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# Robotic single anastomosis duodenal-ileal bypass with sleeve gastrectomy (SADI-S): adverse outcomes compared to gastric sleeve and Roux-en-Y gastric bypass from a high-volume bariatric center

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**How to cite this article:** Baird E, Schreuder H, Thompson K. Robotic single anastomosis duodenal-ileal bypass with sleeve gastrectomy (SADI-S): adverse outcomes compared to gastric sleeve and Roux-en-Y gastric bypass from a high-volume bariatric center. *Mini-invasive Surg.* 2025;9:18. <https://dx.doi.org/10.20517/2574-1225.2024.104>

**Received:** 2 Dec 2024 **First Decision:** 25 Apr 2025 **Revised:** 9 May 2025 **Accepted:** 20 May 2025 **Published:** 29 May 2025

**Academic Editor:** Giulio Belli **Copy Editor:** Ting-Ting Hu **Production Editor:** Ting-Ting Hu

## Abstract

**Aim:** The single anastomosis duodenal-ileal bypass with sleeve gastrectomy (SADI-S) is the most recent procedure to be endorsed by the American Society for Metabolic and Bariatric Surgery. It is gaining popularity due to its combined restrictive and malabsorptive properties, and a single anastomosis may theoretically decrease operative time and risk of enteric leak compared to alternative options such as the biliopancreatic diversion duodenal switch or Roux-en-Y gastric bypass (RNY). However, because SADI-S has only recently been adopted, outcomes data remain limited. Here, we present our single-center adverse outcome data after incorporating the SADI-S into our bariatric practice to compare its safety profile with that of other common bariatric procedures.

**Methods:** We retrospectively analyzed the data of patients who underwent robotic-assisted laparoscopic SADI-S, vertical sleeve gastrectomy (VSG), or RNY at Saint Joseph Hospital in Denver, Colorado. Postoperative adverse events after SADI-S were compared to those following VSG and RNY, respectively. We evaluated complications occurring within a 30-day follow-up period, including superficial surgical site infection (SSI), organ space infection, deep vein thrombosis (DVT), gastrointestinal bleeding, and anastomotic staple line leak. Additionally, we assessed rates of readmission, reoperation, or any procedural intervention within 30 days postoperatively. Length of hospital stay and operative time were also compared as indirect indicators of cost and procedural efficiency.

**Results:** In this retrospective data review from January 2023 to August 2024, 35 patients underwent SADI-S, 592



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patients underwent VSG, and 200 patients underwent RNY. Compared to VSG, SADI-S demonstrated no significant difference in adverse outcomes with respect to SSI, DVT, gastrointestinal bleeding, readmission, reoperation, and interventions within 30 days. Length of stay was also similar. Compared to RNY, SADI-S also demonstrated no significant differences in adverse outcomes or length of hospital stay. Additionally, there was no significant difference in operative time. ( $P < 0.05$ ).

**Conclusion:** When compared individually to VSG and RNY, SADI-S was not associated with a higher incidence of early postoperative complications, including SSI, DVT, gastrointestinal bleeding, readmission, reoperation, or need for additional interventions within 30 days, nor with prolonged hospital stay. These findings support the safe implementation of SADI-S in a high-volume bariatric practice without an increased risk of early adverse outcomes.

**Keywords:** Bariatric surgery, gastric bypass, sleeve gastrectomy, single anastomosis duodenal-ileal bypass (SADI), biliopancreatic diversion, weight loss surgery, obesity

## INTRODUCTION

The most updated reports from the Centers for Disease Control (CDC) indicate that between August 2021 and August 2023, the prevalence of obesity in adults (defined as BMI  $\geq 30$ ) among the U.S. adults was 40.3%<sup>[1]</sup>. During this period, the prevalence of severe obesity (BMI  $\geq 40$ ) increased from 7.7% in 2013-2014 to 9.7%. Obesity is a global epidemic and a chronic disease associated with a heightened risk of hypertension, type 2 diabetes, coronary heart disease, stroke, and certain cancers. It is estimated that by 2030, more than one billion people worldwide will suffer from obesity, affecting one in five women and one in seven men<sup>[2]</sup>.

