



Open, Laparoscopic, or Robotic? Defining the Short-Term Tradeoffs in Gastric Cancer Surgery

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Objective

Minimally invasive techniques are increasingly utilized in gastric cancer surgery, yet the optimal operative approach remains under debate. Laparoscopic and robotic gastrectomy may offer advantages in visualization, precision, and recovery compared to the open technique, but their impact on perioperative outcomes and oncologic resection remains uncertain. While prior studies suggest short-term benefits of minimally invasive approaches, few large-scale analyses have directly compared open, laparoscopic, and robotic gastrectomy. This study evaluates outcomes across these three strategies to better define their relative safety and effectiveness.

Methods

The 2022–2023 American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) registry was queried to identify patients undergoing total or distal gastrectomy with Roux-en-Y reconstruction. Surgical approach was categorized as open, laparoscopic, or robotic. Outcomes of interest included operative time, length of stay, 30-day postoperative complications, readmissions, and mortality. Comparative analyses were performed, and significant outcomes further evaluated using regression modeling. A p-value <0.05 was considered statistically significant.

Results

Characteristic	Open (n=732)	Laparoscopic (n=163)	Robotic (n=154)	p
Age	64.5 (±12.4)	66.1(±11.9)	64.8(±11.7)	0.310
BMI	27.0(±6.3)	26.5(±5.0)	27.3 (±5.9)	0.513
Female	279 (38.1%)	60 (36.8%)	67 (43.5%)	0.396
Distal Gastrect	433(66.5%)	116(17.8%)	102(15.7%)	<0.001
Total Gastrect	299(75.1%)	47(11.8%)	52(13.1%)	<0.001
Asian	96 (13.1%)	50 (30.7%)	38 (24.7%)	<0.001
African American	103 (14.1%)	12 (7.4%)	15 (9.7%)	
White	287 (39.2%)	44 (27.0%)	73 (47.4%)	
Other Race	246 (33.6%)	57 (35.0%)	28 (18.2%)	
Ascites	4 (0.5%)	0 (0.0%)	0 (0.0%)	0.419
Disseminated CA	49 (6.7%)	10 (6.1%)	8 (5.2%)	0.779

Outcomes	Open (n=732)	Laparoscopic (n=163)	Robotic (n=154)	p
OR Time(min)	227	247	329	<0.001
LOS (days)	8	6	5	0.112
Return to OR	47 (6.4%)	13 (8.0%)	8 (5.2%)	0.599
Readmission	63 (8.6%)	17 (10.4%)	16 (10.4%)	0.649
Mortality	17 (2.3%)	2 (1.2%)	2 (1.3%)	0.530

Multivariable Regression of Open (Baseline) vs Laparoscopic and Robotic Approaches				
	β	Lower	Upper	p
OR Time, Laparoscopic	24.618	5.68	43.521	0.011
OR Time, Robotic	105.017	85.912	124.124	<0.001

Conclusion

In this national analysis, operative approach was not associated with significant differences in short-term morbidity or mortality following gastrectomy for gastric cancer. Minimally invasive techniques were independently associated with longer operative times, particularly robotic surgery. These findings highlight the need for further investigation into pathologic and long-term oncologic outcomes to clarify the role of robotic and laparoscopic platforms in gastric cancer surgery.