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Robotic Roux-en-Y Gastric Bypass: A Single Surgeon's Experience with 527 Consecutive Patients

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ABSTRACT

Background and Objectives: Robotic bariatric surgery is increasingly adopted by surgeons. We present the surgical results of 527 consecutive patients who underwent robotic Roux-en-Y gastric bypass (RYGB) using the standard technique.

Methods: A retrospective analysis of a prospectively maintained database was performed including 527 consecutive patients who underwent robotic RYGB between January 1, 2018 and December 31, 2021.

Results: The mean age of the patients was 41 years, with a male/female sex distribution of 143/384 (27.1%/72.9%). Type 2 diabetes in the pre-operative period was diagnosed in 31% of patients. The median pre-operative body mass index (BMI) was 44.6 kg/m^2 (range, 35–64). The mean operation time was 134 min for robotic RYGB, including the docking process. Early (< 30 days) complications included ileus (0.2%), atelectasis (0.2%), thromboembolic (0.2%) events, and surgical-site infection (0.2%). No leakage or bleeding of the gastrojejunal and jejunojejunal anastomoses were recorded. Oral food intake was begun at 1.8 days on average. The average hospital stay was 2 days. Despite a range of BMI values, operation times and gastrojejunal anastomosis times did not show significant differences. There were no significant differences in mean operation time or mean gastrojejunal anastomosis time over the years.

Conclusions: The robotic approach is effective and safe for patients undergoing RYGB. This technique provides satisfactory results with short-term surgical outcomes. However, the real benefits of robotic RYGB should be further evaluated by well-conducted randomized trials. Even in difficult cases with higher BMI values, optimal operation times and similar operative efficiency can be obtained if a standard operation technique is applied.

Key Words: Robotic surgery, Roux-en-Y gastric bypass, Operative outcomes.

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INTRODUCTION

Bariatric surgery has been performed for the treatment of morbid obesity for more than 50 years. However, bariatric surgery has become more widely applied in the past 20 years, as technological advances in minimally invasive surgery and surgeons' experiences in performing laparoscopic surgery have increased. In recent years, all bariatric surgical procedures using laparoscopic methods have been performed effectively and safely. Among these surgical procedures, Roux-en-Y gastric bypass (RYGB) has both restriction and malabsorption mechanisms, and is considered the gold standard by many surgeons.[1] The average results of RYGB are quite successful in terms of weight loss success and reduction of comorbidities such as type 2 diabetes mellitus (T2DM), hypertension, and sleep apnea caused by morbid obesity.[2] Nevertheless, RYGB surgery with conventional laparoscopic equipment is a technically difficult procedure in obese patients with deep intra-abdominal cavities and large amounts of subcutaneous adipose tissue.[3] Three-dimensional imaging, the decrease in the sense of depth, and the advanced movement capability of robotic instruments make robotic technology an effective method in RYGB surgery. Between January 1, 2015 and December 31, 2018 years, 8.2% of bariatric surgical procedures performed in the U.S. utilized a robotic method.[4] Although this rate is low compared to that of laparoscopic bariatric surgery, the use of robotic equipment has increased exponentially, doubling each year's previous number of instances over four years. A common conclusion of many articles comparing the results of laparoscopic and robotic RYGB is that the robotic method is noninferior to laparoscopy, except in terms of cost and the long operation time.[5] As a team with both basic and advanced laparoscopic observation experience, we performed our first robotic surgery at our clinic in 2011 with rectal surgery, and then we continued with other procedures. Robotic bariatric surgery was then initiated for our clinic in 2015; subsequently the majority of our bariatric surgeries utilized robotic RYGB. This research presents the surgical results of 527 consecutive patients who underwent robotic RYGB using the standard technique at our clinic.

