If I Replace These Bushings, How Long Will They Last?
An Analysis of 58 Isolated Coonrad-Morrey Isolated Bushing Exchanges With 21 Year Average Follow-up

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Introduction: Bushing wear is a common radiographic finding that rarely requires isolated bushing exchange (BE),[2] but prior studies are limited to small case series.[1,3] The survival of bushings after isolated BE, and the need for subsequent BE, is poorly understood. The purpose of this study was to determine the survival of isolated BE after primary or revision total elbow arthroplasty (TEA). Secondary aims were to determine the outcomes and complication and revision rates after one or more bushing exchanges.

Material & Methods: Our institutional Total Joint Registry database was queried to identify all elbows that had undergone revision of a primary or revision Coonrad-Morrey TEA between 1980-2021. After excluding reoperations for infection, cancer, or inadequate records, our study included fifty-eight BE procedures with retention of both the humeral and ulnar components. The rate of isolated bushing exchange was 3% (43 per 1,483 TEAs) for the total cohort, 3% (30 per 909 TEAs) for patients with a primary TEA, and 2% (13 per 574 TEAs) for patients with a revision TEA. The mean age at the time of the initial TEA was 51±12 years and 63% were female. A single BE was performed in 31 patients, two in 10 patients, three in 1 patient, and four in 1 patient. Electronic medical records were reviewed for surgical factors, complications, revisions, and outcomes. Statistical analyses included independent samples t-tests, Mann-Whitney U tests, Fisher's exact, and Chi-squared tests. Multivariable Cox proportional hazards models were created to determine the factors associated with undergoing a revision BE or any revision (revision BE or revision TEA). The mean follow-up was 21 years (range, 7-35 years).

Results: 43 patients with a primary (n=30) or revision (n=13) TEA underwent a subsequent isolated BE (n=58). In the total cohort, the median time to BE was 11 years, which was significantly greater than subsequent BEs (8 years; P=0.04). When analyzed separately, patients who underwent an index primary TEA had a significantly greater interval between the first and revision BE (11 versus 8 years; P=0.01) compared to patients with an index revision TEA (7 versus 5 years; P=0.50). Kaplan-Meier analysis for the median survival according to the first BE (11.0 years; 95% CI, 9.1-13.0 years), revision BE (5.1 years; 95% CI, 0.0-12.2 years), and revision TEA (3.3 years; 95% CI, 0.9-5.8 years; $P < 0.001$; **Figure 1**) revealed a significant difference in survival. Cox regression analysis revealed a "triceps on" approach during the index TEA was associated with undergoing revision BE (HR, 27.0; 95% CI, 2.2-329.4; $P = 0.01$). Additionally, a "triceps on" approach during the initial TEA (HR, 5.4; 95% CI, 1.3-23.1; $P = 0.02$) and a diagnosis of post-traumatic arthritis or osteoarthritis (HR, 2.8; 95% CI, 1.-7.7; $P = 0.045$) were significantly associated with undergoing any revision following isolated BE (revision TEA or revision BE). The overall revision (28%) and complication (19%) rates, MEPS (85 points), pain (1.5 points), and arc of motion (110°) were not significantly different between patients with a single BE or multiple BEs.

Discussion: While a BE may be seen as a simple procedure in patients with stable implants and evidence of bushing wear or failure, the relatively high revision and complication rates should be emphasized to patients in preoperative counseling. A "triceps on" approach during the index TEA may increase the risk of malrotation of implants and the need for subsequent revision BE. Patients with non-rheumatoid diagnoses may place higher demands on their implants, leading to higher rates of revision BE or TEA. Patients can expect less bushing survival with subsequent exchanges but can expect good clinical outcomes.

References

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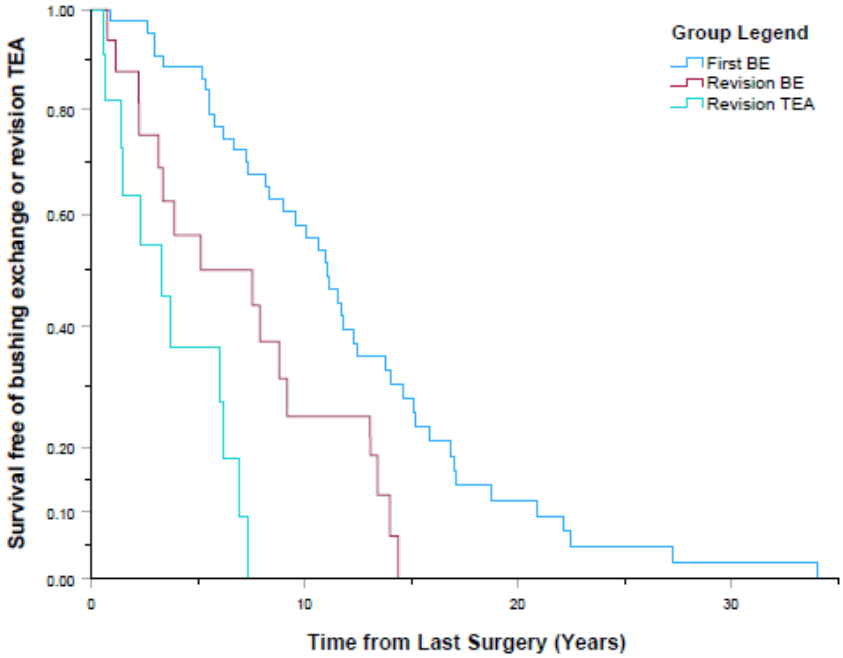

Figure 1. Kaplan-Meier survival analysis for any BE or revision TEA, stratifying by the first BE versus revision BE versus revision TEA. BE, bushing exchange; TEA, total elbow arthroplasty.