Research Square

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Single-Center Experience with SASI Bypass: Three-Year Outcomes and Technical Evolution

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Abstract

Purpose

To evaluate the feasibility, safety, and metabolic outcomes of the Single Anastomosis Sleeve Ileal (SASI) bypass in patients undergoing primary metabolic and bariatric surgery at our institution, expanding upon previous data.

Methods

A retrospective cohort study was conducted including patients who underwent SASI bypass as a primary procedure. Primary outcomes included %EWL and remission rates of T2DM, hypertension, dyslipidemia, and other obesity-related diseases. Complications were classified using the Clavien–Dindo system. Surgical technique modifications were analyzed for their impact on outcomes. A subset of patients was followed for more than three years, allowing mid-term outcome evaluation.

Results

Mean %EWL was 84.0 ± 31.1%. Remission rates for T2DM, hypertension, and dyslipidemia were 78.3%, 89.1%, and 85.6%, respectively. GERD symptoms improved in all affected patients, with 57.9% achieving complete remission. The overall complication rate was 13.1%, with a 3.6% reoperation rate, and most adverse events occurred early in the study period. Technical modifications, including reduction of anastomosis size and adjustment of limb length, were associated with lower %EWL but decreased complication rates.

Conclusions

SASI bypass is a safe and effective metabolic procedure, achieving weight loss and diabetes remission outcomes comparable to other bariatric techniques, with emerging evidence of GERD improvement. Anastomosis size (≤ 2.5–3 cm) and alimentary limb length (≈ 3–3.5 m) are key factors in balancing efficacy and nutritional risk. Further studies are needed to define the optimal configuration and long-term outcomes.

Introduction

Since the introduction of metabolic and bariatric surgery in the 1950s, continuous refinements have sought an optimal balance between efficacy, safety, and accessibility.

The single anastomosis sleeve ileal (SASI) bypass is an emerging hybrid bariatric procedure that combines sleeve gastrectomy with loop bipartition. Initially introduced by Mui in 2014 [1] and later

emphasized by Mahdi in 2016 [2], it incorporates key elements of both OAGB and SADI-S, aiming to balance restriction and metabolic effects. The procedure preserves endoscopic access to the duodenum and is technically simpler than duodenal-switch–based operations, as it avoids duodenal division. Its metabolic effects result from early exposure of the terminal ileum to gastric contents, stimulating incretin hormones such as glucagon-like peptide-1 (GLP-1) and peptide YY (PYY), thereby promoting functional rather than mechanical restriction and improving glucose homeostasis and appetite regulation [3].

Despite encouraging early results, long-term data on SASI bypass remain limited. This study evaluates its feasibility and metabolic outcomes at our institution, contributing to the growing evidence supporting its role in obesity and metabolic disease management.

Methods

This retrospective study included patients undergoing SASI bypass as a primary bariatric procedure. Ethical approval was obtained from the regional ethics committee, and written informed consent was secured from all participants.

Eligible patients were 18–65 years old. All followed a preoperative diet for 5–30 days and were evaluated by internal medicine and psychology to confirm surgical suitability. Postoperatively, patients received proton pump inhibitors for 2 months to prevent ulceration or gastritis, along with daily multivitamin supplementation and isolated protein intake as part of standard care.

During the initial study phase (first 83 patients), indications for SASI bypass included frequent consumption of sweets or snacks, mild to moderate gastroesophageal reflux, and adult-onset type 2 diabetes mellitus (T2DM). Subsequently, selection criteria were refined, and SASI bypass was recommended exclusively for patients with moderate to severe reflux, adult-onset T2DM following comprehensive evaluation, or those who specifically requested this procedure.

Follow-up data include the original cohort of 83 patients previously reported by Romero et al. [4] and an additional 85 patients, yielding a total of 168 patients included in the analysis.

Definitions and Clinical Criteria

Percentage of excess weight loss (%EWL) was calculated using an ideal body weight corresponding to a BMI of 25 kg/m². Prediabetes was defined as fasting plasma glucose between 100 and 125 mg/dL in patients not meeting diagnostic criteria for diabetes.