METHODS

The study included 527 patients who underwent robotic RYGB with a standard technique performed by a single surgeon (AB) for morbid obesity between January 1, 2018 and December 31, 2021. We used the DaVinci® robotic system from Intuitive Surgical Inc. (Sunnyvale, USA) for all operations. A total of 138 patients who underwent secondary or revision RYGB surgery using the robotic method were excluded from the study. Furthermore, 114 patients with a history of open upper abdominal surgery who underwent cholecystectomy and hiatal hernia repair during robotic RYGB surgery were also excluded from the study. All patients had a body mass index (BMI) of $> 40\,kg/m^2$ or had a BMI of $> 35\,kg/m^2$, together with at least one comorbid condition triggered by obesity, such as hypertension, hyperlipidemia, T2DM, sleep apnea, and degenerative joint disease. The patients attempted to lose weight with conser-vative methods for at least 6 months before the operation. Detailed information about the surgery was provided to all patients, who provided consent prior to bariatric surgery. Smokers were categorized into three groups according to the exact number of cigarettes smoked per day: light smokers (1–5 cigarettes/day), moderate smokers (6–10 cigarettes/day), heavy smokers (11–20 cigarettes/day). We strictly recommend cessation 4 weeks before the operation to all smokers. For heavy smokers, we recommend intense pre-operative smoking cessation programs including pharmacological interventions 8 weeks before the surgery. During pre-operative anesthesiology evaluation, patients screened for obstructive sleep apnea (OSA) and Stop-Bang Questionnaire is used.[6] Intestinal preparation and subcutaneous enoxaparin treatment at a dose of 4,000 international units (IU) (40 mg)/00.4 mL were administered among the hospitalized patients the day before the surgery.

Surgical Method

A Foley catheter was placed in patients after induction. A sequential compression device was used in all patients for prophylaxis against venous thromboembolism. Carbon dioxide insufflation was performed with a Veress needle through a 2-cm incision above the umbilicus with patients in the supine position. Intra-abdominal pressure was set to 12 mm Hg on average during the operation. After the Veress needle was withdrawn and a 12-mm-diameter long robotic was inserted through this incision into the abdomen, a 12-mm-diameter robotic camera was advanced through this trocar into the abdomen. A total of three robotic trocars, each 8-mm-diameter long, were advanced to the abdomen under image guidance, with one of them in the right upper abdominal quadrant and two in the left upper abdominal quadrant. A 12-mm assistant port was placed on the left of the camera trocar. The Nathanson retractor for the retraction of the left hepatic lobe was advanced into the abdomen through the path formed with a 5-mm-diameter robotic trocar placed from the xiphoid; after appropriate retraction was achieved, it was fixed from the outside of the abdomen (**Figure 1**). Before docking, the patients were placed in a 20-degree reverse Trendelenburg position. After the docking procedure, the fenestrated bipolar forceps from the right upper quadrant, the ProGrasp™ forceps from the left most lateral upper quadrant, and the harmonic ace from the medial trocar were advanced into the abdomen (**Figure 2**). In addition to the three instruments utilized in all surgeries, a total of four robot instruments (Intuitive Surgical Inc.), including a large needle driver, were used. We used The Signia™

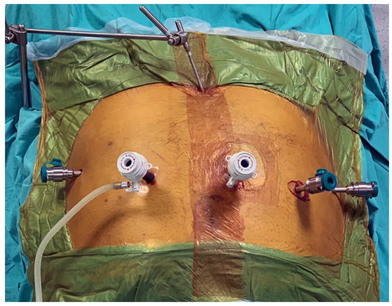

Figure 1. Placement of trocars and liver retractor.

Figure 2. Postdocking robotic instruments placed on the abdomen.

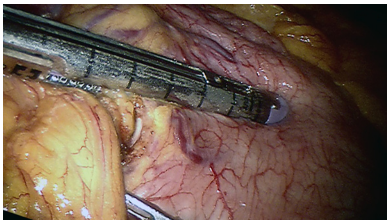

Figure 3. Application of the first stapler horizontally for the gastric pouch.

stapling system with Tri-Staple™ purple load (Medtronic, Minneapolis, USA) device as stapler. All stapler procedures (stomach and jejunum stages) were performed by inserting the 12-mm-diameter assistant port. The robotic arms did not change during the use of the stapler.

