

High accuracy of a new robotically assisted technique for total knee arthroplasty: an in vivo study

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In a recent publication Rossi et al.¹ sought to evaluate the in vivo accuracy of the ROSA[®] Knee System using image-free landmark registration and reported that:

1. The average difference between the planned and executed resections for all measures was $<1^\circ$ and <1 mm with standard deviations <1 for each.
2. The average difference between planned and executed hip-knee-ankle (HKA) angle was $1.2^\circ \pm 1.1^\circ$.

Methods

This is a retrospective review of a consecutive series of 85 patients who underwent primary total knee arthroplasty (TKA) with the ROSA Knee System. The first ten cases were removed to account for a potential learning curve. All cases were performed image-free relying on intra-operative landmarking.

The planned vs. validated resections were evaluated using the robotic system and radiographic evaluation was performed post-operatively. Additionally, bone cuts were measured with a caliper for external validation of resection thickness.

Results

Resection Thickness

| Bone Resection | Planned, mean \pm SD | ROSA validated, mean \pm SD | Caliper measured, mean \pm SD |
|-------------------|------------------------|-------------------------------|---------------------------------|
| Femoral | | | |
| Distal Medial | 10.2 \pm 1.4 | 10 \pm 1.8 | 10.1 \pm 1.3 |
| Distal Lateral | 8.9 \pm 1.3 | 8.7 \pm 1.7 | 8.9 \pm 1.5 |
| Posterior Medial | 10.9 \pm 1.5 | | 10.4 \pm 1.4 |
| Posterior Lateral | 9.2 \pm 1.6 | | 9.4 \pm 1.1 |
| Tibial | | | |
| Lateral | 9.6 \pm 1.4 | 8.9 \pm 1.8 | 8.5 \pm 2.1 |
| Medial | 7.2 \pm 2.1 | 6.6 \pm 1.9 | 7.8 \pm 2 |

Resection Angles

| Angle | Planned, mean \pm SD | ROSA validated, mean \pm SD | X-ray measured, mean \pm SD |
|----------------|------------------------|-------------------------------|-------------------------------|
| Femoral | | | |
| Flexion | 2.7 \pm 1 | 2.0 \pm 1 | 2.2 \pm 1 |
| Varus/Valgus | 1.3 \pm 1 | 1.4 \pm 1.1 | 1.0 \pm 1.1 |
| Tibial | | | |
| Slope | 3 \pm 0.3 | 2.8 \pm 0.8 | 2.6 \pm 1 |
| Varus/Valgus | 0.5 \pm 0.7 | 1.1 \pm 1.2 | 1.1 \pm 1.1 |

The average difference between planned HKA and measured was 1.2 ± 1.1 .

Conclusion

The ROSA Knee System allows for accurate bones cuts for both planned angles and resection depths.

Significance

This study supports the use of the ROSA Knee System in accurately assisting the orthopedic surgeon by precisely placing and stabilizing the cutting guides. The actual measures obtained were, on average, within 1 degree or 1 mm of the planned resection.



References

1. Rossi SMP, Sangaletti R, Perticarini L, Terragnoli F, Benazzo F. High accuracy of a new robotically assisted technique for total knee arthroplasty: an in vivo study. Knee Surg Sports Traumatol Arthrosc 2022.

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