Robotic Approach to Laparoscopic Bariatric Surgery: Omega Double Loop Reduction in Internal Herniation

Stacey M. Knowles[1], MS, Hanna Almoaswes[1], BS, Michael Cook[1], MD, FACS, FASMBS

[1]Louisiana State University Health Sciences Center, New Orleans, LA

Introduction

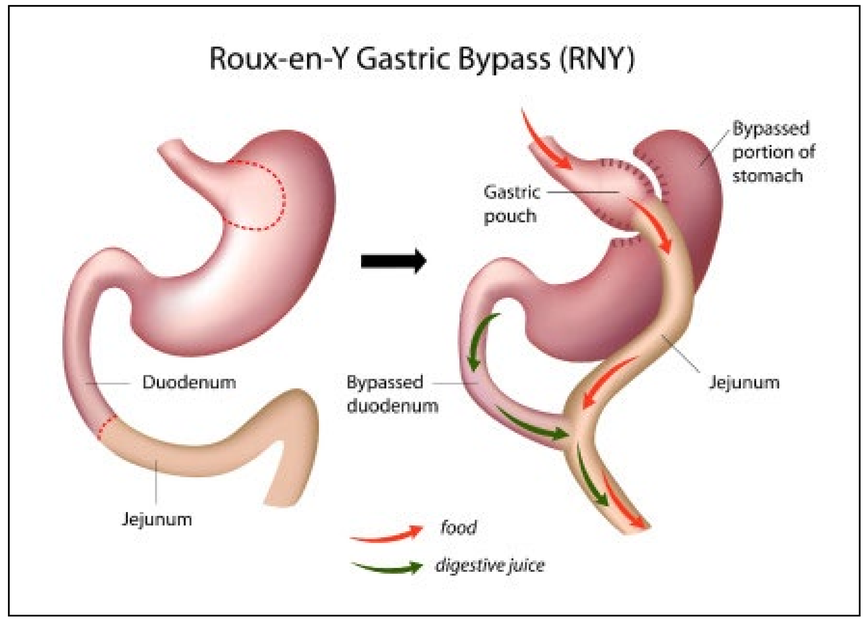
Obesity was declared an epidemic by the world health organization (WHO) in 1997. According to the world obesity atlas 2023 report, 38% of the global population are currently either overweight or obese. Within the United States, 78% of adults are estimated to be overweight or obese. Recent data reflective of the current state of the obesity epidemic has shown obesity rates in adults in high-income populations as well as children and adolescents in economically advanced countries has begun to plateau since the 2000s. However, in low-income countries and globally overall, the trend has been an increase in obesity mostly driven by the steep increase in obesity in low-income populations. Additionally, middle-income countries are also experiencing a rise in rates of severe obesity. Even within those high-income populations, severe obesity is expected to double its prevalence from 10-20% between 2020 and 2035. All this to say, it is still a pertinent, worrisome problem that is afflicting the majority of the US population and only projected to worsen.

In addition to lifestyle modifications, bariatric surgery has been an option for the patient population with either BMI equal to or greater than 40 or a BMI greater than 35 with additional obesity-related comorbidities such as type 2 diabetes mellitus or hypertension. Studies have shown in cases of severe obesity (BMI 40+), weight loss surgery has been shown to not only be effective in keeping the weight off but improving the obesity–related comorbidities as well as a decrease in all-cause mortality at 5 years and up to 10 years following the procedure.

While there are multiple types of bariatric surgery, today we will be focusing on the most commonly performed weight loss procedure in the United States, the Roux En Y Gastric bypass. The Roux en Y Gastric bypass surgery involves creating a small pouch from the stomach and connecting the pouch directly to the small intestines, creating the "roux limb". This results in 2 anastomoses, the gastrojejunostomy and the jejunojejunostomy. This procedure can be performed laparoscopically or robotically. One of the most common post-op Roux en Y Gastric bypass complications are internal hernias. The incidence rate is highest up to 2 years after surgery. The clinical presentation is variable from mild abdominal pain to life-threatening small bowel strangulation. Initial techniques to decrease the rate of hernias included closing the mesenteric defects created as a result of mobilizing the roux limb and using an antecolic approach. While this did provide significant improvement in the post–operation complication rate, the risk of internal herniation remains high. The aim of this study is to evaluate the incidence of internal hernias after transitioning from the traditional laparoscopic Roux en Y Gastric bypass to the robotic approach utilizing the omega-double-loop gastric bypass approach.

The traditional laparoscopic Roux-en-Y gastric bypass(RNY-GB) for morbid obesity is complicated by the development of internal herniation (IH) at a reported incidence of 1-5%. Robotic approaches utilize the omega-double-loop gastric bypass (ODL-GB) method that consists of raising loops of bowel to the gastric pouch and biliopancreatic limb for each respective anastomosis. The aim of this study is to evaluate the incidence of IH after transitioning from the traditional laparoscopic RNY-RB to the laparoscopic ODL-GB approach.