The operation began with the dissection of the fat pad located on the left lateral aspect of the gastroesophageal junction. Following this, dissection of the lesser curvature of the stomach was started 4 cm distal to the esophagogastric junction. While the left traction of the stomach was provided by the ProGrasp™ forceps in the third arm in this region, traction on the lesser omentum was provided by the fenestrated bipolar on the second arm. A window was created using the harmonic ace device, and the lesser sac was reached. A 60-mm linear stapler was placed from the opening of the orificium with the tip slightly inclined down and horizontally and fired (**Figure 3**). Then, the second 60-mm linear stapler was placed vertically; at this stage, the 36-degree calibration tube was advanced toward the gastric pouch. The first vertical incision was made by firing the staples from the lateral side of the tube (**Figure 4**). After this stage, the gastric pouch containing the tube was tractioned toward the liver with the fenestrated bipolar on the second arm, and the posterior wall of the stomach was tractioned laterally with the ProGrasp™ in the third arm. Traction was performed with a curved grasper placed through the assistant port, a window was opened behind the stomach with the harmonic

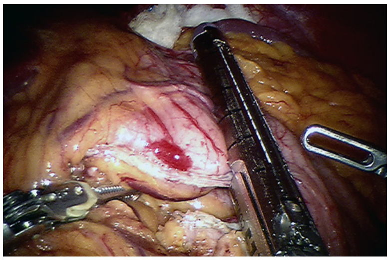

Figure 4. Second stapler is applied vertically from the lateral aspect of the calibration tube.

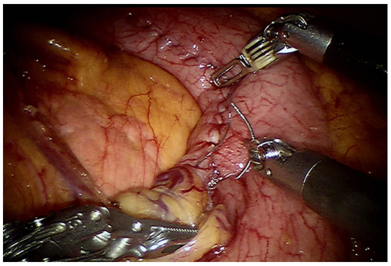

Figure 5. Seromuscular suturing of the stapler line of the remnant stomach in the lembert style.

device, and the ProGrasp™ tip was passed through the opened window with the tip pointing upward. Once the dissection was large enough for the stapler to pass through, the second vertical 60-mm stapler was fired by passing it through the dissection. After completing the pouch with a volume of approximately 30 mL, the large needle driver was taken to the arm numbered 1, ProGrasp™ to the arm numbered two, and fenestrated bipolar to the arm numbered 3, and the stapler line in the remnant stomach was passed through the seromuscular layers with V-Lock™ (Medtronic) 3-0 sutures and sutured via the Lembert technique (**Figure 5**).

After these procedures, the omentum majus was advanced cranially over the stomach, and the omentum was separated into two with the harmonic device placed on the arm numbered 1. The ligament of Treitz was revealed by hanging the transverse mesocolon anteriorly, and the jejunum was transected with a linear stapler at this distance after measuring 75 cm of the biliopancreatic limb from the ligament of Treitz (**Figure 6**). After dissection with 2–3 harmonic devices without tension in the anastomosis, the distal jejunum was brought closer to the gastric pouch in an antecolic and antegastric manner through the prepared omental split. The lower outer layer of the seromuscular style gastrojejunostomy (GJ) anastomosis was created using a 3-0 V-lock suture (**Figure 7**). A 150-cm jejunum from the gastrojejunostomy was counted as the feeding limb, and the jejunum with a 75-cm biliopancreatic limb

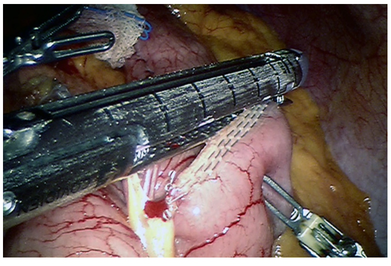

Figure 6. Transection of the jejunum at 75 centimeters from the treitz ligament with a linear stapler.