The two most commonly performed bariatric surgeries are vertical sleeve gastrectomy (VSG) and Roux-en-Y gastric bypass (RNY)<sup>[3]</sup>. While both procedures have demonstrated significant weight loss outcomes, each has notable limitations. VSG lacks a malabsorptive component, may exacerbate gastroesophageal reflux in patients with pre-existing obesity, and is prone to pouch dilation over time. RNY, on the other hand, involves two anastomoses, the creation of a mesenteric window (which carries the risk of internal hernias), and a potential for marginal ulcers. Furthermore, both procedures have been associated with the recurrence of comorbidities and weight regain over time<sup>[4]</sup>. These limitations have prompted bariatric surgeons to explore alternative techniques or develop new operations that combine the benefits of existing options.

The single anastomosis duodenal-ileal bypass with sleeve gastrectomy (SADI-S) is the most recent procedure to be endorsed by the American Society for Metabolic and Bariatric Surgery. In 2020, the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP) started reporting outcomes for SADI-S.

The SADI-S technique was first introduced clinically by Sánchez-Pernaute *et al.* in 2007. They proposed a modification of the biliopancreatic diversion in which a sleeve gastrectomy is followed by a proximal end-to-side duodeno-ileal diversion<sup>[5]</sup>, creating a 200-cm common channel-alimentary limb. This procedure is now increasingly being performed due to its combined restrictive and malabsorptive properties, achieved with only a single anastomosis. Its advantages include reduced operative time, decreased risk of enteric leaks, and the elimination of a mesenteric window - while producing weight loss outcomes comparable to those seen with other alternative options such as the biliopancreatic diversion duodenal switch (BPD-DS) or RNY. The gastric sleeve preserves the pylorus, enabling reconstruction with one single anastomosis and one loop, which eliminates the mesenteric window and the associated risk of internal hernias. The use of a single

anastomosis also decreases the risk of enteric leaks and related postoperative complications. In their initial 1- to 3-year outcome study, Sánchez-Pernaute and Torres published their favorable results, including 94.7% excess weight loss at 1 year, sustained over the following two years, and discontinuation of diabetes medications after 6 months with normalized glucose levels and hemoglobin A1c<sup>[6]</sup>.

Given the relatively recent adoption and acceptance of the SADI-S procedure, long-term outcomes data remain limited. Surgeons may be hesitant to embrace new techniques due to concerns about unexpected adverse events in their bariatric population. Additionally, new and technically complex procedures like SADI-S often involve a learning and efficiency curve. Here, we present our single-center adverse outcome data after incorporating the SADI-S into our bariatric practice, with the aim of comparing its safety profile to that of other commonly accepted bariatric procedures.

## METHODS

We conducted a retrospective cohort analysis using data from the MBSAQIP. The dataset included all VSG, RNY, and SADI-S procedures performed at Saint Joseph Hospital in Denver, Colorado, by three primary bariatric surgeons between January 2023 and August 2024. A total of 827 patients were included in the study. Patients undergoing revisional bariatric surgery were excluded. All patients followed similar pre- and postoperative Enhanced Recovery After Surgery (ERAS) protocols. Shared decision making was guided using the MBSAQIP Risk Benefit Calculator. BPD-DS was used as the analogous procedure for SADI-S. Patients with a BMI > 50, especially those with DM2, were encouraged to consider SADI-S.

We evaluated and compared the following outcomes: number of superficial incisional surgical site infections (SSIs), organ/space SSIs, venous thrombosis requiring treatment, gastrointestinal bleeding, anastomotic staple line leaks, 30-day readmission rates, reoperations within 30 days, interventions within 30 days, length of hospital stay (in days), operative time (in minutes). Statistical analysis included two-tailed *t*-tests assuming unequal variance for the qualitative data set and chi-square tests for the quantitative data, with an alpha value of 0.01 and statistical significance defined as *P* value < 0.05.

### Operative techniques

All procedures included in this analysis were performed robotically using the Da Vinci Xi system. No cases were completed laparoscopically or converted to open surgery.

VSG was performed routinely by all three surgeons with minimal to no variation. A combination of white and blue SureForm stapler loads was used to construct the sleeve.

RNY was also performed with little variation among surgeons, using the SureForm stapler with blue and white loads to form the gastric pouch. An omega loop technique was employed, with a 150 cm Roux limb positioned in an antecolic, antegastric fashion and a 75 cm biliopancreatic limb. The gastrojejunostomy was hand-sewn in two layers. The jejunojejunostomy was stapled, with the common enterotomy closed by hand. Both the mesenteric defect and Peterson's defect were closed.

