Outcomes Following Minimal Humeral Preparation Using a Self-Broaching, Stemless Anatomic Total Shoulder Arthroplasty

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INTRODUCTION: As anatomic total shoulder arthroplasty (aTSA) continues to advance, the adoption of stemless humeral implants has increased due to their bone-preserving potential. However, concerns remain regarding implant stability, particularly in patients with variable bone quality or anatomy. To address these concerns, our center implemented a minimal humeral preparation technique using a novel self-broaching stemless implant. Importantly, this implant was utilized in all patients, with no exclusions made based on preoperative imaging, intraoperative assessment, or patient-specific factors such as age, sex, or bone quality. This retrospective, single-surgeon study evaluates the long-term radiographic and clinical outcomes associated with this universally applied technique.

METHODS: A retrospective review was conducted to identify all adult aTSA patients who received a self-broaching humeral implant with a minimum follow-up of two years. Demographics (age, sex, BMI [body mass index]), clinical assessments (patient reported outcome measures [ASES and SANE scores], range of motion [ROM]), and x-rays were collected. Radiographic analysis was conducted by an independent orthopedic surgeon, who assessed radiolucency in glenoid components via The Lazarus Score and humeral component rubric. To assess differences in radiographic osteolysis scores across multiple humeral zones, the nonparametric Friedman test was used. Post-hoc pairwise comparisons were conducted using Wilcoxon signed-rank tests with Bonferroni correction to adjust for multiple comparisons. Other continuous variables were analyzed using paired t-tests. Statistical significance was set at $p < .05$.

RESULTS: In total, 70 patients (71 shoulders) were included with 46 males (65.71%) an average age of 67.64 ± 9.17 years and BMI of 28.86 ± 5.04 kg/m2. Over a minimum follow-up period of two years, 2 patients required revision to a reverse prosthesis due to supraspinatus and subscapularis tendon tears. Operative reports for these revisions indicated no evidence of component loosening. Upon radiographic assessment, 68 shoulders (95.77%) scored a Lazarus grade 0 or 1, while 3 shoulders (4.23%) demonstrated a Lazarus grade ≥ 2 (Table 1). On the humeral side, a positive result from the Friedman test indicated osteolysis score difference ($p = .0029$). Post-hoc pairwise comparisons revealed significantly higher bone resorption in zone 1 compared to zones 2 and 5 ($p = .0116$). Additionally, significantly greater resorption was observed in zone 2 and 5 compared to zones 3, 4, and 6 ($p < .05$). The comparison between zones 2 and 5 was excluded due to insufficient non-zero pairs. No humeral osteolysis around the implant received a grade above a 1. The mean postoperative improvements were $66.09° \pm 40.36°$ in anterior elevation ($p < .0001$, n = 69), $67.90° \pm 41.26°$ in abduction ($p < .0001$, n = 69), and $27.25° \pm 16.19$ in external rotation ($p < .0001$, n = 69) (Table 2). Corresponding gains were observed in patient reported outcome measures, with the mean ASES score improving 50.39 ± 20.50 ($p < .0001$, n = 44) and the mean SANE score improving 57.50 ± 20.77 ($p < .0001$, n = 44).

DISCUSSION: This study supports the consistent performance of a stemless, self-broaching humeral component in aTSA, even when applied across a heterogenous patient population without selective criteria for bone quality. Despite the absence of intraoperative exclusion for suboptimal bone, radiographic outcomes showed no cases of humeral component loosening, and all observed osteolysis remained low-grade. Clinical outcomes demonstrated significant improvements in ROM and patient reported outcome measures. These findings reinforce the utility of this implant and technique as a bone-conserving, dependable option for aTSA with broad applicability in routine clinical practice.

SIGNIFICANCE/CLINICAL RELEVANCE: This study evaluates the survivorship of a self-broaching stemless humeral implant in aTSA, showing favorable early outcomes without evidence of loosening across a heterogeneous patient population.

TABLES:

Table 1. Distribution of Humeral Osteolysis Grades by Lazarus Score

Lazarus Score	Grade 0 H Osteolysis	Grade 1 H Osteolysis	Grade 2 H Osteolysis	Grade 3 H Osteolysis
0	51	12	0	0
1	2	3	0	0
2	1	0	0	0
3	0	0	0	0
4	0	1	0	0
5	1	0	0	0

Table 2. Pre- and Postoperative Range of Motion Outcomes

Range of Motion	Pre-operative	Post-Operative	P – value
Anterior Elevation (°)	90.00 ± 36.15	156.09 ± 20.45	**< .0001**
Active Abduction (°)	88.19 ± 37.94	40.30 ± 21.86	**< .0001**
External Rotation (°)	13.26 ± 14.57	17.03 ± 12.89	**< .0001**