Laparoscopic single anastomosis sleeve–jejunal bypass for the treatment of morbidly obese patients: 1-year follow-up

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Introduction
The bariatric procedure known as single anastomosis sleeve–jejunal (SASJ) bypass is relatively new. By maintaining access to the duodenum, common bile duct stones can be removed endoscopically and secure in preventing long-term nutritional issues. This research assessed the efficacy of SASJ bypass surgery in treating individuals with morbid obesity and related comorbidities.
Patients and methods
Fifty individuals with severe obesity had SASJ bypass as part of this research. At 1, 6, and 12 months, all patients were followed-up. By measuring BMI, problems, and comorbidities connected to obesity, we analyzed every patient.
Results
The participants' average age was 35.2, and their average BMI was 49.8 kg/m^2. Thirty-seven (74%) of the patients had type 2 diabetes, while 16 (32%) had hypertension. There was intraluminal bleeding in two (4%) cases, biliary gastritis in three (6%) individuals, and deep vein thrombosis in one (2%) patient. In a year, the excess weight loss reached 87%. In 91.9% of diabetes patients who had surgery, blood glucose levels returned to normal after a year. In 81.3% of hypertensive individuals, hypertension decreased.
Conclusion
Laparoscopic SASJ bypass is technically easy to perform and considered to be an efficient procedure for treating morbidly obese patients and comorbid conditions with minimal nutritional deficiency and a low incidence of complications.

Keywords:
bariatric surgery, obesity, single anastomosis sleeve–jejunal bypass

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Introduction

According to the WHO, more than 650 million people, or 13% of the world's population, are obese. Every year, obesity and its comorbidities claim at least 2.8 million lives [1]. Patients who are obese are susceptible to a number of comorbidities, including osteoarthritis, sleep apnea syndrome, dyslipidemia, type 2 diabetes mellitus (T2DM), and cardiovascular disease [2]. When it came to outcomes and costs associated with treating obesity, bariatric surgery outperformed conservative approaches [3].

The Roux-en-Y gastric bypass (RYGB), the mini-gastric bypass, and the vertical sleeve gastrectomy (SG) are typical bariatric surgeries with outstanding metabolic and bariatric results worldwide [4].

Santoro's SG with transit bipartition was modified by Santoro S, *et al.* [5] to create the single anastomosis sleeve ileal bypass (SASI), a novel bariatric procedure.

The following benefits of SASI over alternative bariatric procedures: (a) SASI is a straightforward procedure that takes less time to complete; (b) if necessary, endoscopic access to the biliary tree and duodenum is simple; (c) Since the duodenum is not split with SASI, there is no chance of duodenal stump leaking compared to single anastomosis duodeno-ileostomy (SADI), duodenal switch (DS), and duodenal-jejunal bypass; (d) The anastomosis is under very little strain; (e) There are no foreign bodies, excluded segments, or blind loops; (f) SASI is an entirely reversible procedure [6].

A SASI modification with a short biliopancreatic limb length is the single anastomosis sleeve–jejunal (SASJ) bypass. Therefore, the SASJ bypass is effective and secure in preventing long-term nutritional issues [7]. The goal of our study was to assess the SASJ bypass's effectiveness in treating morbid obesity and associated diseases.

Patients and methods

A total of 50 individuals with a diagnosis of morbid obesity had a laparoscopic SASJ bypass between November 2021 and January 2023 at Minia University hospital as part of this prospective trial.

All the patients who participated in our research gave their informed permission after being informed about the surgery and any potential risks.

Patients having a BMI of 35–40 kg/m^2 with comorbidities or greater than 40 kg/m^2 with or without comorbidities, aged 18–60 years, were included in the research.

Patients with previous bariatric surgery, major psychiatric problems, liver cirrhosis, huge anterior abdominal wall hernia, pregnant or lactating females, and alcohol abusers were excluded from the study.