Roux - en - Y Gastric Bypass



Results

Statistical Analyses
Cases with less than 180 days of follow up were excluded from the study. Continuous measures were summarized using median and range. Categorical variables were summarized using frequency and percentage. Bivariate associations were assessed using Kruskal-Wallis and Fisher's Exact tests.

Table 1. Case characteristics.

	All n=145	Traditional n=94	Omega Loop n=39	Omega Loop Robotic n=12	p-value
Age					0.0135
median (range)	46 (23-78)	49 (24-78)	43 (23-64)	40 (27-56)	
Sex, % (n)					0.0919
Female	95.9 (139)	96.8 (91)	97.4 (38)	83.3 (10)	
Male	4.1 (6)	3.2 (3)	2.6 (1)	16.7 (2)	
BMI on Admission					0.4831
median (range)	44 (19-58)	45 (19-57)	44 (32-57)	43 (37-58)	
Conversion, % (n)					0.4926
No	71.7 (104)	74.5 (70)	64.1 (25)	75.0 (9)	
Yes	28.3 (41)	25.5 (24)	35.9 (14)	25.0 (3)	
LOS ≥ 7d, % (n)					0.0983
No	93.8 (136)	90.4 (85)	100.0 (39)	100.0 (12)	
Yes	6.2 (9)	9.6 (9)			
Readmission, % (n)					<.0001
No	69.0 (100)	57.4 (54)	87.2 (34)	100.0 (12)	
Yes	31.0 (45)	42.6 (40)	12.8 (5)		
Internal Hernia, % (n)					0.1868
No	91.7 (133)	88.3 (83)	97.4 (38)	100.0 (12)	
Yes	8.3 (12)	11.7 (11)	2.6 (1)		
Follow up, days					<.0001
median (range)	714 (181-1921)	925 (183-1921)	395 (191-792)	623 (181-790)	

Results

Table 2. Patient outcomes for Omega Loop versus traditional bypass.

	All n=145	Traditional n=94	Omega Loop n=51	p-value
Readmission, % (n)				<.0001
No	69.0 (100)	57.4 (54)	90.2 (46)	
Yes	31.0 (45)	42.6 (40)	9.8 (5)	
Internal Hernia, % (n)				0.0567
No	91.7 (133)	88.3 (83)	98.0 (50)	
Yes	8.3 (12)	11.7 (11)	2.0 (1)	

Conclusion

Laparoscopically inter-mesenteric spaces are created when making the Roux limb around the anastomosis increasing risk of 3 known spots for herniation: the Petersen hernia behind the gastrojejunostomy, the Brolin hernia occurring in the space between the mesentery of the biliopancreatic and roux limb at the jejunojejunostomy , and in the space at the transverse mesocolon in cases of retrocolic reconstruction.

The incidence rates of internal hernias after laparoscopic roux en y gastric bypass was up to 16% of cases. While closure of the mesenteric defects has been known to decrease rates of internal hernias as well as the antecolic approach to eliminate risk of the transverse mesocolon herniation, the risk rate remains high around 2.5 %. When using the Robotic omega-double-loop gastric bypass approach, the loops of bowel are raised up to the gastric pouch and biliopancreatic limb for each anastomosis. By bringing up the loops of bowel, the rest of the small bowel has enough space to move freely underneath the anastomosis instead of pushing through, likely resulting in decreased internal herniations.

The robotic approach to laparoscopic gastric bypass demonstrates lower complication rates and internal hernias following the ODL-GB approach when compared to the traditional RNY-GB. We aimed for further follow up to surpass the maximum time to IH of the traditional group.

References

https://hospital.uillinois.edu/primary-and-specialty-care/surgical-services/bariatric-surgery-program/our-services/roux-en-y-gastric-bypass-rygb
https://www.worldobesity.org/resources/resource-library/world-obesity-atlas-2023.
https://link.springer.com/article/10.1007/s13679-023-00527-y
https://www.niddk.nih.gov/health-information/weight-management/bariatric-surgery/potential-candidates
https://pubmed.ncbi.nlm.nih.gov/25562267/
https://hospital.uillinois.edu/primary-and-specialty-care/surgical-services/bariatric-surgery-program/our-services/roux-en-y-gastric-bypass-rygb
https://radiopaedia.org/articles/petersen-hernia-1?lang=us
https://www.oaepublish.com/articles/2574-1225.2021.136
https://link.springer.com/article/10.1007/s11695-007-9260-6
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10435621/#:~:text=However%2C%20the%20closure%20itself%20contains,%25%20of%20cases%20%5B9%5D.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8097920/