



# Does Robotic-Arm Assisted Surgery Improve Early Outcomes in Total Knee Arthroplasty?

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## Introduction

- Robotic-arm assisted TKA (RA-TKA) has been introduced to provide precision bone cuts along with real time intraoperative data on component alignment and flexion extension gap measurements to help achieve the desired limb alignment and symmetric flexion extension gaps in patients undergoing primary TKA.
- The purpose of this study was to compare early outcomes of RA-TKA to conventional TKA performed with manual instruments to determine if achieving the desired alignment and symmetric gap balancing using RA-TKA can lead to improved outcomes.

## Methods

- 100 consecutive patients undergoing RA-TKA and 100 consecutive patients undergoing conventional TKA during the same time period, using the same implant design (Stryker Triathlon™ PS), same anesthesia and post op protocols were studied.
- There were no differences between the groups with respect to age, BMI, Charlson comorbidity scores, preop KSS knee and function scores.
- Differences in postoperative parameters including ROM, Western Ontario & McMasters University Osteoarthritis Index (WOMAC) knee and function scores, Knee Society (KSS) knee and function scores, Visual Analog Scores (VAS) for pain at rest and activity, and postoperative complications at 6 weeks were analyzed.
- With RA-TKA, implant sizes were known prior to surgery, no manual cutting guides or jigs were used and gaps were symmetrically balanced within 1mm in flexion and extension.
- Patients underwent manipulation if 105° of flexion was not achieved at 6 weeks post op.



Figure 1a & 1b) PreOp radiographs of a 67 yo male with right knee OA.



Figure 2) Baseline intraoperative native limb alignment with 13° of varus, 6 mm medial gap and 16mm lateral gap in extension.

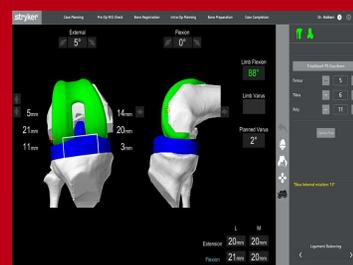


Figure 3) Final gap measurements after bone cuts and removal of osteophytes with medial and lateral flexion extension gap measurements within 1mm using trial implants.



Figure 4) Postoperative AP & lateral view after RA-TKA.

	Conventional TKA (n=100)	Robotic-Arm Assisted TKA (n=100)	p-value
Age (years)	64.3 ± 8.9	66.0 ± 9.1	0.30
BMI	34.9 ± 7.0	33.5 ± 5.9	0.25
<b>Operative Time (min)</b>	<b>88 ± 16</b>	<b>103 ± 18</b>	<b>0.0001</b>
KSS Function Score	58.4 ± 12.5	58.1 ± 16.4	0.93
KSS Knee Score	77.0 ± 16.3	77.6 ± 15.6	0.88
<b>VAS Pain at Rest</b>	<b>3.3 ± 1.9</b>	<b>1.5 ± 1.5</b>	<b>0.03</b>
<b>VAS Pain with Activity</b>	<b>6.9 ± 1.8</b>	<b>4.5 ± 2.7</b>	<b>0.04</b>
<b># of Contractures</b>	<b>14 (14%)</b>	<b>4 (4%)</b>	<b>0.02</b>
# of Infections	1 (1%)	2 (2%)	1.00

Table 1) Comparisons of demographics and post-operative parameters with RA-TKA versus conventional TKA using manual instruments.

## Results

- The RA-TKA group had significantly lower VAS pain scores at rest (p=0.03) and with activity (p=0.04) compared to the manual instrument TKA group.
- Using a strict criteria for manipulation, the RA-TKA group had fewer contractures requiring manipulation under anesthesia 4 (4%) compared to the conventional group 14 (14%) (p=0.02).
- Operative time for RA-TKA (103 minutes) was significantly higher than the conventional group (88 minutes) (p=0.001).
- There were no significant differences in postop ROM, WOMAC scores, and KSS scores at 6 week following TKA.

## Discussion & Conclusion

- Early results of RA-TKA has demonstrated improved pain scores (VAS) and decreased risk of contracture compared to conventional TKA with manual instruments.
- Long term up to 20% of patients have reported dissatisfaction with primary TKA. Instability due to malalignment and flexion extension gap mismatch is a leading cause of TKA failure.
- Innovative technology using RA-TKA has demonstrated the ability to perform 3D virtual preop planning, decreased soft tissue and bone trauma, with the capability to make intraoperative adjustments to component position to achieve the desired component alignment and symmetrically balanced gaps with promising early results.
- Longer follow up is needed to determine if the benefits of RA-TKA with its ability to provide the desired alignment and symmetric gap balancing will lead to long term improvement in patient outcome and satisfaction compared to TKA using manual instruments.