ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

Robotic-Assisted Total Knee Arthroplasty Achieves Superior Accuracy In Restoring Native Posterior Femoral Condylar Offset And Tibial Slope Compared To Conventional Technique

Lika Dzidzishvili, MD, PhD

Ester García-Oltra, MD, PhD

Francisco Aliaga, MD, PhD

Vicente López, MD

José Antonio Hernández-Hermoso, MD, PhD

Hospital Universitari Germans Trias i Pujol, Universidad Autónoma de Barcelona, Barcelona, Spain

Germans Trias i Pujol Hospital

UAB Universitat Autònoma de Barcelona

Author´s Disclosure

The authors declare no conflict of interest.

PURPOSE, HYPOTHESIS, AND METHODS

Purpose: to compare the effects of robotic-assisted total knee arthroplasty (RA-TKA) and conventional total knee arthroplasty (C-TKA) on the correction of mechanical axis, PFCO, and PTS.

Hypothesis: RA-TKA restores the planned PFCO and PTS more accurately than C-TKA.

Methods: In this comparative, matched-group analysis, 60 patients undergoing TKA with a posterior-stabilized implant for primary osteoarthritis were included. The study comprised 30 patients receiving RA-TKA and 30 patients undergoing C-TKA. Preoperative full-leg and lateral X-rays were obtained for each patient to measure planned alignment reproducibility. Postoperative assessments were conducted on the first day, and at 2- and 6-month follow-up as per standard protocol.

ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11 | Germans Trias i Pujol Hospital | UAB Universitat Autònoma de Barcelona

SUMMARY OF RESULTS

Comparison of mean mechanical axis correction between RA-TKA and C-TKA groups.

