Totally Robotic Sleeve Gastrectomy Versus Robotic Gastrectomy with Laparoscopic Stapling– Is There A Difference?

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Abstract

INTRODUCTION: Use of the robotic stapler can obviate the need for a skilled bedside assistant. However, the impact of robotic stapling on patient outcomes is not well studied. We sought to determine whether the use of the robotic stapling device impacted the 30-day postoperative outcomes in our bariatric surgery patients.

METHODS: A local database of bariatric surgery procedures was used to extract basic demographics for patients undergoing robotic-assisted sleeve gastrectomy over 10 years. A similar operative technique was used for all patients. Patients were split into cohorts based on whether a laparoscopic (Medtronic Endo GIA™) or robotic stapler (SureForm DaVinci Xi®) with bioabsorbable staple line reinforcement (GORE®SEAMGUARD®) was used. Thirty-day outcomes included mortality, wound infection, respiratory or urinary-related complications, cardiac events, metabolic disturbances, readmission, re-operation, leaks, VTE, and bleeding. Descriptive comparisons and Chi-square analyses were made using SPSS.

RESULTS: A total of 311 patients underwent robotic-assisted sleeve gastrectomy by two surgeons in our institution. The robotic stapler was used in 65 cases (21.3%). Overall, there were no mortalities, re-operations, or leaks. Although laparoscopic stapling group trended towards more complications, none were statistically significant. There were 2 postoperative bleeding events in the robotic stapling group (p=0.042).

CONCLUSION: Use of a robotic stapler in robotic-assisted sleeve gastrectomy is not associated with worse outcomes when compared to a laparoscopic stapler. Therefore, the choice of stapler can be based on availability of staplers, cost, first assistant skills, and surgeon comfort. Further studies with larger sample size are necessary to examine other variables that can determine the clinical benefits of robotic technology in bariatric surgery.

Introduction

The emergence of robotic technology has brought many changes in the technique and scope of surgical care offered throughout the world. As technology itself continues to evolve and progress, ongoing research allows clinicians to identify best practices and standards of care. Several subspecialties have identified procedures where robotic technology offers an advantage to the patient when compared to laparoscopy, including in urology, gynecology, colorectal and thoracic surgery [Memon, Liu, Autorino, Seder]. However, in an age of increasing pressure to work with limited resources and drive down healthcare costs, it becomes imperative to identify which components of a process are most responsible for patient benefit, and which components add disproportionate cost relative to benefit.

Unfortunately, much of the literature on robotic surgery studies the robotic platform as a whole and not its components. This makes it impossible to study whether specific instruments have any effect on patient outcomes, and thus whether transitioning from an assistant-dependent approach to a totally robotic approach is safe and feasible. In this study, we sought to begin answering this question by determining whether use of a totally robotic approach, including use of the robotic stapling device, had an impact on 30-day outcomes in our bariatric surgery patient population.

Methods

A local database of bariatric surgery procedures was used to extract basic demographics for patients undergoing robotic-assisted sleeve gastrectomy over 10 years. A similar operative technique was used for all patients. Patients were split into cohorts based on whether a laparoscopic (Medtronic Endo GIA™) or robotic stapler (SureForm DaVinci Xi®) with bioabsorbable staple line reinforcement (GORE®SEAMGUARD®) was used. Thirty-day outcomes included mortality, wound infection, respiratory or urinary-related complications, cardiac events, metabolic disturbances, readmission, re-operation, leaks, VTE, and bleeding. Post-operative weight loss was collected at three and six months. Descriptive comparisons and Chi-square analyses were made using SPSS, with a p-value <0.05 considered statistically significant.

