

Postoperative Pain and Opioid Consumption in Robot-Assisted vs Conventional Open Kidney Transplantation

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Objectives

- To investigate the potential benefits of robotic-assisted kidney transplants (RAKT) vs. open kidney transplants (OKT)
- Primary Aim:** Postoperative opioid consumption at 48h MME and highest pain score within 72 hours
- Secondary Aim:** Intraoperative opioid consumption, ICU length of stay, total length of stay, estimated blood loss

Discussion

- RAKT did not reduce 48-hour opioid requirement of postoperative pain scores.
- However, it did result in lower blood loss. Interestingly, we observed that increased BMI and EBL were associated with higher postoperative opioid requirements
- Our results differ from the majority of existing literature, which has reported significantly reduced pain scores and postoperative opioid requirements in RAKT, attributing this to smaller incision size and thus decreased tissue trauma and postoperative discomfort. Further studies are required to determine the clinical benefit of RAKT compared to OKT.

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NO SIGNIFICANT DIFFERENCES IN POSTOPERATIVE PAIN OR OPIOID USE WERE OBSERVED IN ROBOT-ASSISTED VS OPEN KIDNEY TRANSPLANTATION.

INCREASED BMI AND ESTIMATED BLOOD LOSS WERE ASSOCIATED WITH HIGHER POSTOPERATIVE OPIOID REQUIREMENTS.

Adults (≥18 years old) who underwent kidney transplantation at the University of Illinois Hospital from September 2020 to September 2025 yielded a total of 1379 patients (1234 OKT and 145 RAKT patients)

1:1 nearest-neighbor propensity score matching with a caliper width of 0.2 yielded 125 pairs (125 RAKT and 125 OKT). Covariates for matching included demographics, ASA score, and comorbidities.

Following matching, paired *t*-tests were applied to normally distributed continuous variables, Wilcoxon signed-rank tests to non-normally distributed continuous variables, and Fisher's exact test to binary and ordinal variables.

Table 1. Demographics and Clinical Characteristics Before and After Propensity-Score Matching								
Preoperative Characteristics	Before matching				After matching			
	Total (N=1379)	OKT (n=1234)	RAKT (n=145)	p-value	Total (n=250)	OKT (n=125)	RAKT (n=125)	p-value
Age (years)	52 (41-60)	53 (42-61)	46 (37-54)	<0.0001	47 (38-54)	46 (38-54)	48 (38-54)	0.6607
Race, Black or African American	41.0% (565)	39.2% (484)	55.9% (81)	0.0016	54.0% (135)	55.2% (69)	52.8% (66)	0.7958
Race, White	49.9% (688)	51.1% (630)	40.0% (58)		42.4% (106)	41.6% (52)	43.2% (54)	
BMI (kg/m ²)	31 (7.5)	30 (6.9)	41 (5.7)	<0.0001	40 (6.0)	40 (6.4)	40 (5.7)	0.8759
HTN	28.7% (396)	29.7% (366)	20.7% (30)	0.0254	20.4% (51)	20.8% (26)	20.0% (25)	>0.9999
CAD	19.4% (268)	20.3% (250)	12.4% (18)	0.0260	11.6% (29)	9.6% (12)	13.6% (17)	0.4300
Obesity	24.4% (337)	20.3% (250)	60.0% (87)	<0.0001	54.8% (137)	52.8% (66)	56.8% (71)	0.6113
OSA	19.2% (265)	16.5% (204)	42.1% (61)	<0.0001	36.8% (92)	34.4% (43)	39.2% (49)	0.5121

ASA = American Society of Anesthesiologists; BMI = body mass index; HTN = hypertension; CAD = coronary artery disease; OSA = obstructive sleep apnea; SD = standard deviation
Data shown as mean (SD), % (n), or median (IQR)

Table 2. Intraoperative Variables & Clinical Outcomes After Matching				
Variables	Total (n=250)	OKT (n=125)	RAKT (n=125)	p-value
Procedure Length, min	248 (211-298)	226 (197-277)	275 (231-317)	<0.0001
Estimated Blood Loss, mL	100 (50-178)	100 (50-200)	80 (50-124)	0.0007
PRBC Transfusions, mL	0 (0-300)	0 (0-300)	0 (0-300)	0.2577
Postoperative MME 48h	227 (70-440)	191 (54-390)	256 (111-456)	0.1591
Highest Pain Score in Recovery <72h	6 (4-8)	6 (5-8)	6 (4-8)	0.0627
Remained Intubated After Procedure	78.4% (196)	72.0% (90)	84.8% (106)	0.0206
ICU Length of Stay, days	4.5 (3.4-6.0)	4.5 (3.7-5.8)	4.2 (3.3-6.2)	0.6960
Recovery Length of Stay, days	7.0 (6.0-9.0)	7.0 (6.0-9.0)	7.0 (5.0-9.0)	0.5146
Outpatient Opioid Use within 90 days Post-op	12.0% (30)	14.4% (18)	9.6% (12)	0.3306

Data shown as % (n) or median (IQR)

Table 3. Multivariate Linear Regression of Postoperative MME at 48-hours After Matching			
Variable	Ratio of geometric means (95% CI)	% change in 48h MME (95% CI)	p-value
Age, years	0.99 (0.99 to 1.00)	-0.57 (-1.29 to 0.20)	0.1452
Race, Black or African American	0.97 (0.83 to 1.15)	-2.57 (-17.30 to 15.03)	0.7548
BMI	1.02 (1.01 to 1.03)	2.12 (0.77 to 3.46)	0.0022
Primary Procedure, RAKT	1.16 (0.97 to 1.39)	16.18 (-2.57 to 39.10)	0.0949
ASA Score	1.13 (0.88 to 1.45)	12.75 (-12.19 to 44.77)	0.3478
Procedure Length, min	1.00 (1.00 to 1.00)	0.10 (-0.02 to 0.21)	0.0911
Highest Pain Score in Recovery <72h	0.97 (0.94 to 1.01)	-2.66 (-5.82 to 0.70)	0.1194
Intraoperative MME	1.00 (1.00 to 1.00)	0.01 (-0.26 to 0.27)	0.9557
EBL, per 100 mL	1.00 (1.00 to 1.00)	1.06 (1.00 to 1.12)	0.0377

ASA = American Society of Anesthesiologists; BMI = body mass index; EBL = Estimated Blood Loss; RAKT = Robotic-Assisted Kidney Transplant
48-hour MME were log-transformed prior to multivariable linear regression to improve normality of residuals. Estimates are presented as exponentiated coefficients, representing ratios of geometric means and percent differences.

Multiple Linear Regression of Postoperative MME at 48-hours After Propensity Score Matching