Preoperative assessment

All patients had their personal, medical, surgical, and family histories thoroughly recorded. Comprehensive clinical examination, which includes a general physical with particular attention paid to body weight, height, and BMI. All patients had standard imaging procedures such as abdominal ultrasonography and echocardiography in addition to routine laboratory testing like complete blood count, liver function tests, renal function tests, coagulation profile, glycated hemoglobin (HbA1C), fasting blood sugar, lipid profile, and thyroid function tests.

Surgical technique

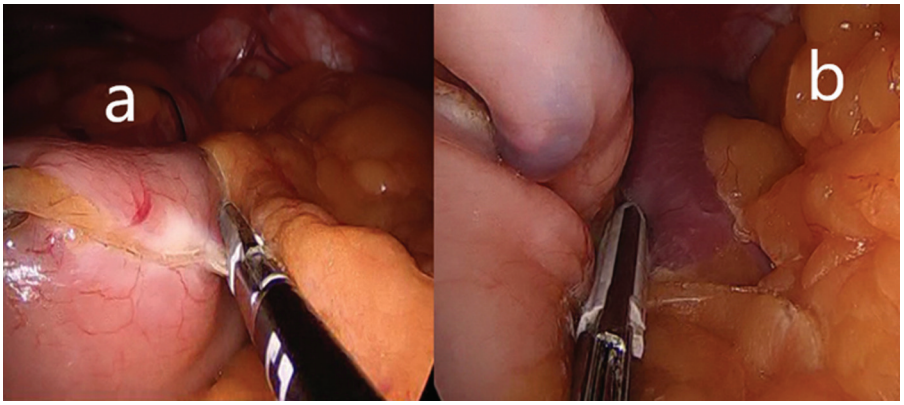
General anesthesia with endotracheal intubation was used for all patients. Third-generation cephalosporins weighing 2 g were given as preventative antibiotics during the induction of anesthesia. The surgeon stood between the patient's knees while all the patients were positioned in a steep reverse Trendelenburg posture.

The two fundamental components of SASJ are a SG and anastomosis between the sleeved stomach and the jejunum. The greater omentum was dissected from the stomach during the SG, 6 cm from the pylorus to the left crus of the diaphragm (Fig. 1). If there were any posterior gastric adhesions to the pancreas, these were dissected. To ensure a correct sleeve, a 38-Fr bougie was placed in the stomach as a reference. Stapling was done with a linear cutting stapler (Ethicon Endosurgery, Johnson and Johnson, GUAYNABO, Puerto Rico, USA) starting 6 cm from the pylorus and going all the way to the Hiss angle (Fig. 2). After identifying the duodenojejunal junction, a loop of jejunum measuring 200 cm was measured, and then linear cutting staplers (Ethicon Endosurgery, Johnson and Johnson) were used to create an antecolic isoperistaltic side-to-side anastomosis between the antrum of the stomach and the jejunum (Fig. 3). A single layer running suture was used to close the gastro–jejunal anastomosis defect, and a methylene blue test was used to determine if leaking had occurred. For 24 h, a drain was kept in place.

Postoperative care

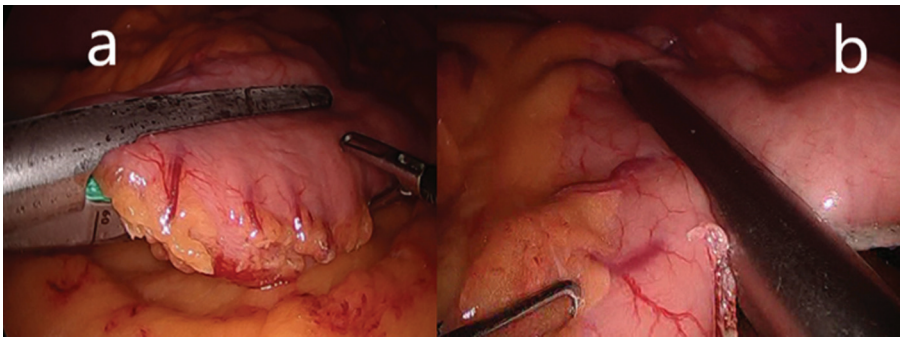
Patients were transferred from the operating room to the ICU or the intermediate care unit according to patient's condition. Patients were advised to ambulate as soon as possible after surgery. Patients were allowed clear fluids 6–24 h postoperatively according to their tolerance. Patients were discharged 2–3 days after the operation according to the postoperative course. Thrombosis prophylaxis in the form of daily