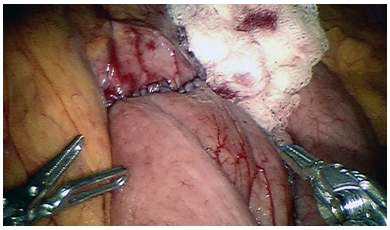

Figure 7. The lower outer layer of the Gastrojejunostomy Anastomosis was completed with 3-0 V-lock suture.

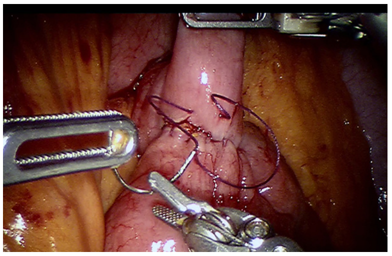

Figure 9. Closure of Jejunojejunostomy Enterotomy.

was approached with Vicryl™ (Ethicon Inc., Somerville, USA) 3-0 sling suture. At 6-cm proximal to this, orifices were opened for stapler entry into both jejunums with the harmonic device. A side-to-side jejunojejunostomy (JJ) anastomosis was established by placing a 60-mm purple linear stapler through these orifices (**Figure 8**). The enteric defect was then closed using a two-layer 3-0 Vicryl™ full-thickness running suture followed by a running Lembert suture pattern (**Figure 9**). Peterson's defects were closed in all patients with running Ethibond™ (Ethicon Inc.) 3-0 sutures. We don't closed JJ defects routinely.

For the GJ anastomosis, the gastric pouch was first perforated with a harmonic device and opened transversely at a standard size of 1.8 cm. Then, the jejunum was perforated and the same length of jejunum was prepared for anastomosis. A 30-cm V-Lock™ 3-0 suture was used to construct the GJ anastomosis. First, the pouch was taken from the left lateral corner from the outside to the inside and then from the jejunum, which came across, from the inside to the outside, and then it was fixed after passing the loop of the V-lock suture. After entering the stomach through the pouch of the stomach, the posterior wall anastomosis was completed with a full layer of continuous sutures from the stomach and then from the jejunum (**Figure 10**). The same suture was removed from the right corner of the jejunum, and an anterior wall full-thickness anastomosis stage was initiated. After constructing the full-thickness layer, one or two passes through the stomach and then through the jejunum, the 36-degree calibration tube was advanced from the stomach to the jejunum. The first layer of anterior wall anastomosis was completed by a full-thickness layer passing through the tube through the stomach and jejunum, respectively (**Figure 11**). After completing the left lateral corner of the anastomosis, the calibration tube was retracted into the stomach. The same suture was advanced from the left lateral corner to the right lateral corner by including the seromuscular layers of the stomach and jejunum. Upon reaching the right lateral corner, this suture and the suture used on the outer layer of the posterior wall were tied together to complete the double-layer robot hand-sewn GJ anastomosis (**Figure 12**). After placing a clamp 5 cm distal to the anastomosis with the fenestrated bipolar forceps, a leak test was performed by passing methylene blue through the calibration tube quickly and under pressure. A silicone drain was placed in the left subdiaphragmatic area in patients who had bleeding of ≥ 85 mL during the operation. At the end of the surgery, none of the patients in our series had bleeding at the surgical site.

Thromboembolism prophylaxis (Enoxaparin 4,000 IU (40 mg)/00.4 mL, subcutaneous) was started in all patients in the first 12 h after the operation. Compression was continued in the clinic until mobilization, and foley catheters were removed on the first postoperative day. On the second postoperative day, patients were started on clear fluids. When the amount coming from the drain

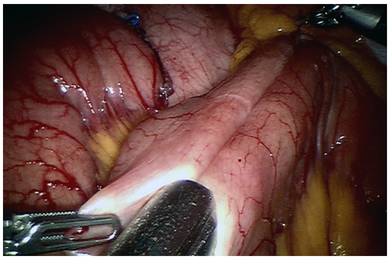

Figure 8. Latero-lateral Jejunojejunostomy Anastomosis with linear stapler.

