), Shoulder Pain and Disability Index (SPADI) score ($p=0.006$), Shoulder Arthroplasty Smart (SAS) Score ($p=0.016$), forward elevation ($p<0.001$), abduction ($p<0.001$), and external rotation ($p=0.007$). Patient satisfaction was higher in Aug rTSA group compared to BG rTSA group ($p=0.006$). Additionally, the utilization of an augmented glenoid component instead of glenoid bone grafting resulted in approximately 50% less total intraoperative time ($p<0.001$), nearly 33% less intraoperative blood loss volume ($p<0.001$), approximately threefold less scapular notching ($p<0.01$) and approximately fifteenfold less adverse events requiring revision ($p<0.01$) when compared to bone graft augmentation. Aside from SCB for abduction, the Aug rTSA cohort achieved higher rates of exceeding MCID and SCB for every PROM compared to BG rTSA. More specifically, 77.6% and 70.2% of the Aug rTSA achieved SCB for ASES and SPADI versus 55% and 48.6% in the BG rTSA, respectively ($p=0.003$ and $p=0.013$).

DISCUSSION AND CONCLUSION:

The present midterm clinical and radiographic study demonstrates that the utilization of an augmented base plate for insufficient glenoid bone stock is superior as judged by multiple PROMs and ROM metrics when compared to bone graft augmentation at minimum 2 year follow up. Additionally, when analyzed according to MCID and SCB thresholds, the use of augmented baseplates outperforms the use of glenoid bone grafting. Complication and revision rates also favor the use of augmented glenoid baseplates over glenoid bone grafting. Long-term clinical and radiographic follow up is necessary to confirm that these promising mid-term results are durable.