Robotic-arm assisted total knee arthroplasty more accurately restored the posterior condylar offset ratio and the Insall-Salvati Index compared to the manual technique; a cohort-matched study

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Introduction

Despite the demonstrated success of modern total knee arthroplasty (TKA), it remains a procedure that involves sophisticated pre-operative planning and meticulous technique in order to reconstruct the mechanical axis, achieve ideal joint balance, and restore maximal range-of-motion (ROM). Recently, robotic-arm assisted TKA have emerged as a promising new technology offering several technical advantages and achieving excellent radiological results. Among important radiological parameters are the posterior condylar offset ratio (PCOR) and the Insall-Salvati Index (ISI). Studies have demonstrated that these parameters are surgically modifiable and their accurate restoration correlate with the final joint range-of-motion. However, there is a paucity of studies that attempted to evaluate these parameters when undertaking robotic-arm assisted TKA. Therefore, in study we aimed to compare:

1) PCOR and

2) ISI restoration in a cohort of patients who underwent robotic-arm assisted vs. manual TKA.

Methods

- Evaluation included a series of 43 consecutive robotic-arm assisted (mean age 67 years; range, 46 to 79 years) and 39 manual total knee arthroplasties (mean age 66 years; range, 48 to 78 years) performed by 7 fellowship-trained joint reconstructive surgeons.
- All surgeries were performed using medial para-patellar approaches by high volume surgeons.
- Using the Knee Society Radiographic Evaluation System, pre-operative and 4 to 6 week post-operative radiographs were analyzed in order to determine the posterior condylar offset ratio (PCOR) and patella height based on the Insall-Salvati Index.

	Robotic-arm assisted	Manual	*p*-value
Age	67 (46 to 79)	66 (48 to 78)	0.570
Gender	17 females, 16 males	20 females, 9 males	0.366
BMI	31 (20 to 39)	32 (19 to 40)	0.699

Table 1
Patient demographics showing similar baseline age and BMI.

Results

The mean post-operative PCOR was larger in manual, when compared to robotic assisted cohort (0.53 vs. 0.49; p=0.024). The absolute mean difference between pre-operative and post-operative PCOR was larger in manual, when compared to robotic-arm assisted TKA (0.03 vs. 0.004; p=0.01) (Table 2). In addition, the number of patients who had post-operative Insall-Salvati Index outside of normal range (0.8 to 0.12) was higher in the manual cohort (12 vs. 4).

	Robotic-arm assisted	Manual	*p*-value
Pre-op Insall-Salvati Index	0.91 (0.59 to 1.23)	0.93 (0.61 to 1.3)	0.469
Post-op Insall-Salvati Index	1 (0.1 to 1.5)	1 (0.7 to 1.5)	0.049
Pre-op PCOR	0.49 (0.4 to 0.6)	0.50 (0.4 to 0.6)	0.937
Post-op PCOR	0.49 (0.41 to 0.55)	0.53 (0.41 to 0.6)	0.024
Absolute mean difference in PCOR	0.004	0.03	0.05

Table 2
Comparison of robotic-arm assisted and manual radiographic measurements (PCOR – posterior condylar offset ratio)

Conclusion

Patients who underwent TKA using robotic-arm assisted technology, had smaller mean differences in PCOR which has been previously shown to correlate with better joint ROM at 1-year following surgery. In addition, these patients were less likely to have values outside of normal Insall-Salvati Index, which means they are less likely to develop patella baja, a condition in which the patella would impinge onto the patellar component, leading to restricted flexion and overall ROM.

Reference:
Sultan, A., Khlopas, A., Sodhi, N., Bhowmik-Stoker, M., Chen, A., Orozco, F., Kolisek, F., Mahoney, O., Smith, L., Malkani, A., Molloy, R., Mont, M. Robotic-arm assisted total knee arthroplasty more accurately restored the posterior condylar offset ratio and the Insall-Salvati Index compared to the manual technique; a cohort-matched study. ORS 2018 Annual Meeting, New Orleans, LA. March 10-13, 2018.

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