For SADI-S, the procedure began with a standard sleeve gastrectomy as described above. The duodenum was then transected just distal to the pylorus and anastomosed to the ileum 300 cm proximal to the terminal ileum. The duodeno-ileal anastomosis was hand-sewn in two layers.

## RESULTS

A total of 826 patients were included in this retrospective analysis. Of these, 34 (4.1%) underwent SADI-S, 592 (72%) underwent VSG, and 200 (24%) underwent RNY. Patients in all three procedural groups were within a similar age range and predominantly female. The average BMI was significantly higher in the SADI-S group compared to the VSG group ( $48.9 \pm 8.5 \text{ kg/m}^2$  vs.  $43.9 \pm 6.8 \text{ kg/m}^2$ ;  $P < 0.05$ ) and the RNY group ( $48.9 \pm 8.5 \text{ kg/m}^2$  vs.  $43.7 \pm 6.4 \text{ kg/m}^2$ ;  $P < 0.05$ ). The groups were otherwise comparable in terms of preoperative comorbidities and characteristics, except for the prevalence of gastroesophageal reflux disease (GERD), which was significantly higher in the RNY group than in the SADI-S group (48% vs. 26.5%;  $P < 0.05$ ). [Table 1].

Postoperative complications in the SADI-S group included one case (2.9%) each of organ space infection, anastomotic leak, readmission, and intervention within 30 days - all of which occurred in the same patient. In comparison, the VSG group had two cases (0.34%) of organ space infection and one case (0.17%) of anastomotic leak. The RNY group reported no organ space infections or leaks. Readmission rates were 2.9% (17 patients) in the VSG group and 7.5% (15 patients) in the RNY group. [Table 2].

The anastomotic leak and organ space infection in the SADI-S group were diagnosed 1 week postoperatively. The patient presented to the emergency department with tachycardia, dyspnea, a new oxygen requirement, worsening upper abdominal pain, and dehydration. A computed tomography (CT) scan with intravenous and oral contrast revealed an anastomotic leak at the gastric sleeve staple line with a contained perisplenic fluid collection. This collection was managed with the placement of a 12 French pigtail catheter by interventional radiology. The patient was then treated with bowel rest, total parenteral nutrition (TPN), and intravenous antibiotics. The hospital stay during readmission lasted 14 days, after which the patient was discharged home. The drain was removed 14 days after placement, following imaging confirmation of complete resolution of both the leak and abscess. The patient completed the IV antibiotic course and was successfully weaned off TPN in the subsequent 6 weeks.

Length of stay (LOS, in days) and length of procedure (LOP, in minutes) were compared and there was no difference in LOS between VSG, RNY, and SADI-S. [Table 2].

## DISCUSSION

The SADI-S procedure represents a significant innovation in bariatric surgery, offering promising weight loss outcomes and a favorable safety profile during early adoption. However, its uptake by bariatric surgeons has been relatively slow, possibly due to perceived complexity stemming from its close association with the BPD-DS. The BPD-DS has historically been linked to longer operative times, extended hospital stays, and higher rates of anastomotic leaks compared to gastric bypass<sup>[7]</sup>. It has fallen out of favor primarily due to the failure rates, health risks, and severe nutritional deficiencies. This negative perception may discourage surgeons who are more comfortable with traditional approaches such as the VSG and RNY, both of which tend to have reliable outcomes and a relatively good safety profile. Based on our single-center experience, we would argue that SADI-S should also be accepted as a safe and effective bariatric surgery option with reliable outcomes. As adoption increases, the growing body of literature similarly supports the view that SADI-S achieves improved metabolic and weight loss outcomes with lower perioperative risks compared to other malabsorptive procedures<sup>[8,9,10]</sup>.