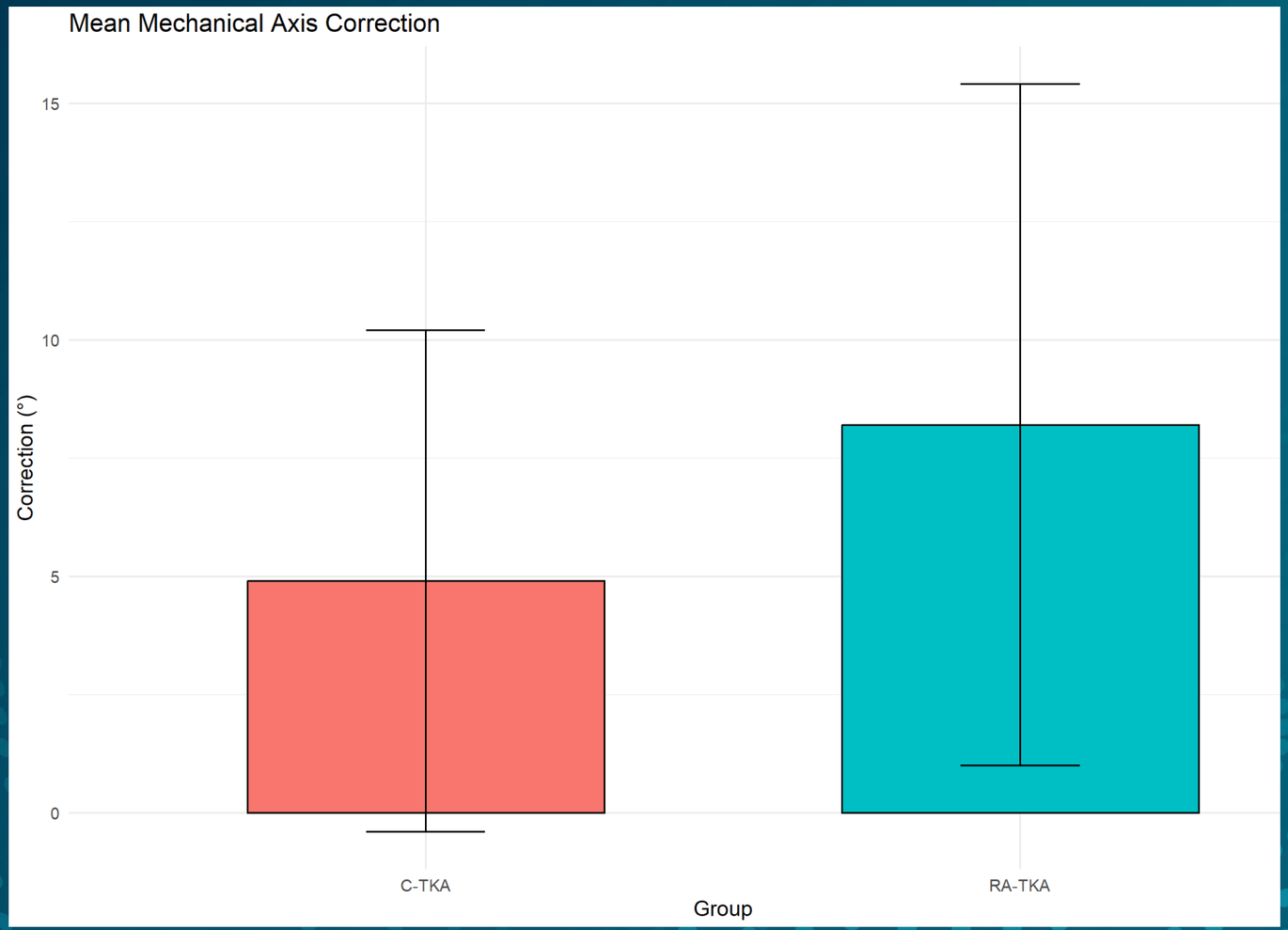

Figure 1. Bars represent the mean correction (°), and error bars indicate the standard deviation. The RA-TKA group had a mean correction of 8.2° ± 7.2°, while the C-TKA group had a mean correction of 4.9° ± 5.3°. No statistically significant difference was observed between the groups (p = 0.19; 95% CI, -1.03 to 5.06)

ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

Germans Trias i Pujol Hospital

UAB Universitat Autònoma de Barcelona

SUMMARY OF RESULTS

Comparison of the mean difference between preoperative and postoperative PFCO in RA-TKA and C-TKA groups.

