How Frequently Does Medial Calcar Bone Loss Occur After Stemless Anatomic Total Shoulder Arthroplasty at Midterm Follow Up, and Does it Matter?

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Introduction:

Anatomic total shoulder arthroplasty (aTSA) with stemless humeral components reliably improves clinical and patient reported outcome scores (PROs) and has the potential to decrease rates of medial calcar bone loss (MCBL) when compared to stemmed humeral components. MCBL has been reported with several different aTSA stemless components[1,2]; however, the effect of MCBL on patient outcomes remains unknown. The purpose of this study was to investigate the rate of MCBL where a single stemless aTSA humeral component was utilized, and to evaluate its effect on patient outcomes at mid-term follow up.

Methods and Materials:

A retrospective review of prospectively collected data was performed to identify patients with 5 year-minimum radiographic and clinical follow up after undergoing aTSA with a stemless component (Simpliciti, Tornier, Bloomington, MN). MCBL was assessed by a shoulder and elbow fellow at 2 years, 5 years, and 8 years if available. MCBL was defined as greater than 2 millimeters (mm) of bone loss on either the horizontal or vertical axis of the medial calcar (Figure 1). Magnification was controlled based on the known diameter of the humeral head component. PROs including ASES, Constant, VAS pain, and SANE scores, as well as satisfaction rates were obtained preoperatively and at all follow up periods. Active range of motion (AROM) was measured by a trained research assistant at all follow up periods. PROs and AROM scores were compared in patients with ≤2mm MCBL and those with >2 mm of MCBL. Additionally, in patients with >2mm of MCBL, an analysis was performed to compare PROs and AROM in patients with MCBL ≥8mm to those with <8mm of MCBL. Data was evaluated to identify statistically significant differences ($p<0.05$) in outcomes.

Results:

One hundred and five patients were included in this study. Fifty-seven (54.3%) patients had greater than 2 mm of MCBL (MCBL Group) and 48 (45.7%) patients had 2mm or less of MCBL (No MCBL Group). The average follow up was 70 months, with 74 months in the MCBL Group and 66 months in the No MCBL Group ($p < 0.001$). There were no significant differences in age at surgery, sex, primary diagnosis, glenoid Walch classification, glenoid implant type, or history of previous surgery between the two groups. At final follow up, the ASES score was significantly better in the No MCBL group compared to the MCBL group (mean 96 vs 91, respectively, $p=.014$). There was no significant difference between VAS pain, satisfaction rates, SANE, Constant scores or AROM measurements between the two groups. Multiple regression analysis in the MCBL Group did not find glenoid Walch classification, gender, or age at surgery to be predictive of ASES scores. Patients with greater than 8 mm of vertical or horizontal MCBL (n=14) had similar PROs and AROM compared to patients with less than 8 mm of vertical or horizontal MCBL (n=43).

Discussion:

At minimum 5 year follow up, MCBL occurred in 54.3% of patients following stemless aTSA. While MCBL may be associated with slightly decreased ASES scores, this difference did not exceed the minimal clinically important difference for anatomic TSA. Patient with greater than 8 mm had similar PROs and AROM when compared to patients with less than 8 mm of MCBL.

References:

1. Aibinder WR, Uddin F, Bicknell RT, et al. Stress shielding following stemless anatomic total shoulder arthroplasty. *Shoulder Elbow*. 2021 Nov;15(1):54-60
2. Engler ID, Hart PA, Swanson DP, et al. High prevalence of early stress shielding in stemless shoulder arthroplasty. *Seminars in Arthroplasty: JSES.* 2022 Dec;32(4):751-756

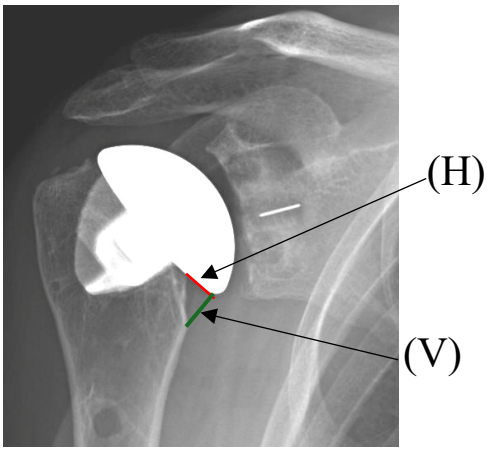

Figure 1: On the Grashey view, medial calcar bone loss was measured in millimeters on the horizontal (red line) and vertical (green line) axis.