Figure 1



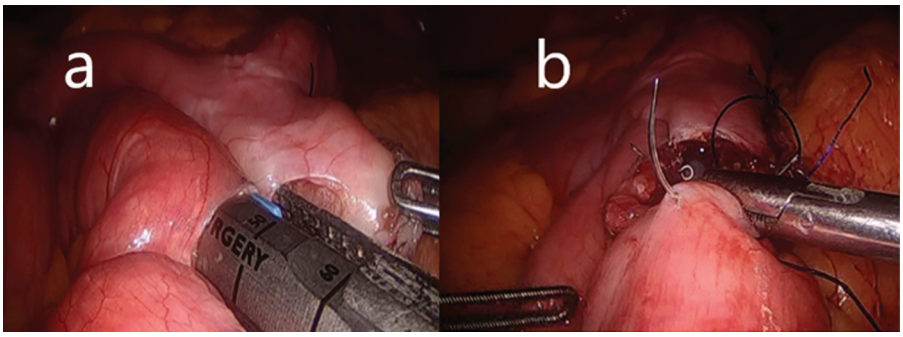
Division of the greater omentum from the greater curvature of the stomach (a), control of short gastric vessels (b).

Figure 2



The creation of a gastric sleeve 6 cm from the pylorus using linear cutting staplers (a, b).

Figure 3



Antecolic side-to-side sleeve ileal anastomosis (a), Closure of the enterotomy using 3/0 prolene suture (b).

subcutaneous injection of enoxaparin which was continued for 14 days, proton pump inhibitors was administrated for 3 months postoperative.

Study outcomes

The primary outcomes of the study were as follows [8]: the percentage of

$$\text{TWL} = \frac{\text{Preoperative weight}-\text{follow up weight}}{\text{Preoperative weight}} \times 100,$$

the percentage of

$$\text{EWL} = \frac{\text{Preoperative weight}-\text{follow up weight}}{\text{Preoperative weight}-\text{ideal weight}} \times 100$$

A fasting plasma glucose level of less than 100 mg/dl or an HbA1C level of less than 6% without the use of oral hypoglycemic medications or insulin was considered to be a complete remission of T2DM. A partial improvement in T2DM was defined as a decrease of at least 25% in fasting plasma glucose and at least 1% in the HbA1C level with the use of hypoglycemic medications.

The impact of the procedure on additional comorbidities and postoperative complications were secondary outcomes [8]. If the patient's blood pressure was under control and was normotensive (blood pressure 120/80), the condition was regarded to be in remission. A normal lipid profile without the use of drugs was used to define hyperlipidemia remission. When gastroesophageal reflux disease (GERD) symptoms, such as regurgitation and retrosternal chest discomfort, are gone and medication is stopped, the condition is said to be in remission. Postoperative complications include leakage, port-site infection, port-site hernia, bleeding, biliary reflux, and nutritional deficiencies.

Follow-up

The patients included in the study were followed up in the outpatient clinic. During the first month after the operation patients were seen every week and then every 3 months during the first year. In addition to detecting postoperative complications, body weight, and blood pressure are evaluated at every visit.

The patients were prescribed oral multivitamin supplements once daily. Also, vitamin B and vitamin D were given every month through intramuscular injections.

Follow-up laboratory investigations in the form of HbA1C, fasting blood sugar, complete blood count, serum vitamin D, and serum calcium, and serum proteins were done for every patient every 3 months.

