ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

Soft Tissue Safety In Robotic-Assisted Total Knee Arthroplasty: Is It Reliable?

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Faculty Disclosure Information

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- **Research support:** Stryker, Medcomtech
- **Board member:** SEROD Past-president, EKA Board member (education), IKS Founding Member
- **Consultant:** Stryker, Medcomtech, United Orthopedic Corporation

Juan Ignacio Erquicia:

- **Consultant:** Smith & Nephew

Introduction

- Joint replacement with a total knee prosthesis is the gold standard treatment for severe osteoarthritis, with an 80% patient satisfaction rate.

- Complications like injuries can occur due to the lack of precision and it can lead to poor outcomes increasing postoperative pain, analgesia needs and reduced implant longevity.

Introduction

- To enhance precision and minimize complications, robotic-assisted surgery, such as the MAKO® Robotic System, is increasingly used. This semi-active robot aids in surgical cutting, but safety margins may need to be expanded depending on the patient's morphology.

- The study aims to describe and quantify potential injuries from margin widening.

Material And Methods

- The study involved 15 fresh-frozen pelvis-to-toe cadaver specimens, excluding one due to a prior Girdlestone procedure (29 cadaveric knees). Approved by the ethics committee on 04/24/2024.

- A preoperative CT scan was conducted to match the knee's three dimensions during surgery, as typically done with the MAKO® robotic system.

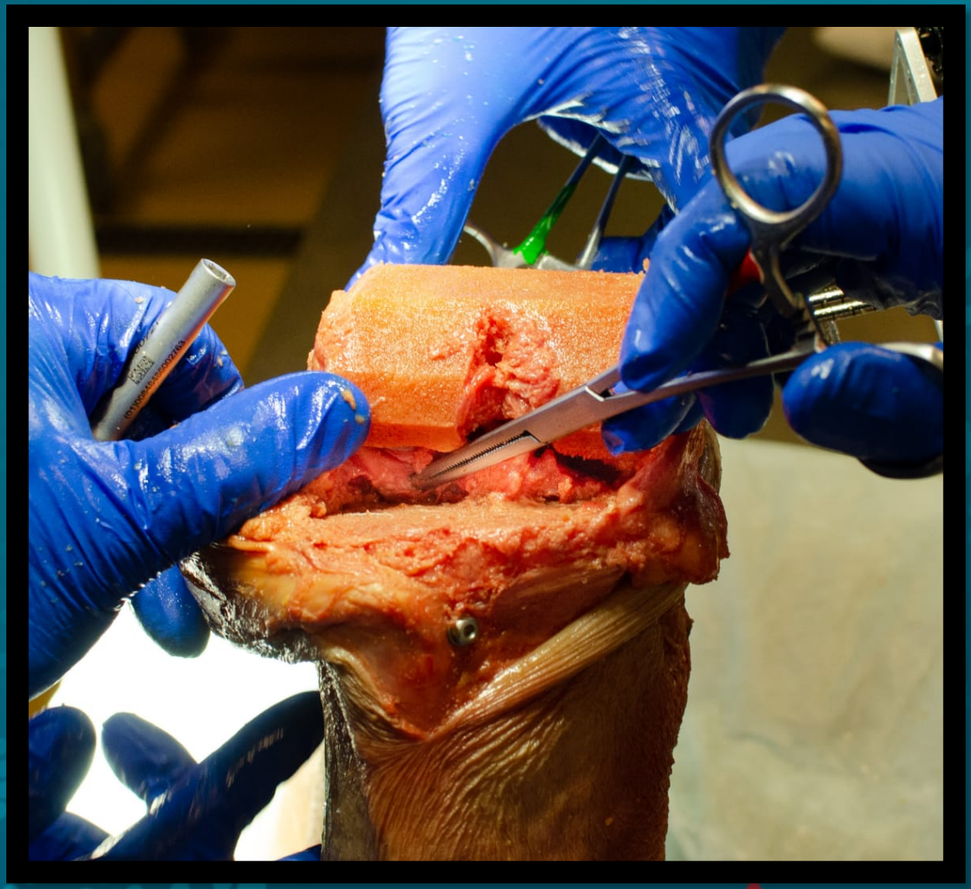
Material And Methods

- An expert surgeon performed the prosthetic surgery, and after making bone cuts, the robot's safety margins were expanded at the tibial cut level. The tibial cut was remade to its limits in all directions.

- Lesion measurements were defined by an anatomy professor, using the MASTI classification to quantify knee structure damage.

Material And Methods

- Additionally, two independent anatomy experts measured the distance from the tibial bone margin to the injured structures.
- Statistical analysis included descriptive methods, with T-student, Kruskal-Wallis, and U-Mann-Whitney tests used for variable comparison.
- Intraclass correlation explored the agreement between the two observers measurements, and Pearson correlation was used for other continuous variables.



Results

- 67% of the hemibodies were male, with a mean age of 77.2 ± 13.1 years.
- The average MASTI score was 33.38 ± 4.45. A higher percentage of injuries were observed in the posterior compartment (68.9%) compared to the lateral (41.4%) and medial (37.9%) compartments.
- The correlation of MASTI scores between surgeons and anatomists was moderate (rho = 0.47).

Results

- Soft tissue cleavage injuries, classified as the second most severe category, occurred in 6.9% of the medial and lateral compartments, and in 24.1% of the posterior compartment.

- Severe damage in the posterior compartment was identified in only one case (complete detachment).

Results

- The mean lesion size was largest in the medial compartment (11.90 mm), followed by the lateral (9.41 mm) and posterior (8.78 mm) compartments, with a high correlation between observers (rho = 0.99, $p < 0.0001$).

- No correlation was observed between soft tissue damage and final knee stability

Results

- The percentages of undamaged compartments were 62.1% for medial, 58.6% for lateral, and 31% for posterior.
- The mean MASTI scores by compartment were similar in the medial (8.37) and lateral (8.34) compartments, but lower in the posterior (6.65).
- The average distance from the bone margin to the injured structure in the posterior compartment was 10.86 mm.

Conclusions

- Expanding boundaries during robotic-assisted total knee arthroplasty results in a high percentage of soft tissue damage, predominantly affecting the posterior compartment.

- However, this damage was not correlated with final knee stability.

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