

Outcomes of a gradually reducing radius revision knee system in single-stage revision procedures – a large database study

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INTRODUCTION: Knee replacements are common orthopaedic surgical procedures that reduce pain, restore function, and enhance mobility. Both the number of primary and revision knee replacements are increasing. The outcomes of primary knee replacement have been thoroughly investigated; however, the outcomes of revision total knee arthroplasty (rTKA) are less well-understood. In particular, newer rTKA implant designs have limited clinical evidence. The purpose of this study is to investigate the outcomes and resource utilization associated with rTKA using a revision implant based off gradually reducing radius knee (GRRK) design compared to all other revision implants.

METHODS: This retrospective cohort study utilized the Premier Healthcare Database to analyze patients who underwent single-stage revision with GRRK compared to all other revision implants from January 1, 2017, to October 31, 2024. The Premier database contains clinical coding data, encompassing diagnoses and procedures from more than 25% of all inpatient hospital admissions throughout the United States. Outpatient visits to emergency departments, ambulatory surgery centers, and alternate sites of care are also included, representing over 1,300 hospitals. The study variables included both patient and hospital demographics and procedural characteristics. The primary endpoint was knee-related readmission rate within 90 days. Exploratory outcomes included discharge status, length of stay, surgical time and all-cause readmissions. Propensity score fine stratification was utilized for covariate balancing, followed by analysis through generalized linear models.

RESULTS SECTION: 43,073 rTKAs were analyzed (2,203 for GRRK and 40,870 for all other revision implants) between Jan 2017 to Oct 2024. At baseline across the two cohorts, the average patient age was 68 years, 62% were Female, and 78% were White. 51% of patients had two or less comorbidities while 15% of patients had five or more comorbidities in both cohorts. Over 98% of surgeries were carried out in an inpatient setting. There were minimal differences between the cohorts after covariate balancing [Figure 1].

At 90-days of follow up there was significantly lower rate of knee-related readmissions for GRRK compared to all other revision implants (4.07% vs. 6.41%), with a mean difference of -2.35% [95 CI %: -3.23% to -1.47%, p<0.001]. At 30-day (2.08% vs. 2.94%) and 365-day (9.01% vs. 12.82%), knee-related readmission rates were also lower compared to all other revision implants [Figure 2]. All-cause readmission rates were also lower during the 30-, 90- and 365-day follow-up period for GRRK compared to other revision implants. Patients undergoing revision surgery with GRRK have lower discharge to skilled nursing facility (12.5% vs. 14.1%) and higher rates of discharge to home (83.5% vs. 80.8%). While the average surgical time was lower for GRRK compared to all other revision implants (191 vs. 200 mins), the average length of stay was similar (2.69 vs. 2.80 days).

DISCUSSION: The knee-related readmission rate was found to be significantly lower with GRRK compared to all other revision implants. There was a 37% reduction in knee-related readmission rate within 90-days of follow-up, highlighting the robust performance of GRRK in a clinical setting. Overall, resource utilization was lower with GRRK compared to all other revision implants at 30, 90 and 365 days. These results demonstrate GRRK’s value to patients, the health care system, and reinforce confidence for surgeons currently using this system, as well as those contemplating its adoption. Further clinical studies are needed to identify factors and/or predictors of GRRK’s success leading to the observed improved patient outcomes and resource utilization.

SIGNIFICANCE/CLINICAL RELEVANCE: This large database study demonstrates that the gradually reducing radius revision knee system is associated with significantly lower 90-day knee-related readmission rate and improved health resource utilization compared to other revision knee implants. These findings provide evidence supporting the use of this revision system to enhance patient outcomes and optimize post-operative care in single-stage revision total knee arthroplasty.

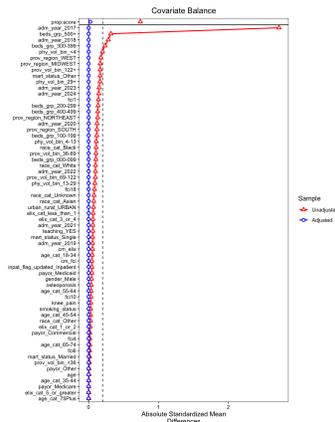


Figure 1: Covariate balancing. Adjusted standardized mean difference is below 0.2 indicating balanced cohort

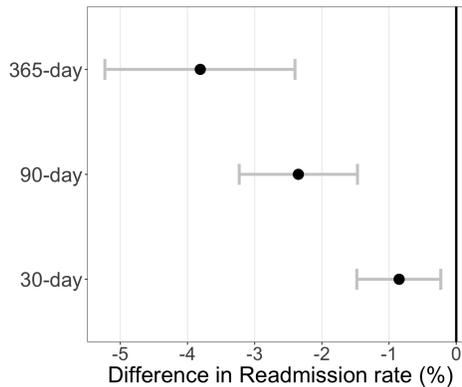


Figure 2: Difference in readmission rate between gradually reducing radius knee (GRRK) and all other revision implant. The data shows lower rate for GRRK.