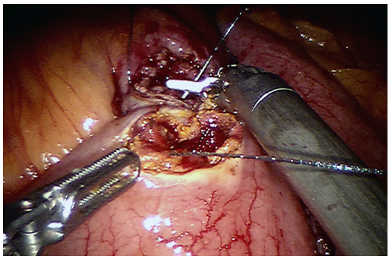

Figure 10. Full-thickness suturing of the posterior wall of the Gastrojejunostomy Anastomosis with 3-0 V-lock suture.

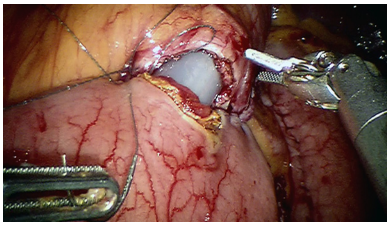

Figure 11. Full-thickness suturing of the anterior wall of the Gastrojejunostomy Anastomosis.

decreased below 50 ml/day and depending on its content, the drains were removed. All were withdrawn before discharge. All patients were discharged with dietary advice. Subcutaneous enoxaparin treatment was continued for three weeks after surgery. Nutritional support was provided to the patients for at least three months postoperatively. The patients were called in for follow-up at 1, 3, 6, 12, and 24 months after surgery, and routine blood tests were performed. The resulting vitamin and trace element deficiencies were treated with the appropriate replacement. The occurrence of comorbidities such as weight loss, T2DM, hypertension, and sleep apnea were recorded in the patients who were followed up.

Statistical Analysis

The duration of GJ anastomosis and operation times in the patients were recorded according to year (2018, 2019, and 2020) and BMI values (35–40, 40–45, 45–50, and >50 kg/m^2). Differences among groups were analyzed using the χ^2 test. Analysis items with $P < .05$ were considered statistically significant.

RESULTS

The characteristics of the 527 patients included in the analyses are presented in **Table 1**. A total of 143 patients were male (27.1%) and 384 were female (72.9%), with an average age of 41 years. The pre-operative median BMI value of the patients was 44.6 (35 – 64) kg/m^2. Thirty-two of the patients had a history of laparoscopic cholecystectomy. Forty-eight patients had a history of open lower abdominal surgery. Regarding comorbidities, 31% of the patients had T2DM, 28% had hyperlipidemia, and 26% had hypertension. Gastroesophageal reflux disease (GERD) was detected in 106 patients (20%). Eighty-six patients (16%) with high Stop-Bang score underwent continuous positive airway pressure treatment (**Table 1**). Considering the operative outcomes, the mean operation time ranged between 102 and 187 min, including docking, and the mean operation time was 134 min. The mean time taken to construct the robot hand-sewn GJ anastomosis was 16 min. While the average volume of blood lost was 45 mL, an intra-abdominal drain was placed in 136 patients. The duration of hospital stay was 2 days in 523 patients; 4 patients with complications stayed an average of 4.5 days (**Table 2**). When we evaluated the distribution of 527 patients in our study by year, we performed RYGB surgery on 183

Table 1.
Patient Characteristics

Patient Characteristics	Value (n = 527)
Sex	
Male (27.1%)	143
Female (72.9%)	384
Age, years	41 (21–67)
Body mass index, kg/m^2, Median	44.6 (35–64)
American Society of Anesthesiologists score	
II	86
III	441
History of open lower abdominal surgery	48
Comorbidity	
Type 2 diabetes mellitus	163
Hyperlipidemia	148
Hypertension	137
Reflux disease	106
Fatty liver	94
High risk of obstructive sleep apnea	86
Arrhythmia	67
Chronic lung disease	58
Depression	49
Heavy smokers (>10 cigarette/days)	44

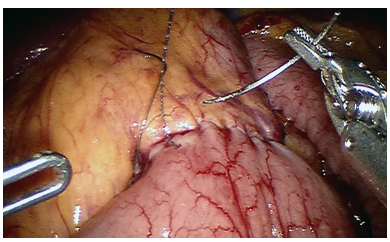

Figure 12. Final version of robot-assisted manual Gastrojejunostomy Anastomosis.