In this study, the adverse outcomes associated with SADI-S were largely comparable to those of VSG and RNY, except for organ space infection and staple line leak, where VSG and RNY showed statistically significant advantages. Notably, this complication in the SADI-S group was based on a single patient who,

**Table 1. Patient characteristics comparing individuals undergoing SADI-S to those receiving either the VSG or RNY**

	SADI	%	VSG	%	P-value*	RNY	%	P-value*
<i>n</i>	34		592			200		
<b>Average age</b>								
Mean +/- SD	43.8 +/- 12.5		44.3 +/- 12.1		0.8124	45.8 +/- 11.3		0.3935
<b>Average BMI</b>								
Mean +/- SD	48.9 +/- 8.5		43.9 +/- 6.8		0.0016	43.7 +/- 6.4		0.0015
Female	28	82.4%	499	84.3%	0.7629	169	84.5%	0.7518
Male	6	17.6%	93	15.7%	0.7629	31	15.5%	0.7518
Hispanic	9	26.5%	193	32.6%	0.4571	77	38.5%	0.1786
<b>ASA class</b>								
1	0	0.0%	0	0.0%		0	0.0%	
2	2	5.9%	67	11.3%	0.3249	18	9.0%	0.5485
3	26	76.5%	384	64.9%	0.1663	137	68.5%	0.3499
4	6	17.6%	141	23.8%	0.4092	45	22.5%	0.5261
5	0	0.0%	0	0.0%		0	0.0%	
Smoking	3	8.8%	46	7.8%	0.8248	19	9.5%	0.9025
<b>Diabetes</b>								
No or diet controlled	24	70.6%	430	72.6%	0.7943	138	69.0%	0.8537
Non-insulin-dependent	5	14.7%	124	20.9%	0.3815	44	22.0%	0.3341
Insulin-dependent	1	2.9%	38	6.4%	0.4148	18	9.0%	0.2318
HTN	12	35.3%	206	34.8%	0.9563	76	38.0%	0.7642
GERD	9	26.5%	135	22.8%	0.6213	96	48.0%	0.0196
OSA	18	52.9%	322	54.4%	0.8671	120	60.0%	0.439
Liver disease	5	14.7%	76	12.8%	0.7518	31	15.5%	0.9058
Hyperlipidemia	8	23.5%	116	19.6%	0.5752	48	24.0%	0.9563
History of DVT	2	5.9%	30	5.1%	0.8357	6	3.0%	0.3932
History of MI	0	0.0%	18	3.0%	0.3021	1	0.5%	0.6792

\*P-values were determined using chi-squared analysis for categorical data and *t*-test for quantitative data. *P* < 0.05 is considered statistically significant. SADI-S: Single anastomosis duodeno-ileal bypass with sleeve gastrectomy; VSG: vertical sleeve gastrectomy; RNY: Roux-en-Y gastric bypass; SD: standard deviation; BMI: body mass index; ASA: American Society of Anesthesiologists; HTN: hypertension; GERD: gastroesophageal reflux disease; OSA: obstructive sleep apnea; DVT: deep vein thrombosis; MI: myocardial infarction.

early in our adoption phase, experienced a leak from the stapled sleeve gastrectomy line, resulting in a deep space infection. This was successfully managed with percutaneous drainage and antibiotics. By contrast, the RNY group, with 200 patients, had zero deep space infections, and the VSG group reported only 2 cases out of 592 patients - both considerably more favorable compared to the 1 of 35 incidence reported in the SADI-S group. It is very likely that with increased case volume and enhanced surgical proficiency, the SADI-S leak rate will approach parity with RNY.

Operative times for SADI-S were significantly longer than for VSG, which is expected given the additional anastomotic diversion component. Therefore, this metric is unlikely to improve substantially. Nonetheless, the improved weight loss outcomes may justify the additional operative time. When compared to RNY, SADI-S showed non-inferiority, with average times of 151 min *vs.* 142 min, respectively. Anecdotally, SADI-S operative times at our institution are now comparable to, or even shorter than, those for RNY, due to increased procedural volume and improved technical efficiency. Early data include several cases in which cholecystectomy was performed concurrently, a practice we no longer follow. Furthermore, the dataset includes operations by two of our three bariatric surgeons who do not routinely perform SADI-S, possibly

**Table 2. Adverse outcomes, Length of stay and Length of procedure compared between patients undergoing SADI-S and VSG or SADI-S and RNY**

