

Total Knee Arthroplasty with Robotic Surgical Assistance Results in Less Physician Stress and Strain Than Conventional Method¹

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The ROSA[®] Knee System resulted in less “surgeon physiologic stress, energy expenditure per minute, and postural strain” in surgeons performing robotic total knee arthroplasty (rTKA) compared to conventional TKA (cTKA).

- These benefits were noted “despite longer operative times”.

Methods

Sensor equipped “smart garments” and other wearable sensors were worn by the author (JHL) to monitor surgeon stress metrics while performing consecutive cases of either rTKA (n=20) or cTKA (n=20) using the Persona[®] Knee System:

- Cardiorespiratory
- Postural
- Kinematic

The robotic cases were performed with the ROSA[®] Knee System and represent the first 20 ROSA Knee cases performed by the surgeon.

Results

Operative times were longer in rTKA ($p < 0.001$)

- rTKA: 48.2 ± 9 minutes
- cTKA: 31.8 ± 7 minutes

Average operative time were lower in the second ten rTKA cases compared to the first ($p = 0.15$)

- 1-10: 53.2 ± 10 minutes
- 11-20: 43.2 ± 5 minutes

The average heart rate was lower in rTKA than cTKA ($p < 0.001$)

- rTKA: 81.5 ± 4 beats per minute
- cTKA: 90.1 ± 5 beats per minute

Energy expenditure per minute was lower in rTKA cases ($p < 0.001$)

- rTKA: 2.53 ± 0.4 calories/minute
- cTKA: 3.50 ± 0.7 calories/minute

Lumbar flexion was lower in rTKA ($p < 0.001$)

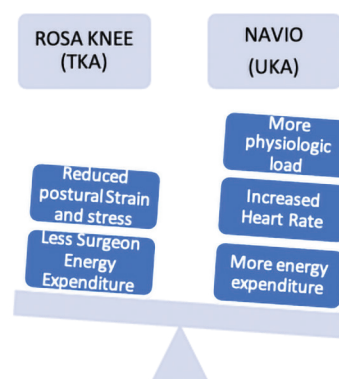
- rTKA: $-13.1^\circ \pm 6^\circ$
- cTKA: $-22.3^\circ \pm 5^\circ$

The time spent in lumbar flexion was also less ($p < 0.001$)

- rTKA: 23%
- cTKA: 55%

Discussion

In addition to comparing this system with conventional for TKA, Haffar et al.² recently compared NAVIO to conventional UKA using these same parameters and reported different outcomes.



Conclusion

The authors noted that, “...robotic technology may benefit the surgeon by reducing ergonomic strain and physiologic cardiorespiratory stress.”

Significance

Unlike other robotic systems for joint arthroplasty², and compared to conventional instrumentation, the ROSA Knee System improves intra-operative surgical ergonomics for the surgeons themselves by reducing the stress and strains of this physically demanding procedure.

References

1. Haffar A, Krueger CA, Goh GS, Lonner JH. Total Knee Arthroplasty With Robotic Surgical Assistance Results in Less Physician Stress and Strain Than Conventional Methods. *The Journal of Arthroplasty* 2022. 2. Haffar A, Krueger C, Goh GS, Lonner JH. UKA with a Handheld Robotic Device Results in Less Neck Flexion but Greater Energy Expenditure. *American Association of Hip and Knee Surgeons Annual Meeting*. Dallas, TX; 2021.

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