Table 2.
Perioperative Data

Operative time (Min)	134 (range, 102–187)
Gastrojejunostomy anastomosis time (min)	16 (range, 12–19)
Estimated blood loss (mL)	45 (range, 25–110)
Drain applied (number of patients)	136
Time of urinary catheter removal (days)	1
Postoperative hospital stay (days)	2

patients in 2018, 218 patients in 2019, and 126 patients in 2020. The number of patients decreased in 2020 due to the limited application of elective surgeries at our clinic due to the Covid-19 pandemic. The average values of operation times and GJ anastomosis times per year were similar (**Figure 13**). The mean operation times and GJ anastomosis times according to the BMI values of the patients are shown in **Figure 14**. Although the mean operation and GJ anastomosis times in patients with BMI > 50 kg/m^2 were higher than those in the other groups, there were no significant differences among the groups ($P > .05$). During the postoperative follow-up, none of the patients required rehospitalization in the early postoperative period. Bleeding, anastomotic leakage, and death were not observed in any of the patients in this study. In the early postoperative period, one patient developed wound infection, one patient developed ileus, one patient had pulmonary thromboembolism, and one patient developed atelectasis. In the late postoperative period, while fistula and anastomotic stenosis

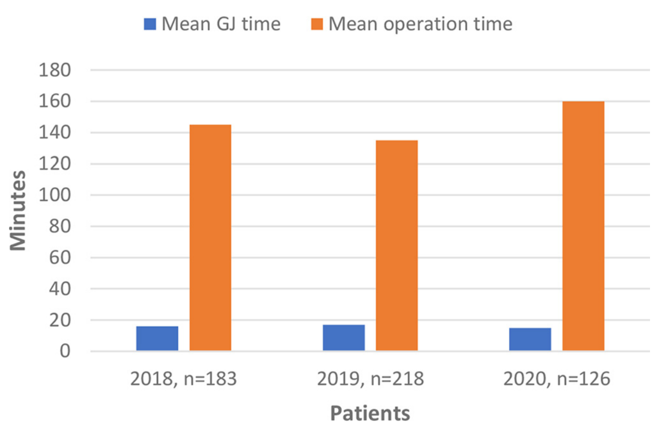

Figure 13. Distribution of average Gastrojejunostomy Anastomosis and operation times by years.

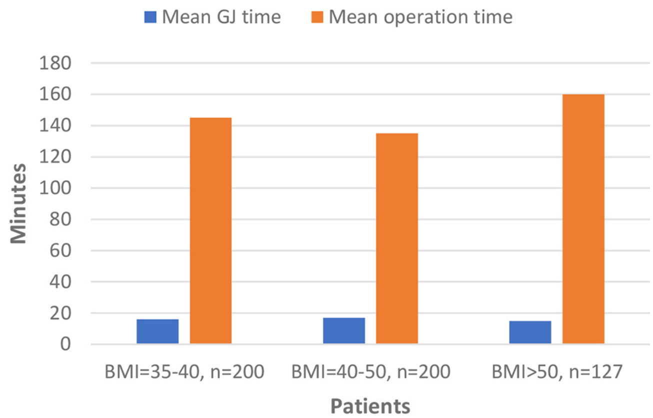

Figure 14. Distribution of mean Gastrojejunostomy Anastomosis and operation times according to body mass index values in patients.

were not observed in any patient. Two patients who were heavy smokers developed marginal ulcers and two patients developed internal hernias from Peterson's defect. Patients with marginal ulcers responded to proton pump inhibitor therapy. Two patients who developed internal herniation at 13th and 22nd months postoperatively underwent emergency surgery, and the mesenteric defects were repaired laparoscopically. All seven patients who developed symptomatic cholelithiasis underwent laparoscopic cholecystectomy. Seven months after the operation, one patient was hospitalized for B12 deficiency. The patient was treated with