	SADI-S		VSG		P-value*	SADI-S		RNY		P-value*
	n	34	n	592		n	34	n	200	
		%		%			%		%	
Superficial incisional SSI	0	0.00%	3	0.51%	0.6775	0	0.00%	0	0.00%	1.00
Organ space SSI	1	2.94%	2	0.34%	0.0326	1	2.94%	0	0.00%	0.0151
Postop venous thrombosis requiring treatment	0	0.00%	1	0.17%	0.8113	0	0.00%	1	0.50%	0.6792
Gastrointestinal bleeding	0	0.00%	3	0.51%	0.6775	0	0.00%	4	2.00%	0.4055
Anastomotic/staple line leak	1	2.94%	1	0.17%	0.0053	1	2.94%	0	0.00%	0.0151
Readmissions within 30 days	1	2.94%	17	2.87%	0.9748	1	2.94%	15	7.50%	0.3305
Reoperations performed within 30 days	0	0.00%	7	1.18%	0.524	0	0.00%	1	0.50%	0.6792
Interventions within 30 days	1	2.94%	6	1.01%	0.0299	1	2.94%	6	3.00%	1.00
Length of stay (days)		1.38		1.23	0.1918		1.38		1.245	0.2608
Length of procedure (min)		151.85		71.78	4.06E-12		151.85		142.68	0.2732

\*P-values were determined using chi-squared analysis for categorical data and t-test for quantitative data.  $P < 0.05$  is considered statistically significant. SADI-S: Single anastomosis duodeno-ileal bypass with sleeve gastrectomy; VSG: vertical sleeve gastrectomy; RNY: Roux-en-Y gastric bypass; SSI: surgical site infection.

contributing to longer operative times due to lower technical efficiency. Given the relatively low number of SADI-S procedures, these factors can certainly influence the results. Additionally, the unequal sample sizes across groups must be considered, as they can impact the statistical power of our findings. This discrepancy primarily reflects the more recent adoption of SADI-S, currently performed by only one surgeon at our center. While appropriate statistical analyses were conducted, further follow-up will be necessary to strengthen the reliability of our conclusions as case volume increases.

This dataset does not yet include weight loss outcomes because we currently lack sufficient data points to compare SADI-S with VSG and RNY. This comparison will be possible in the future, and we anticipate that SADI-S patients will achieve greater weight loss percentages over time compared to those undergoing VSG, with outcomes comparable to those of RNY patients.

Long-term nutritional deficiencies were not addressed in this analysis. One of the primary concerns surrounding SADI-S is its hypoabsorptive mechanism, which, while effective in promoting weight loss and metabolic improvement, also raises concerns about malnutrition. This concern is partially due to its anatomic similarities to BPD-DS, which has been associated with severe malnutrition. In 2022, Sánchez-Pernaute *et al.* published their long-term SADI-S results<sup>[10]</sup> including a review of nutritional deficiencies, reporting that rates of hypoproteinemia and deficiencies in vitamin A and D, ferritin, iron, and zinc were comparable to those seen in duodenal switch<sup>[11]</sup>, classic biliopancreatic diversion<sup>[12]</sup>, and gastric bypass<sup>[13]</sup>. A 2024 retrospective study from a UK bariatric center that tracked 17 patients who underwent SADI-S over a seven-year period found that 23.5% experienced persistent diarrhea, but no cases of severe protein-energy malnutrition requiring hospitalization were reported<sup>[14]</sup>. We recommend conducting additional 5- and 10-year follow-ups in our patient cohorts to evaluate the incidence and severity of such complications.

Further studies with larger cohorts are needed to evaluate adverse events and weight loss outcomes more robustly and to assess the viability of incorporating SADI-S as a routine bariatric procedure. A randomized controlled trial would be the next logical step to validate comparative outcomes across VSG, RNY, and SADI-S, including overall weight loss, weight regain, health outcomes, and nutritional profiles.



## DECLARATIONS

### Acknowledgments

We would like to acknowledge Margaret Schrieber, MD, for her support of this project, specifically her work to obtain IRB approval from our institution.

### Authors' contributions

Made substantial contributions to the conception and design of the study and performed data analysis and interpretation: Baird E, Schreuder H, Thompson K

Data analysis and interpretation: Baird E

Conceptual design of study and review of data and manuscript: Thompson K

Data acquisition, analysis, and interpretation: Schreuder H

### Availability of data and materials

All the data and materials used in our study are available from the corresponding author upon reasonable request.

### Financial support and sponsorship

None.