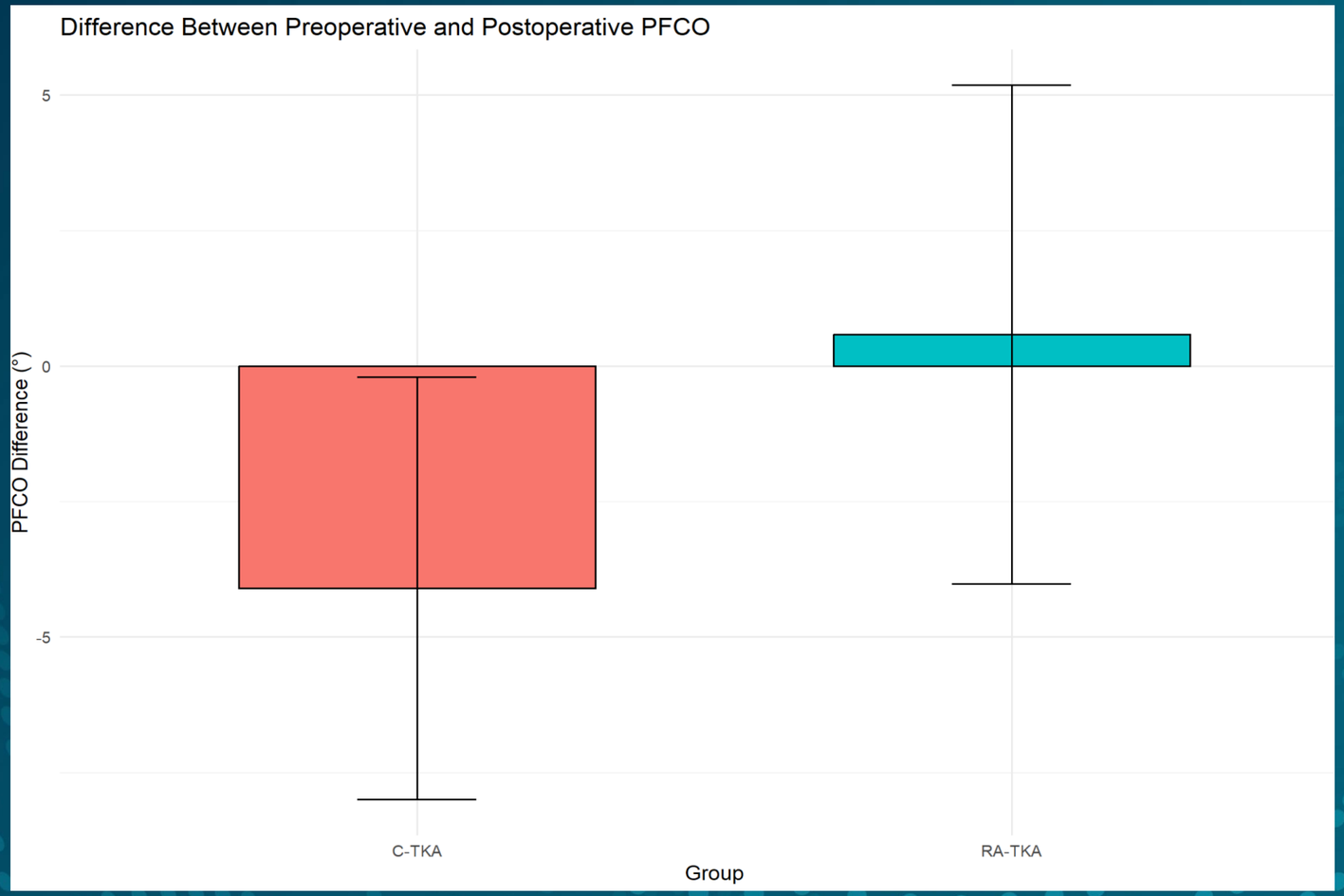

Figure 2. Bars represent the mean difference (°), and error bars indicate the standard deviation. The RA-TKA group showed a mean difference of 0.58° ± 4.6°, while the C-TKA group had -4.1° ± 3.9°. The difference between the groups was statistically significant ($p < 0.001$; 95% CI, 2.47–6.89), indicating improved PFCO restoration in the RA-TKA group.

SUMMARY OF RESULTS

Comparison of the mean difference in posterior tibial slope (PTS) between the RA-TKA and C-TKA groups.