Statistical analysis

Statistical analysis was done using IBM SPSS Statistics version 25 (Armonk, NY: IBM Corp). Numerical data will be expressed as mean and standard deviation or median and range as appropriate. Qualitative data will be expressed as frequency and percentage. A *P* value less than 0.05 will be considered significant.

Ethical approval

This research was performed at the Department of General Surgery, Minia University Hospitals. Ethical Committee approval and written, informed consent were obtained from all participants.

Results

Preoperative data

A total of 50 cases were included in this study. Regarding their demographics, the mean age of the studied cases was 35.2 years (range, 19–60 years). Patients were 36 (72%) females and 14 (28%) males. The mean preoperative BMI was 49.8 kg/m^2. As for comorbidities, 37 (74%) patients had diabetes mellitus, 16 (32%) had hypertension (HTN), 10 (20%) had osteoarthritis and 12 (24%) had obstructive sleep apnea. (Table 1).

Short-term effect of single anastomosis sleeve–jejunal bypass on BMI and comorbidities

The percentage of total weight loss and percentage of excess weight loss (EWL) reached 44 and 87%, respectively, in 1 year (Table 2). All of the HbA1C

Table 1 Preoperative characteristics of patients

Variables	Descriptive statistics (*N*=50)
Age	
Range	19–64
Mean±SD	35.2±11.1
Sex [*n* (%)]	
Male	14 (28)
Female	36 (72)
Comorbidity [*n* (%)]	
DM	37 (74)
HTN	16 (32)
OA	10 (20)
OSA	12 (24)
Hyperlipidemia [*n* (%)]	18 (36)
GORD	4 (8)
Preoperative weight (kg)	
Range	95–198
Mean±SD	140±25.7
Height (cm)	
Range	152–188
Mean±SD	167.8±10.6
Preoperative BMI	
Range	37.1–79.3
Mean±SD	49.8±8.3

DM, diabetes mellitus; GORD, gastro-esophageal reflux disease; HTN, hypertension; OA, osteoarthritis; OSA, obstructive sleep apnea.

Table 2 Follow-up percentage of excess weight loss and total weight loss

	Postoperative 6 months *N*=50	Postoperative 12 months *N*=50	*P* value
Excess weight loss			
Range	35.6–77.3	62.1–97.3	<0.001
Mean±SD	58.2±11	87±8.8	
Total body weight loss			
Range	18.9–38.9	30.5–60.2	<0.001*
Mean±SD	29.1±4.9	44±7.1	

*Statistically significant.

Table 3 Follow-up glycated hemoglobin and fasting blood sugar

	Preoperative *N*=37	Postoperative 1 month *N*=37	Postoperative 6 months *N*=37	Postoperative 12 months *N*=37	*P* value
HbA1C					
Range	6.7–12.4	5.3–9.1	4.8–8.8	4.7–9	<0.001
Mean±SD	8±1.1	6.6±0.9	5.6±1	5.2±0.8	
FBS					
Range	117–230	78–200	80–205	75–170	<0.001
Mean±SD	152.9±25	96.6±20.6	93.1±20.9	90.3±16.5	
P value between each two time					
Preoperative		<0.001*	<0.001	<0.001*	
Postoperative 1 month			<0.001*	<0.001*	
Postoperative 6 months				<0.001*	

FBS, fasting blood sugar; HbA1C, glycated hemoglobin. *Statistically significant.

readings obtained at follow-up visits following surgery were considerably lower than those obtained prior to surgery (Table 3). After a year of follow-up, 91.9% of patients experienced full remission from T2DM. Improvement was made in two (5.4%) cases, nevertheless. The failure occurred on just one (2.7%) occasion. (Table 4). All patients also had improvements in their levels of HTN, hyperlipidemia, and obstructive sleep apnea. Three out of four individuals who had GERD before surgery saw an improvement (Table 5).

