

Functional Recovery After Revision Total Knee Arthroplasty

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INTRODUCTION: Revision total knee arthroplasty (TKA) is an extensive procedure with a challenging postoperative recovery as compared to primary TKA. Current studies on revision TKA recovery are limited to patient reported outcomes, radiographs, and other clinical findings such as complications. A gap in knowledge remains on the timeline of functional progression after revision TKA. Our objective was to prospectively follow early postoperative functional outcomes after revision TKA and determine when they reached or exceeded preoperative levels.

METHODS: Candidates for revision TKA were prospectively recruited. Inclusion criteria were age over 40 years and ability to ambulate 30 meters without assistance or rest. Exclusion criteria were cardiovascular or neurological contraindications to aerobic exercise or plans to have another total joint arthroplasty during the study period. Functional assessments were performed at 2-weeks preoperatively, and at 2-weeks, 6-weeks, 3-months, and 6-months postoperatively. Each assessment took place in a biomechanics lab within the Department of Physical Therapy. Trained physical therapists guided patients through a series of validated functional tests controlled for robustness and repeatability. These included Timed Up and Go, 10-meter walking speed, 2-minute walking endurance, stair climb, and the Y-Balance Test. Timed Up and Go has been validated to assess basic mobility and balance.¹ Y-Balance Test assesses balance, symmetry, and proprioception between the non-surgical and surgical leg in three directions: anterior, posteromedial, and posterolateral.² Robotic assistance was used to measure extension, midflexion, and flexion balance to verify they were symmetric through full range of motion with less than 1mm in laxity. Results were analyzed with ANOVA and Student's t-tests (GraphPad Prism 10).

RESULTS: A series of patients (n=13, 4 female, 9 male) were enrolled in this study. On Timed Up and Go performance, patients returned to preoperative function at 6-weeks and significantly improved at 3-months postoperatively (p=0.03) [Figure 1A]. Walking speed decreased at 2-weeks postoperatively but significantly improved between 2-weeks and 3-months after revision TKA (p=0.04) [Figure 1B]. Pairwise comparisons indicated significant improvement in 2-minute walking endurance between 2-weeks and 6-weeks postoperatively (p=0.04) [Figure 1C]. Stair climbing performance improved significantly for both ascent (p=0.03) and descent (p=0.04; Figures 1D, 1E). Y-Balance Test results trended with improvement at 6 months, with significantly greater distance reached posterolaterally between 2-weeks and 3-months postoperatively [Figure 2].

DISCUSSION: In this prospective study, we used validated functional outcomes to quantify functional recovery after revision TKA. When an imageless robotic system was used with neutral alignment goals within 1 degree and laxity within 1mm through ROM, patients reached preoperative functional levels within 6 weeks and had improved functional levels at 3 months. This suggests that improved balance in revision TKA will increase recovery. This study is not without limitations. The study population is limited in size and to one institution. Further investigation should increase enrollment numbers and participating medical centers. Future direction should compare functional recovery for revision TKA to primary surgeries.

SIGNIFICANCE/CLINICAL RELEVANCE: When increased attention is focused on a well-balanced revision TKA, return to preoperative function can be observed at 6-weeks postoperatively with improvement from baseline at 3 months.

REFERENCES: ¹Christopher A, et al. The reliability and validity of the Timed Up and Go as a clinical tool in individuals with and without disabilities across a lifespan: a systematic review. *Disabil Rehabil.* 2021;43(13):1799-1813.
²Powden CJ, et al. The reliability of the star excursion balance test and lower quarter Y-Balance Test in healthy adults: a systematic review. *Int J Sports Phys Ther.* 2019;14(5):683-694.

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IMAGES AND TABLES

Figure 1: Results of Timed Up and Go, 10 Meter Walking Speed, 2 Minute Walk, and Stair Climb Tests. * denotes significance (p<0.05).

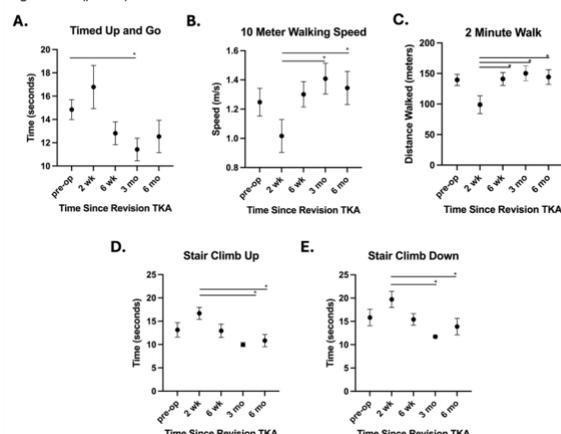


Figure 2: Y-Balance Test results. A, B, C: Symmetry of surgical and non-surgical side for anterior, posteromedial, and posterolateral directions. D, E, F: Distance reached normalized to leg length for the surgical side in anterior, posteromedial, and posterolateral directions.

