

# Functional positioning with robotic-assisted TKA achieved higher functional outcomes at one year compared to conventional TKA

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**Disclosures:** E. Hampp (3A; Stryker, 4; Stryker), M. Caba (3A; Stryker, 4; Stryker), S. Shi (3A; Stryker, 4; Stryker), L. Scholl (3A; Stryker, 4; Stryker), K. Taylor (None), K. Marchand (None), R. Marchand (3B-Stryker, Zipline, Onetrax, 4-Stryker, 5-Stryker)

**INTRODUCTION:** The utilization of manual technique in total knee arthroplasty (MTKA) has demonstrated excellent clinical success, though the ability to achieve a patient-specific implant position may be limited. With the introduction of CT-based robotic-arm assisted TKA (RATKA), surgeons have greater ability to individualize and functionally position the implant in 3-D to a patient's bony anatomy. However, more evidence is desired to assess the clinical outcomes of functionally-positioned RATKA. This retrospective query of a prospectively collected dataset aimed to compare outcomes of MTKA with functionally-positioned RATKA.

**METHODS:** Patients who underwent primary MTKA and functionally-positioned RATKA were propensity score matched 1:1 (145 MTKA: 145 RATKA cases) for demographics (age, gender, BMI) and preoperative PROMs [reduced WOMAC (r-WOMAC) pain and function] using a prospectively collected institutional dataset. For RATKA cases, the surgeon followed functional positioning principles, in which a 3-D CT was utilized to assess the individualized planned implant position and subsequently balance the knee prior to bone cuts, while minimizing the need for soft tissue releases. For MTKA, cases were mechanically-aligned and gap balanced. The demographic characteristics were similar between both MTKA and RATKA for age ( $64.6 \pm 7.9$  vs.  $66.0 \pm 7.3$ ,  $p = 0.101$ ), gender (57.9% male vs. 49.7% male,  $p = 0.158$ ), and BMI ( $32.5 \text{ kg/m}^2 \pm 6.9$  vs.  $32.4 \text{ kg/m}^2 \pm 6.9$ ,  $p = 1.000$ ), respectively. For both MTKA and RATKA groups, the preoperative r-WOMAC pain ( $8.98 \pm 3.25$  vs.  $8.98 \pm 3.54$ ,  $p = 1.000$ ) and r-WOMAC function ( $12.59 \pm 4.49$  vs.  $12.52 \pm 4.89$ ,  $p = 0.901$ ) were also similar. The postoperative r-WOMAC pain and function scores were compared at six months and one year using T-tests.

**RESULTS:** At the six-month follow-up, there was no statistically significant difference in the r-WOMAC pain and r-WOMAC function scores between both groups; however, it is worth noting that the results slightly favored the RATKA group, where lower scores signify reduced pain or greater function. The mean r-WOMAC pain score for the MTKA cohort was  $3.08 \pm 3.03$ , while for the RATKA group, it was  $2.90 \pm 2.82$  ( $p = 0.616$ ). Similarly, the mean r-WOMAC function score for the MTKA cohort was  $4.74 \pm 4.29$ , and for the RATKA cohort, it was  $4.26 \pm 3.97$  ( $p = 0.321$ ). At the one-year follow-up, the r-WOMAC function scores showed a significant improvement in function for the RATKA group ( $2.94 \pm 3.37$ ) compared to the MTKA group ( $4.38 \pm 4.51$ ), with a  $p$ -value of 0.024. There was no significant difference in the r-WOMAC pain scores at one-year follow-up, with values of  $2.51 \pm 3.16$  in the MTKA cohort and  $2.11 \pm 2.66$  in the RATKA cohort ( $p = 0.413$ ), though the scores remained slightly more favorable for RATKA.

**DISCUSSION:** This study conducted a comparative analysis of mechanically-aligned MTKA and functionally-positioned RATKA procedures, assessing the outcomes through r-WOMAC pain and r-WOMAC function scores. Propensity score matching was employed to ensure that demographic and preoperative characteristics were comparable between the MTKA and RATKA groups. There was some favorability for the RATKA group in terms of r-WOMAC pain and function scores at six months and r-WOMAC pain at one year, though the findings were not statistically significant. At the one-year follow-up, functionally-positioned RATKA showed significantly better function, compared to the MTKA group.

**SIGNIFICANCE/CLINICAL RELEVANCE:** Knee functional positioning with RATKA may help improve functional outcomes, as the functionally-positioned RATKA cohort in this study achieved better r-WOMAC scores at one year after TKA compared to conventional technique.