Complications

Regarding postoperative complications, there was no leakage in any of our patients. Two (4%) patients had intraluminal bleeding, one (2%) patient developed deep vein thrombosis, two (4%) cases had port-site infections, three (6%) cases had biliary vomiting, and one (2%) case developed a port-site hernia (Table 6).

Discussion

The ideal bariatric operation has to be risk-free, technically simple, and successful in reducing weight and curing comorbidities [9].

Choosing the best bariatric surgery might be difficult nowadays since there are so many options available [10].

Although SG is often carried out in many bariatric centers, it is less successful in patients who are extremely obese, have a high rate of postoperative esophageal reflux, and are likely to result in weight gain over the long term [11].

The most successful bariatric surgery for treating morbid obesity is laproscopic RYGB, although it is technically difficult and has major perioperative risks. Compared with RYGB, one-anastomosis gastric bypass (OAGB) is simpler and has better long-term outcomes, although it is also linked to nutritional and vitamin deficiencies [12].

Another significant concern is that in the cases of RYGB, OAGB, and SADI, typical transoral endoscopic retrograde cholangiopancreatography (ERCP) access to the biliary tree is not feasible. Other methods for gaining access to the biliary tree include laparoscopic trans-cystic common bile duct exploration, balloon enteroscopic ERCP, laparoscopic trans-gastric ERCP, laparoscopic choledochoduodeonoscopy, and endoscopic ultrasound-guided transhepatic ERCP. However, the likelihood of success is low, and the risk of complications is high [13].

On the other hand, In SASJ bypass biliary tree can be assessed by traditional transoral ERCP or radiological examination as neither the stomach nor the duodenum is bypassed [10].

This study aimed to evaluate the short-term outcomes of SASJ in morbidly obese patients. 50 patients were included in this study, all patients completed 1 year of follow-up, 37 (74%) cases were complaining of DM and 16 (32%) cases were hypertensive patients.

According to our statistics, the total weight loss was 44% and the EWL, after a year of follow-up, was about 87%. This agrees with Sewefy and colleagues findings, who found an 85% EWL with SASJ bypass [14]. This was greater than the average %EWL after a SG (56%) or after an RYGB (68%) at a year's follow-up, but lower than the %EWL for SADI, which varied from 91 to 95%. In addition, the reported %EWL following SASI bypass at 12 months postoperatively ranged from 68 to 90% [14]. Our results were lower than Mansey *et al.* [15] %EWL (92.13%), but higher than Elrefai *et al.* [16] %EWL (77.61%).

Regarding HbA1C, all the readings measured postoperatively at follow-up visits were significantly lower than the preoperative levels ($P<0.0001$).

Table 4 The effect of single anastomosis sleeve–jejunal bypass on diabetes mellitus

	n (%)
DM complete remission	34 (91)
DM partial remission	2 (5.4)
Failure	1 (2.7)

DM, diabetes mellitus.

Table 5 The effect of single anastomosis sleeve–jejunal bypass on other comorbidities

	Preoperative number	1 year postoperative	Percentage of improvement (%)	*P* value
HTN	16	0	100	<0.001
OSA	11	0	100	<0.001
Hyperlipidemia	18	0	100	<0.001
GERD	4	1	75	<0.001

HTN, hypertension; GERD, gastroesophageal reflux disease; OSA, obstructive sleep apnea.

Table 6 Postoperative complications

Variables	Descriptive statistics (*N*=50) [*n* (%)]
DVT	1 (2)
Port-site infection	2 (4)
Biliary vomiting	3 (6)
Port-site hernia	1 (2)
Intraluminal bleeding	2 (4)

DVT, deep vein thrombosis.

Mansey *et al*. [15] observed a significant decrease in glycosylated hemoglobin levels following the SASI procedure ($P<0.001$), which decreased from 8.23% before the operation down to 5.72% at the 12-month follow-up.