### Conflicts of interest

Thompson K is a consultant for Intuitive and Medtronic and the Guest Editor of the journal *Mini-invasive Surgery*. Thompson K was not involved in any steps of editorial processing, notably including reviewers' selection, manuscript handling and decision making. The other authors declare that there are no conflicts of interest.

### Ethical approval and consent to participate

This study was conducted in accordance with ethical standards and was approved by the Intermountain Healthcare Privacy Board (IRB #1053164, Submission Reference #: 046299; approved on 11/27/2024) as a registered QA/QI project for publication. Written informed consent for participation was not applicable, as the study utilized the MBSAQIP database containing anonymized and de-identified patient information.

### Consent for publication

Not applicable.

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## REFERENCES

1. Emmerich SD, Fryar CD, Stierman B, Ogden CL. Obesity and severe obesity prevalence in adults: United States, August 2021–August 2023. *NCHS Data Brief.* 2024;508:7. DOI PubMed PMC
2. World Obesity Atlas 2022. One billion people globally estimated to be living with obesity by 2030. Available from: <https://www.worldobesity.org/resources/resource-library/world-obesity-atlas-2022>. [Last accessed on 21 May 2025].
3. Roth AE, Thornley CJ, Blackstone RP. Outcomes in bariatric and metabolic surgery: an updated 5-year review. *Curr Obes Rep.* 2020;9:380-9. DOI PubMed
4. Noria SF, Shelby RD, Atkins KD, Nguyen NT, Gadde KM. Weight regain after bariatric surgery: scope of the problem, causes, prevention, and treatment. *Curr Diab Rep.* 2023;23:31-42. DOI PubMed PMC
5. Sánchez-Pernaute A, Rubio Herrera MA, Pérez-Aguirre E, et al. Proximal duodenal-ileal end-to-side bypass with sleeve gastrectomy: proposed technique. *Obes Surg.* 2007;17:1614-8. DOI PubMed
6. Sánchez-Pernaute A, Herrera MA, Pérez-Aguirre ME, et al. Single anastomosis duodeno-ileal bypass with sleeve gastrectomy (SADI-S). One to three-year follow-up. *Obes Surg.* 2010;20:1720-6. DOI PubMed
7. Hedberg J, Sundström J, Sundbom M. Duodenal switch versus Roux-en-Y gastric bypass for morbid obesity: systematic review and

- meta-analysis of weight results, diabetes resolution and early complications in single-centre comparisons. *Obes Rev.* 2014;15:555-63. DOI PubMed
8. Verhoeff K, Mocanu V, Zalasky A, et al. Evaluation of metabolic outcomes following SADI-S: a systematic review and meta-analysis. *Obes Surg.* 2022;32:1049-63. DOI PubMed
  9. Ospina Jaramillo A, Riscanevo Bobadilla AC, Espinosa MO, et al. Clinical outcomes and complications of single anastomosis duodenal-ileal bypass with sleeve gastrectomy: a 2-year follow-up study in Bogotá, Colombia. *World J Clin Cases.* 2023;11:5035-46. DOI PubMed PMC
  10. Sánchez-Pernaute A, Herrera MÁR, Ferré NP, et al. Long-term results of single-anastomosis duodeno-ileal bypass with sleeve gastrectomy (SADI-S). *Obes Surg.* 2022;32:682-9. DOI PubMed PMC
  11. Topart P, Becouarn G, Delarue J. Weight loss and nutritional outcomes 10 years after biliopancreatic diversion with duodenal switch. *Obes Surg.* 2017;27:1645-50. DOI PubMed
  12. Scopinaro N, Adami GF, Marinari GM, et al. Biliopancreatic diversion. *World J Surg.* 1998;22:936-46. DOI PubMed
  13. Poitou Bernert C, Ciangura C, Coupaye M, Czernichow S, Bouillot JL, Basdevant A. Nutritional deficiency after gastric bypass: diagnosis, prevention and treatment. *Diabetes Metab.* 2007;33:13-24. DOI PubMed
  14. Haider MI, Kaur M, Jamal Z, et al. Outcomes of single anastomosis duodeno-ileal bypass with sleeve gastrectomy (SADI-S): a single bariatric center experience. *Cureus.* 2024;16:e76150. DOI PubMed PMC