



Opioid Consumption During Hospitalization Across Manual, Computer- and Robotic-Assisted Total Hip Arthroplasty

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INTRODUCTION

What we do know: Robotic-assisted total hip arthroplasty (RA-THA) → decreased opioid requirements during hospitalization vs manual THA (MA-THA)

What we don’t know: What about computer-assisted THA (CA-THA)?

Does eliminating RA-THA learning curve have an **effect on opioid consumption** during hospitalization?

Why does it matter? Effective perioperative analgesia→ better long-term outcomes in THA

Therefore, we asked: Is there a **difference in opioid consumption during hospitalization** among MA-THA/CA-THA/RA-THA in hospitals ≥1 year of RA-THA experience?

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-THA experience. 2016-2023

Participants: Adults undergoing elective primary THA . Excluded: THA with concomitant hardware removal, trauma, neoplasms

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

Variables collected: Patient demographics, hospital characteristics, surgical indication, length of stay (LOS), opioid consumption (morphine milligram equivalents [MMEs]), major mechanical and systemic complications during hospitalization

Outcomes: Primary: total opioid consumption during hospitalization. Secondary: opioid consumption at the day of surgery, postoperative day (POD) 1 and POD ≥2

Statistical Methods: Unadjusted analysis: linear regression, Adjusted analysis: Mixed-effects linear regression; fixed→ collected variables, random→ hospital provider (main analysis), surgeon (sensitivity analysis)

Main findings & tables/figures

Difference in Total Opioid Consumption During Hospitalization					
Opioids (MMEs)		Unadjusted Model		p-value	Adjusted Model p-value
Total Opioids, Mean difference, (95% CI)	CA-THA vs MA-THA	9.55 (2.72, 16.39)		0.006	4.61 (-2.24, 11.45) 0.19
	RA-THA vs MA-THA	-12.72 (-17.07, -8.38)		<0.001	-9.81 (-14.18, -5.44) <0.001
	RA-THA vs CA-THA	-22.27 (-29.93, -14.62)		<0.001	-14.41 (-22.11, -6.72) <0.001

Difference in Opioid Consumption by Timepoint					
Opioids (MMEs)		Unadjusted Model		p-value	Adjusted Model p-value
Day of Surgery, Mean difference, (95% CI)	CA-THA vs MA-THA	30.12, (25.03, 35.21)		<0.001	7.36 (2.19, 12.54) 0.005
	RA-THA vs MA-THA	-10.61, (-13.85, -7.38)		<0.001	-2.48 (-5.78, 0.82) 0.14
	RA-THA vs CA-THA	-40.73, (-46.43, -35.03)		<0.001	-9.85 (-15.66, -4.03) <0.001
POD 1, Mean difference, (95% CI)	CA-THA vs MA-THA	-9.72, (-11.16, -8.29)		<0.001	-1.88 (-3.37, -0.38) 0.014
	RA-THA vs MA-THA	0.96, (-1.87, -0.04)		0.04	-4.10 (-5.05, -3.15) <0.001
	RA-THA vs CA-THA	8.77, (7.16, 10.37)		<0.001	-2.23 (-3.90, -0.55) 0.009
POD ≥2, Mean difference, (95% CI)	CA-THA vs MA-THA	-10.85, (-13.56, -8.13)		<0.001	-0.89 (-3.63, 1.85) 0.52
	RA-THA vs MA-THA	-1.15, (-2.88, 0.57)		0.19	-3.08 (-4.82, -1.34) <0.001
	RA-THA vs CA-THA	9.69, (6.66, 12.73)		<0.001	-2.19 (-5.26, 0.88) 0.16

RA-THA: decreased postoperative opioid consumption compared with MA-THA/CA-THA

CA-THA: higher opioid consumption on the day of surgery compared to RA-THA/MA-THA

Adjusted analysis: most of the differences observed were driven by indication-, hospital- and care-team-specific differences in perioperative management

RESULTS

Participants: MA-THA (n=75,966), CA-THA (n=6,207), RA-THA (n=17,497)

Main Results: CA-THA was associated with increased total opioid consumption compared with MA-THA; this difference did not persist after covariate adjustment. RA-THA was associated with lower total opioid consumption compared to MA-THA and CA-THA. These observations were predominantly influenced by opioid consumption differences on the day of surgery

DISCUSSION

Is there a **difference in opioid consumption during hospitalization** among MA-THA/CA-THA/RA-THA in hospitals ≥1 year of RA-THA experience?

RA-THA: decreased postoperative opioid consumption compared with MA-THA/CA-THA

Interpretation: While the exact mechanism is unknown, **reduced soft tissue trauma/swelling and more efficient/accurate acetabular reaming and cup placement** might contribute to RA-THA resulting in decreased acute inflammation

What about CA-THA?

CA-THA: higher opioid consumption on the day of surgery compared to RA-THA/MA-THA; drastically reduced after adjusting

Interpretation: Based on our data, we believe this observation is primarily explained by **CA-THA’s increased likelihood to be utilized in non-osteoarthritis cases (more complex)**. The adjusted CA-THA/MA-THA difference could be attributed to the **use of pins in CA-THA**

Does eliminating RA-THA learning curve have an effect on opioid consumption during hospitalization?

Not necessarily. **BUT:** Hospital level/surgeon level analysis showed that **most of the differences observed were driven by hospital-specific and care-team-specific differences in perioperative management**

More Info →