T2DM complete remission occurred in 91.9% of patients after a 1-year follow-up, whereas improvement was achieved in two (5.4%) cases failure was encountered in one (2.7%) case.

In their study, Sewefy *et al*. [17] observed remission of T2DM in 98.5% of cases. Their results are superior to ours, which could be interpreted by the large sample size (1986 cases) and long follow-up period (6 years).

Furthermore, Sayadishahraki *et al*. [18] findings's that all patients who had SASJ demonstrated improved diabetes mellitus throughout the 6-month follow-up and stopped using insulin treatment were consistent with this.

In addition, Mahdy *et al*. [6] examined SASI bypass, which uses the same fundamental idea as SASJ, in 61 type 2 diabetic patients. For a full year, all patients were followed-up. The findings showed that all patients' diabetes resolved during the first month following surgery. Except for five patients, who were required to gradually stop using their hypoglycemic drugs and insulin after 3 months.

These outcomes are also better than those seen following a SG (72–81.6%) [19]. After the SASJ bypass, T2DM remission was primarily brought about by a number of reasons. (a) Low-calorie intake as a result of the procedure's restrictive elements (the SG); (b) delivering quickly undigested food through the sleeve–jejunal anastomosis stimulates the distal intestine; (c) A modest amount of food traveling through the duodenum inhibits the proximal gut [6].

In our study, more than 80% of hypertensive patients showed improvement.

Sewefy *et al*. [14] reported HTN remission in 89% of hypertensive patients.

While in a study that was done by Khalaf and Hamed [9] resolution of HTN was reported in 23.2% of hypertensive cases, whereas improvement was reported in the remaining cases.Mansey *et al*. [15] confirmed the efficacy of SASJ in managing obesity-associated HTN. Out of the seven cases with obesity and HTN, five cases showed resolution while the remaining 2 cases showed improvement during the one-year follow-up.

In our research, hyperlipidemic patients experienced a 100% remission rate, compared to 65, 42, 62.3, and 96% for SASI, sleeve, RYGB, and mini-gastric bypass (MGB), respectively. In this trial, 100% of patients with sleep apnea syndrome had improvement, compared to 59, 45.8, 44.2, and 90% with SASI, sleeve, RYGB, and MGB, respectively. In comparison to 92, 25, 60.4, and 92% for SASI, sleeve, RYGB, and MGB, respectively, GERD improved in 75% of patients [20,21].

After the SASJ bypass, the majority of morbidities were modest. Biliary gastritis was the most prevalent complication following the SASI bypass. Biliary gastritis occurred in three patients, and all three were treated nonsurgically with proton pump inhibitors and antiemetics. Patients having a single anastomosis between the gastric pouch and the intestine tend to have bile reflux more frequently. In addition, it has been noted to happen following RYGB and the OAGB [22].

Two (4%) patients had intraluminal bleeding and managed with fresh frozen plasma and blood transfusion, one (2%) patient developeddeep vein thrombosis and managed with therapeutic clexane, two (4%) cases had port-site infections and managed with drainage, antibiotics, and repeated dressing, and one (2%) case developed port-site hernia which was managed by laparoscopic reduction of the viable intestinal content, and closure of the defect with a fascial closure system. In addition, no instances of leakage, anemia, hypocalcemia, or hypoalbuminemia were found in the data we gathered. A previous recent study also negated the occurrence of leakage following SASJ (0%) [14] and this agreed with our findings. However, Khalil *et al*. [23] reported that leakage was encountered in two (7.69%) cases in the SASJ group.

Sewefy and Saleh [14] noticed bleeding in two (1.3%) instances. Gastric leaks occurred in one (0.7%) patient. Biliary gastritis was seen in five (3.3%) instances.

Conclusion

Technically simple to carry out, laparoscopic SASJ bypass is regarded as a safe and effective treatment for morbid obesity and concomitant diseases with little nutritional deficit and a low incidence of complications.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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