Table 3.
Early and Late Complications

Early complications	
Anastomotic leakage	–
Perioperative bleeding	–
Infection events	1 patient
Atelectasis	1 patient
Thromboembolic events	1 patient
Ileus	1 patient
Death	–
Late complications	
Fistula	–
Marginal ulcer	2 patients
Anastomotic stricture	–
İnternal hernia	2 patients
Nutritional deficiency	1 patient
Cholelithiasis	7 patients
Death	–

1000 mcg/day intramuscular B12 for a week until she was asymptomatic (**Table 3**).

DISCUSSION

Although laparoscopic RYGB is a standard technique used in the surgical treatment of morbid obesity, the modern trend in bariatric surgery involves a shift in prevalence from RYGB to sleeve gastrectomy.[7] Many factors can be listed as reasons for this trend, including technical convenience, safety, cost, and the equivalent results of both surgeries. The early results of randomized controlled studies comparing sleeve and RYGB reported that there was no difference between them in terms of weight loss and comorbidity correction.[8,9] When the long-term results were evaluated, the weight loss success rate of gastric bypass surgery was superior to that of sleeve surgery.[10,11] In addition, revision surgery was performed in 14%–37% of patients after sleeve surgery, primarily due to insufficient weight loss, and secondly due to GERD.[12] The most preferred method for revision is to convert the sleeve to RYGB. However, the morbidity rate of revision surgery is higher than that of primary surgery.[13] Chuffart et al. found that de novo GERD developed in 32% of patients who underwent sleeve gastrectomy for longer than five years.[14] As a result of the First International GERD and Bariatric Surgery Consensus Meeting, it was reported that sleeve surgery is contraindicated in patients with morbid obesity and severe GERD.[15] These results reveal the importance of RYGB in the surgical treatment of morbid obesity.

Laparoscopic RYGB surgery still has some technical limitations for the surgical team.[3] The camera system is two-dimensional, and proper visualization of the surgical field depends on the capability of the camera assistant. During the procedure, many stages such as traction, dissection, suturing, aspiration, and stapler application require perfect harmony between the surgeon and the rest of the operation team. Another factor that makes this procedure difficult is the lack of reticulation capacity of conventional laparoscopic instruments in narrow spaces. Although the success of RYGB surgery in weight loss is based on both restriction and malabsorption, the restriction role is more prominent.[16] Therefore, two stages of RYGB surgery are important: constructing a gastric pouch with a volume of 20–50 mL and a GJ anastomosis with a width of 1.2–2.0 cm. The methods used in constructing the GJ anastomosis in laparoscopic RYGB surgery include stapling or manual application of this anastomosis. A linear or circular stapler is preferred. Dillemans et al., who have extensive experience in laparoscopic RYGB surgery, reported that they performed GJ anastomosis with a gap of approximately 17 mm using a 25-mm circular stapler as a standard in their cases.[17] The hand-sewn GJ anastomosis defined by Higa et al. requires advanced laparoscopic suturing capability.[18] Due to the technical limitations mentioned above, laparoscopic RYGB surgery requires a long learning curve. Contrary to popular belief, Doumouras et al. reported that approximately 500 procedures, and not 100 procedures, should be performed to achieve a reasonable morbidity rate and operation time.[19] Robotic technology, which has a 3-dimensional high-resolution camera and wrist-controlled robotic instruments with advanced ergonomic and functional capacities, is increasingly being applied in general surgery compared to previous years. Sheetz et al. reported the rates of use of robots in the field of general surgery in 73 hospitals in Michigan as 1.8% in 2012 and 15.1% in 2018.[20] The use of robotic technology in the field of bariatric surgery remains controversial. Although few studies in the literature have compared laparoscopic and robotic sleeve gastrectomy, more studies have compared laparoscopic and robotic RYGB. For example, Cahais et al. compared 169 laparoscopic RYGB patients with 82 robotic RYGB patients.[21] The researchers encountered lower complication rates among patients who underwent gastric bypass using the robotic method. Stefanidis et al. also stated that in addition to encountering fewer complications with robotic surgery, the duration of hospital stay was also lower in the robotic group.[22] However, Moon et al. found the opposite; a higher rate of leakage was observed at the pouch level in robot-assisted RYGB surgery.[23] Lundberg et al. stated in their meta-analysis that both methods were equally safe.[24] A significant number of authors who prefer the conventional laparoscopic approach compared with robotic surgery for RYGB operation mention two limitations of the robotic system. The first is the longer duration of robotic surgery compared to conventional laparoscopic surgery, and the other is the higher cost.[5,6,25,26] Bindal et al. reported that the operation time in patients who underwent robotic RYGB was 237 min in the first 100 cases and 158 min in the last 100 cases, and they pointed out that the operation times may decrease with increasing experience.[27] When we initiated robotic RYGB, we already had 5 years of experience in performing robotic surgery. The mean operation time was 134 min in our series of 527 patients, and we did not find a significant difference in operation times over the years.

