Glenoid Baseplate Failure in Reverse Total Shoulder Arthroplasty

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INTRODUCTION: Early reverse total shoulder arthroplasty (rTSA) designs had high failure rates, mainly from loosening of the glenoid baseplate. The original Grammont design overcame most of these failures, and the incidence of glenoid baseplate failure has decreased significantly over the last two decades. However, there is little data on the incidence and causes of baseplate failure with modern contemporary designs. The purpose of this study is to determine the incidence of aseptic glenoid baseplate failure following primary rTSA using a contemporary humeral-lateralized system and identify significant risk factors associated with failure.

METHODS: Data from a prospectively collected multicenter shoulder database were analyzed. All 7,162 primary rTSA patients performed from 2007 to 2020 were included. Revision surgery and fractures were excluded. Patients with aseptic glenoid baseplate loosening were identified and compared to all other primary rTSA without loosening, evaluating preoperative and postoperative range of motion (ROM), patient reported outcome metrics (PROM), pain, function, and patient satisfaction scores, as well as demographics, comorbidities, Walch glenoid classification, and radiographic changes associated with risk of loosening. Analyses were performed using a two-tailed, unpaired t-test for continuous variables, Chi-Square test or Fisher's Exact test for categorical variables, and a multivariate logistic regression for significant parameters to determine the odds ratio (OR) for baseplate failure after rTSA.

RESULTS: Irrespective of minimum follow-up, fifty-three (31F/22M) of 7,162 primary rTSA shoulders experienced aseptic glenoid baseplate failure, for an overall rate of 0.74%. Regarding implant risk factors, posterior/superior augmented glenoid baseplates had a 4.7% failure rate compared to 0.6% in non-augmented ($p<.001$). 6mm offset expanded glenosphere had a 2.0% failure rate versus the 0.9% rate associated with 2mm offset standard glenosphere ($p=0.0003$). With regards to glenoid morphology parameters, patients with Walch B3 glenoids had a 7.8% failure rate ($p<0.0001$), and Sirveaux E3 glenoids had a 5.3% loosening rate ($p=0.007$), compared to the other Walch and Sirveaux glenoid classifications, respectively. Additionally, patients with a beta angle <70º had a 10.5% failure rate ($p=0.005$) compared to >70º. Patients with scapular notching had a 2.5% failure rate versus 0.9% associated without scapular notching ($p=0.02$), with 3.5% failure with notching greater than grade 1 ($p=.02$). Similarly, patients with humeral radiolucent lines had a significantly higher failure rate than the rate associated with patients without (4.7% vs 0.9%, $p<0.0001$). No differences in PROM or ROM were observed between the two rTSA cohorts preoperatively. However, at latest follow-up the baseplate failure group had significantly lower PROM, function, and ROM ($p<0.004$), as well as higher pain scores ($p<0.001$). Multivariate logistic regression analysis showed that Walch glenoid types B2 ($p=0.002$, OR= 4.513) and B3 ($p=0.002$, OR=14.804), use of expanded glenospheres ($p=0.025$, OR=2.57) and usage of augmented baseplates ($p=0.001$, OR=2.50) were significant risk factors.

DISCUSSION AND CONCLUSION: With a modern contemporary humeral-lateralized rTSA implant system, the incidence of aseptic glenoid baseplate failure was 0.74%. Compared to previous studies, the aseptic glenoid baseplate failure rate has continued to decrease over time. Failure led to lower PROM, ROM, function, and patient satisfaction, as well as higher pain scores. Higher rates of failure were seen with posterior/superior augmented glenoids, 6mm offset expanded glenospheres, Walch B2 and B3 and Sirveaux E3 glenoids, beta angle <70º, scapular notching, and humeral radiolucent lines. This information can help surgeons and patients make better informed decisions regarding surgical intervention and anticipated outcomes.