Results

TABLE 1. PATIENT DEMOGRAPHICS

Demographic	Laparoscopic Stapler Group (N=246)	Robotic Stapler Group (N=65)	p-value
Mean Age	44.56	42.71	0.249
Sex			0.288
Female	181 (73.6%)	52 (80%)	
Male	65 (26.4%)	13 (20%)	
Race			
Race- White	153 (62.2%)	50 (76.9%)	0.01
Race- black	8 (3.3%)	3 (4.6%)	0.704
American Indian	10 (4.1%)	4 (6.2%)	0.502
Hawaiian or Pacific Islander	2 (0.8%)	0	1
Asian	2 (0.8%)	0	1
Other race	16 (6.5%)	3 (4.6%)	0.773
Hispanic	81 (32.9%)	32 (49.2%)	0.015
Unknown race	41 (16.7%)	4 (6.2%)	0.032
Pre-op BMI [IQR]	48.26 [40.3-53.3]	46.12 [40.4-49.5]	0.125
Any Comorbidities	230 (93.4%)	65 (100%)	0.029
History of prior abdominal surgery	96 (39%)	27 (41.5%)	0.712
History of DM	113 (45.9%)	40 (61.5%)	0.025
HTN	147 (59.8%)	37 (57%)	0.679
Hyperlipidemia	77 (91.1%)	22 (33.8%)	0.695
OSA	184 (74.8%)	52 (80%)	0.383
DJD	74 (30%)	19 (29.2%)	0.894
GERD	85 (34.6%)	14 (21.5%)	0.045

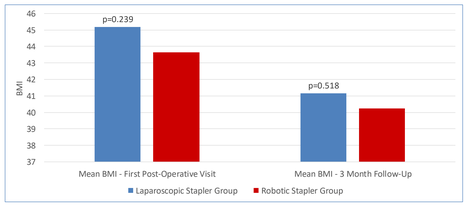
TABLE 2. OPERATIVE DETAILS

	Laparoscopic Stapler Group	Robotic Stapler Group	p-value
Mean operative time (min)	136.8	136.06	0.888
Additional procedures (hiatal hernia repair)	61 (24.8%)	10 (15.4%)	0.108
Additional procedures (other eg. lysis of adhesions)	30 (12.2%)	6 (9.2%)	0.530
Length of stay (days)	1.26	1.09	0.054

TABLE 3. 30- DAY OUTCOMES

Complication Type	Laparoscopic Stapler	Robotic Stapler	p-value
Any complication	9 (3.7%)	5 (7.7%)	0.192
Mortality	0	0	n/a
Re-operation	0	0	n/a
Leaks	0	0	n/a
Wound infection	2 (0.8%)	1 (1.5%)	0.515
Respiratory	0	1 (1.5%)	0.213
Renal	6 (2.4%)	0	0.348
Cardiac	0	1 (1.5%)	0.213
VTE	2 (0.8%)	0	1.00
Bleeding	0	2 (3.1%)	**0.042**
Readmission	0	0	n/a

FIG. 1. WEIGHT LOSS OUTCOMES



Discussion and Conclusions

The overall rate of complications in modern-day bariatric surgery in the United States is low [Hagen, etc]. Yet it is crucial to be persistent in striving to identify modifiable contributions to these complications, because although some of them are infrequent, their consequences can be devastating for the patient. Importantly, this study demonstrates that the overall rate of 30-day complications after robotic-assisted sleeve gastrectomy using the robotic stapler was not different than the rate associated with the laparoscopic stapler. However, post-operative bleeding did occur in two patients in the robotic stapling group which was a significant difference given that there were no bleeding events in the laparoscopic group. This study was not powered to detect this rare event; thus, it is unclear whether this is a generalizable result. Finally, our results indicate that the robotic stapler is not associated with any significant change in the expected weight loss at three months following sleeve gastrectomy. The success of surgery is directly related to the technical details of the mobilization and resection of the fundus, which was standardized in this population.

Totally robotic sleeve gastrectomy is not associated with a difference in 30-day overall morbidity and mortality, although there may be a slightly higher rate of post-operative bleeding. Additional studies with a larger population are needed to validate whether the totally robotic approach is safe and feasible in the general population, as this would have important implications for the use of both material and human resources.

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