Varying operation methods for robotic RYGB surgery present differences in the literature.[28,29] In the hybrid approach, the robot is used only for the GJ anastomosis, while all other stages of the surgery are performed using the laparoscopic method.[27] While a linear stapler is frequently used for JJ anastomosis in robotic RYGB, the robotic hand-sewn method is recommended for GJ anastomosis. While some surgeons use a robotic stapler, manual or automatic laparoscopic stapler technologies inserted through the assistant port are often preferred. In addition, in robotic RYGB, different robotic instruments are used, different numbers of robot arms are used, and there are different trocar distributions and sometimes different docking applications. As a result, the robotic RYGB procedure is not a standard operation performed by all surgeons in the same way. Moreover, there are differences in the methods used by the same surgeons over the years.[22,27] All of these are undoubtedly factors that can affect both operative outcomes and costs. Therefore, it is extremely important to standardize the robotic RYGB procedure. While the surgeon performs the standardized surgery, the assistant team ensures the compliance of the surgery in all steps, thus completing the surgery more effectively, safely, and in a shorter time. More importantly, the surgeon manages the operation successfully, even in complicated cases. It is known that higher BMI values in bariatric surgery negatively affect both the operation difficulty and surgical results.[30] We performed standardized robotic RYGB surgery in all 527 patients in our study. Despite the range of BMI values in our study, we did not observe a significant difference in both operation times and GJ anastomosis times. Although we investigated a large series, we did not encounter major complications or mortality in any of the patients who underwent robotic RYGB. It is particularly significant that the operations in 61 patients with a BMI $> 50\,kg/m^2$ were completed in a robotic manner with the same standard technique at appropriate times, and no major complications were observed in these patients. The present study was important in that it included a large patient group that underwent robotic RYGB surgery applied as a standard in terms of all stages of the surgery, including the number of trocars used, the stapling technique, and manual GJ anastomosis. The implications of our study were as follows:

- When compared with the literature, the operation and anastomosis times of robotic RYGB were reasonable.
- When the postoperative results of the patients were evaluated, the absence of major complications such as anastomotic leak, bleeding, and stenosis showed that the standard robotic RYGB surgery was safe.
- Despite a range of BMI values, operation times and GJ anastomosis times did not show a significant difference according to BMI.

No patients had major complications, such as anastomotic leak or bleeding, despite higher BMI values.

This study had some limitations. First, we did not perform a comparison with the patients who underwent laparoscopic RYGB. Second, the effects of our surgery on weight loss and comorbidities were not presented. In this sense, the follow-up outcomes of the patients would be recorded regularly, and the results of the third and fifth years will be shared in future publications.

CONCLUSION

The robotic RYGB procedure is an efficient and safe procedure. While obtaining an optimal operation time as a result of a standard procedure performed on all patients, similar operative efficiency can be achieved in difficult cases with higher BMI values.

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