



Differences in Anesthesia Modality Across Manual, Computer- and Robotic-Assisted Total Knee Arthroplasty in Experienced Centers

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INTRODUCTION

What we do know: Trends in choice of anesthesia modality have been described for TKA (general over neuraxial over general/neuraxial)

What we do not know: It is unclear whether surgical technique (MA-TKA/CA-TKA/RA-TKA) or surgical experience affect modality choice

Therefore, we compared: Anesthesia modality choice across MA-TKA/CA-TKA/RA-TKA in hospitals with ≥1 year of experience with RA-TKA

METHODS

Study design: Retrospective cohort study (IRB#2012-050). Population-based. Follow-up to discharge from hospital

Setting: Multi-institutional database: Premier Healthcare Database. Hospitals with ≥1 year of RA-TKA experience. 2016-2023

Participants: Adults undergoing elective primary TKA for primary OA

Intervention/Comparison: MA-TKA vs CA-TKA vs RA-TKA

Variables collected: Patients with billing codes of general, neuraxial and combined general/neuraxial anesthesia. Additional variables collected were patient demographics, hospital characteristics and surgical time

Outcomes: Choice of anesthesia modality

Statistical Methods: Unadjusted analysis: chi-squared tests assessed differences between TKA technique groups, Adjusted analysis: **Mixed-effects linear regression**; fixed→ collected variables, random→ hospital provider, surgeon (primary analysis); surgical time (sensitivity analysis)

Main findings & tables/figures

	MA-TKA (n= 91,941)	CA-TKA (n= 9,791)	RA-TKA (n= 28,709)	p-value
Surgical time, median [IQR]	140.9 [118.3, 190.5]	142.2 [120, 180]	150.6 [121.5, 213.5]	< 0.001
(min, max)	(1.0, 10194)	(30, 1080)	(2, 5430)	

Anesthesia Type	MA-TKA (n= 91,941)	CA-TKA (n= 9,791)	RA-TKA (n= 28,709)	p-value
General, N (%)	57550 (62.6%)	8318 (85.0%)	17791 (62.0%)	< 0.001
Neuraxial, N (%)	24986 (27.2%)	1303 (13.3%)	9012 (31.4%)	< 0.001
Combined, N (%)	9405 (10.2%)	170 (1.7%)	1906 (6.6%)	< 0.001

Anesthesia Type		Mixed-effects	p-value	Sensitivity analysis	p-value
General, OR, (95% CI)	CA-TKA vs MA-TKA	1.22 (1.08, 1.39)	0.002	1.24 (1.10, 141)	<0.001
	RA-TKA vs MA-TKA	1.26 (1.19, 1.34)	<0.001	1.26 (1.19, 1.34)	<0.001
	RA-TKA vs CA-TKA	1.03 (0.90, 1.18)	0.67	1.01 (0.89, 1.16)	0.87
Neuraxial, OR, (95% CI)	CA-TKA vs MA-TKA	1.11 (0.96, 1.28)	0.173	1.08 (0.94, 1.25)	0.29
	RA-TKA vs MA-TKA	1.23 (1.16, 1.32)	<0.001	1.22 (1.14, 1.31)	<0.001
	RA-TKA vs CA-TKA	1.15 (0.96, 1.30)	0.16	1.12 (0.97, 1.31)	0.13
Combined, OR, (95% CI)	CA-TKA vs MA-TKA	0.52 (0.43, 0.64)	<0.001	0.52 (0.43, 0.65)	<0.001
	RA-TKA vs MA-TKA	0.54 (0.50, 0.58)	<0.001	0.54 (0.50, 0.59)	<0.001
	RA-TKA vs CA-TKA	1.04 (0.83, 1.30)	0.7	0.90 (0.73, 1.11)	0.33

RESULTS

Participants: MA-TKA (n=91,941), CA-TKA (n=9,791), RA-TKA (n=28,709)

Main Results: In the unadjusted data, this pattern emerged:
CA-TKA was the most likely to be conducted under **general anesthesia**
RA-TKA was the most likely to be conducted under **neuraxial anesthesia**
MA-TKA was the most likely to be conducted under **combined anesthesia**

After adjusting for confounders: **no differences in anesthesia type used between RA-TKA and CA-TKA.**
CA-TKA and RA-TKA: higher odds of general anesthesia vs MA-TKA
RA-TKA: higher odds of neuraxial anesthesia vs MA-TKA
MA-TKA: substantially higher odds of combined neuraxial and general anesthesia vs RA-TKA and CA-TKA

DISCUSSION

Our overall findings are consistent with reported trends for TKA: General anesthesia was used the most, followed by neuraxial and combined neuraxial anesthesia→ **Inconsistent with expert consensus guidelines**

Anesthesia modality choice across MA-TKA/CA-TKA/RA-TKA:
MA-TKA: substantially higher odds of combined neuraxial and general anesthesia vs RA-TKA and CA-TKA
Interpretation: While speculative, **perhaps the more unpredictable procedural length and more intense post-operative pain** associated with MA-TKA may lead physicians to opt for both modalities

Effect modifiers and confounders: CCI, hospital effect and surgeon effect
Interpretation: When we adjusted for these factors, the differences become much less pronounced, highlighting that **most of the difference observed can be attributed to patient-, hospital- and surgical team-related variation**

More Info →

