

Ten-Year Survivorship and Patient Satisfaction of Robotic-Arm Assisted Unicompartmental Knee Arthroplasty: A Prospective Multicenter Study

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INTRODUCTION: Unicompartmental knee arthroplasty (UKA) has considerable benefits over total knee arthroplasty (TKA) in the treatment of isolated medial compartment osteoarthritis. However, revision rates of UKA are generally found to be higher compared to TKA. Several studies have demonstrated that implant malposition, lower leg malalignment and instability were associated with increased risk of revision. As such, robotic-arm assisted systems have been introduced to reliably control surgical variables and to overcome these technical issues. Although previous studies have demonstrated high short- to mid-term survivorship of robotic-arm assisted UKA, limited evidence is available on long-term outcomes following this procedure. The aim of this prospective multicenter study was to determine long-term survivorship and patient satisfaction of robotic-arm assisted medial UKA.

METHODS: A total of 473 consecutive patients (528 knees) underwent robotic-arm assisted medial UKA by four different surgeons at separate institutions between 2009 and 2011. A cemented fixed-bearing metal-backed onlay tibial implant was used in all cases. Patients were contacted at 10-year follow-up to determine survivorship and overall satisfaction with their operative knee, using a five-series questionnaire. Implant survivorship was defined as the time from initial implantation to revision surgery. Kaplan-Meier regression models were used to determine survivorship using conversion to TKA as the endpoint for the primary outcome and any revision of components as the endpoint for the secondary outcome. Annual revision rates (ARR) were calculated to assess any differences in characteristics of revised patients. ARR was expressed as the rate of revision per 100 component years. Patients were divided into groups according to age (i.e., ≤59 years, 60-69 years, 70-79 years, or ≥80 years) and body mass index (BMI) (i.e., normal weight [18.5-24.9], overweight [25.0-29.9], moderate overweight [30.0-34.9], or severe overweight [≥35.0]) at time of surgery.

RESULTS:

Data was collected for 324 patients (364 knees) at a mean follow-up of 10.2 ± 0.4 years. Twenty-eight patients declined study participation, 80 patients were lost to follow-up and 41 patients deceased during the study period. Mean age at time of surgery of enrolled patients was 66.3 ± 8.4 years, mean BMI was 29.6 ± 4.5 kg/m², 44% of patients were female, and 12% of patients received bilateral UKA.

At 10-year follow-up, 26 knees were revised to TKA, resulting in a survivorship of 92.9% (95% confidence interval [CI] 90.3–95.7); (Figure 1). Additionally, three UKA components were revised, corresponding with an overall survivorship of 92.2% (95% CI 89.4–95.0); (Figure 2). Average time to revision was 5.2 ± 2.4 years, and the ARR was 0.78 revisions per year. The ARR was highest for younger patients (≤59 years; ARR 1.16) and moderately overweight patients (BMI 30–35; ARR 1.11). A higher proportion of females were revised to TKA compared to males (65% and 35%, respectively, $p = 0.04$). Unexplained pain and aseptic loosening were the most commonly reported modes of failure (38% and 35% of all revisions, respectively). Of all patients without revision, 92% were either very satisfied or satisfied with the overall function of their operative knee.

DISCUSSION AND CONCLUSION:

In this prospective multicenter study, high long-term survivorship and patient satisfaction were found after robotic-arm assisted medial UKA. Revised patients were more frequently younger, female, or moderately overweight. Unexplained pain and aseptic loosening were the most common modes of failure. Although this study found promising long-term results, comparative studies are warranted to assess whether the improved surgical precision provided by robotic-arm assisted systems translates into improved functional outcomes and survivorship compared to conventional UKA and TKA.

Figure 1

Robotic-Arm Assisted UKA Survivorship - Revision to TKA

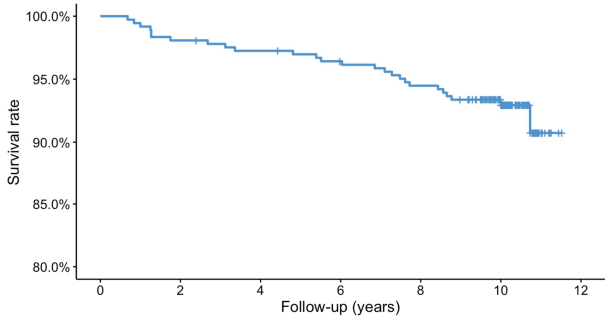


Figure 2

Robotic-Arm Assisted UKA Survivorship - All Revisions