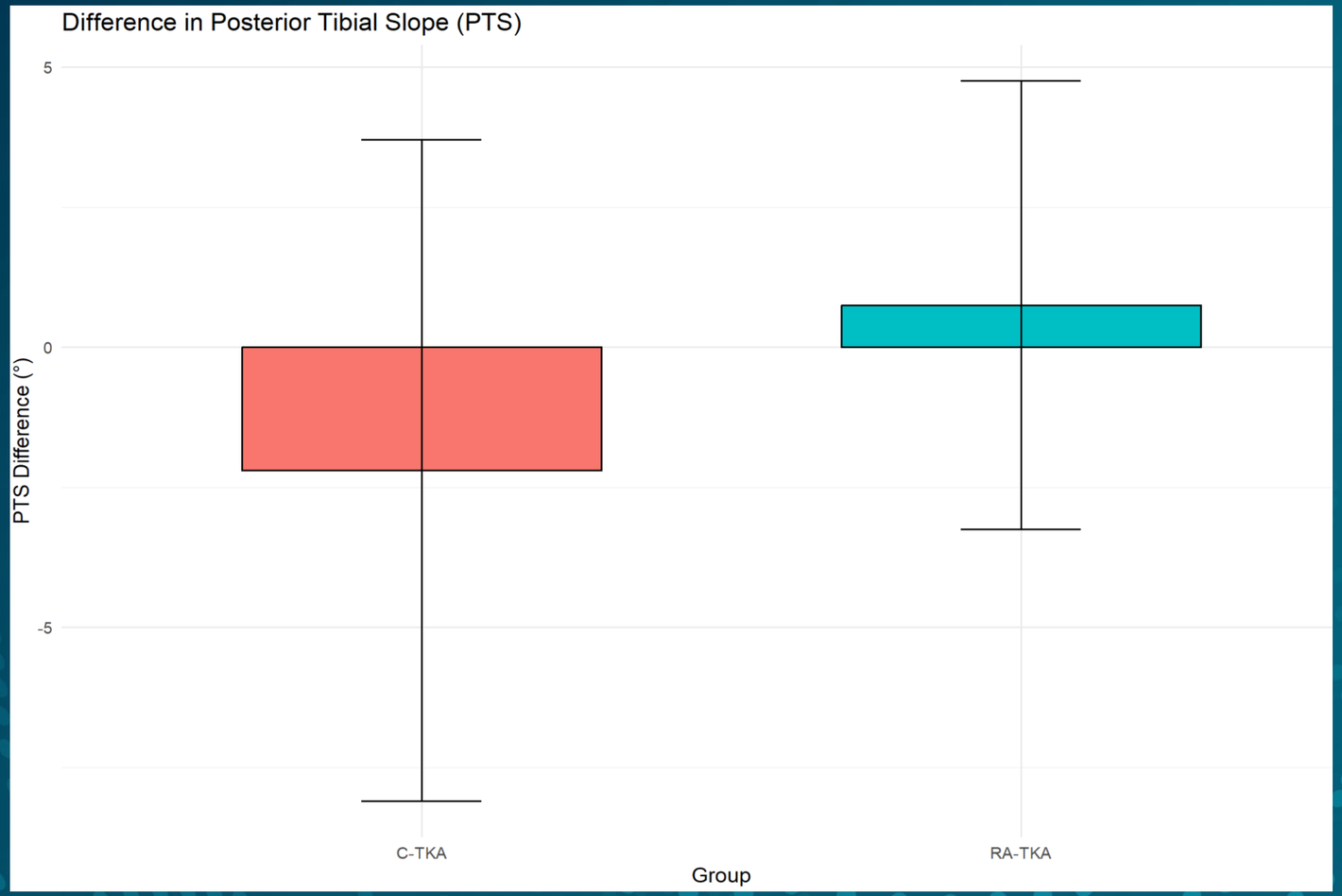

Figure 3. Bars represent the mean difference (°), and error bars indicate the standard deviation. The RA-TKA group showed a mean difference of 0.75° ± 4.0°, while the C-TKA group had -2.2° ± 5.9°. A statistically significant difference was observed between the groups (p = 0.02; 95% CI, 0.33–5.56), indicating more accurate PTS restoration in the RA-TKA group.

CONCLUSIONS

Robotic-assisted TKA more accurately restores the planned PFCO and PTS compared to conventional TKA, though both methods achieve similar outcomes in mechanical axis correction.

REFERENCES

1. Impellizzeri, F.M., Leunig, M., Preiss, S., Guggi, T. & Mannion, A.F. (2017) The use of the Core Outcome Measures Index (COMI) in patients undergoing total knee replacement. The Knee, 24, 372–379. Available from: https://doi.org/10.1016/j.knee.2016.11.016

2. Impellizzeri, F.M., Mannion, A.F., Leunig, M., Bizzini, M. & Naal, F.D. (2011) Comparison of the reliability, responsiveness, and construct validity of 4 different questionnaires for evaluating outcomes after total knee arthroplasty. The Journal of Arthroplasty, 26, 861–869. Available from: https://doi.org/10.1016/j.arth.2010.07.027

3. Jacofsky, D.J. & Allen, M. (2016) Robotics in arthroplasty: a comprehensive review. The Journal of Arthroplasty, 31, 2353–2363. Available from: https://doi.org/10.1016/j.arth.2016.05.026

4. Kayani, B., Konan, S., Huq, S.S., Tahmassebi, J. & Haddad, F.S. (2019) Robotic-arm assisted total knee arthroplasty has a learning curve of seven cases for integration into the surgical workflow but no learning curve effect for accuracy of implant positioning. Knee Surgery, Sports Traumatology, Arthroscopy, 27, 1132–1141. Available from: https://doi.org/10.1007/s00167-018-5138-5

5. Kayani, B., Fontalis, A., Haddad, I.C., Donovan, C., Rajput, V. & Haddad, F.S. (2023) Robotic-arm assisted total knee arthroplasty is associated with comparable functional outcomes but improved forgotten joint scores compared with conventional manual total knee arthroplasty at five-year follow-up. Knee Surgery, Sports Traumatology, Arthroscopy, 31, 5453–5462. Available from: https://doi.org/10.1007/s00167-023-07578-7

6. Kenanidis, E., Boutos, P., Sitsiani, O. & Tsiridis, E. (2023) The learning curve to ROSA: cases needed to match the surgery time between a robotic-assisted and a manual primary total knee arthroplasty. European Journal of Orthopaedic Surgery & Traumatology, 33, 3357–3363. Available from: https://doi.org/10.1007/s00590-023-03554-6

7. Parratte, S., Price, A.J., Jeys, L.M., Jackson, W.F. & Clarke, H.D. (2019) Accuracy of a new robotically assisted technique for total knee arthroplasty: a cadaveric study. The Journal of Arthroplasty, 34, 2799–2803. Available from: https://doi.org/10.1016/j.arth.2019.06.040

8. Seidenstein, A., Birmingham, M., Foran, J. & Ogden, S. (2021) Better accuracy and reproducibility of a new robotically-assisted system for total knee arthroplasty compared to conventional instrumentation: a cadaveric study. Knee Surgery, Sports Traumatology, Arthroscopy, 29, 859–866. Available from: https://doi.org/10.1007/s00167-020-06038-w

9. Shin, C., Crovetti, C., Huo, E. & Lionberger, D. (2022) Unsatisfactory accuracy of recent robotic assisting system ROSA for total knee arthroplasty. Journal of Experimental Orthopaedics, 9, 82. Available from: https://doi.org/10.1186/s40634-022-00522-7

Thank you