Diabetes and prediabetes remission were defined according to American Diabetes Association criteria [5] as HbA1c < 6.0% and fasting blood glucose < 100 mg/dL, indicating normalization of glucose metabolism. Improvement in diabetes or prediabetes was defined as reductions in fasting glucose and/or HbA1c levels and/or decreased medication requirements.

Hypertension (HBP) remission was defined as achieving blood pressure values below established thresholds with complete discontinuation of antihypertensive therapy. Improvement was defined as a reduction in dosage or number of antihypertensive medications and/or a decrease in systolic or diastolic blood pressure.

Dyslipidemia remission was defined as normalization of lipid profile without pharmacological treatment. Improvement was defined as a reduction in at least one lipid parameter (triglycerides, LDL, or VLDL) or an increase in HDL, even in the absence of complete normalization.

Chronic knee pain was documented by a positive response to the question “Do you experience knee pain?” Remission was defined as a negative response at follow-up, while persistent but reduced pain was classified as improvement.

Obstructive sleep apnea (OSA) was identified in patients classified as “high probability” using the STOP questionnaire [6]. Remission was defined as reclassification to “low probability,” and improvement as transition to “moderate probability.”

Gastroesophageal reflux disease (GERD) was classified as mild–moderate when patients reported typical symptoms or proton pump inhibitor (PPI) use 1–4 days per week, and severe when PPI use was ≥ 5 days per week. Remission was defined as absence of medication use, while improvement was defined as symptom reduction with occasional medication use.

Data Analysis

Continuous variables are reported as means ± standard deviations and ranges, and categorical variables as percentages. Follow-up was calculated from the date of surgery and categorized as < 12 months, 12–23 months, 24–35 months, and ≥ 36 months. Data were obtained from the medical records of patients attending scheduled follow-up visits. For patients with limited adherence to in-person follow-up, additional information was collected through telephone and video consultations, during which a comprehensive clinical assessment and review of available studies were performed, comparable to in-person evaluations. Only patients with available follow-up data were included in the analysis.

Surgical Technique

The surgical technique was based on the method previously described by Romero et al. (2021) (Fig. 1), with standardized steps and subsequent technical refinements. Sleeve gastrectomy was performed over a 38-Fr bougie, beginning 5–6 cm proximal to the pylorus. The staple line was reinforced with a continuous non-absorbable oversewing suture. The gastroileal anastomosis was constructed on the anterior aspect of the antrum using a linear stapler (tri-stapler cartridge), and the enterotomy was closed with a single-layer running absorbable suture. Starting from case 39, Petersen’s defect was routinely closed with a running non-absorbable suture.

Beginning with case 84, three technical modifications were implemented. First, alimentary limb length was individualized according to body mass index (BMI). Initially, a fixed 300-cm alimentary limb was measured from the ileocecal valve. From case 84 onward, limb length was adjusted to 300 cm for patients with BMI > 35 kg/m² and 350 cm for those with BMI between 30 and 35 kg/m², measured from the ileocecal valve. Second, the gastroileal anastomotic diameter was reduced from 45 mm to 25–30 mm. Third, routine pneumatic leak testing was discontinued; instead, a meticulous intraoperative macroscopic assessment of the anastomosis, bowel loops, and overall tension was performed before completion of the procedure.

Results

A total of 220 SASI procedures were scheduled: 168 (76.4%) primary, 48 (21.8%) revisions, and 4 (1.8%) converted to sleeve gastrectomy due to adhesions or technical difficulties. Only the 168 primary cases were included in the analysis.

Of these patients, 103 (61.3%) were female. Mean age was 40.9 ± 8.3 years (range 18–66), and mean body mass index (BMI) was 41.2 ± 7.0 kg/m² (range 30.1–73.5). Mean operative time was 110.2 ± 28.4 minutes (range 60–210), and mean hospital stay was 1.6 ± 0.5 days (range 1–4).

Mean percentage of excess weight loss (%EWL) was 84.0 ± 31.1% (range 7.2–216.1%). Demographics and %EWL by follow-up duration are shown in Table 1. Obesity-related diseases and remission rates are summarized in Table 2, with diabetes-specific outcomes detailed in Table 3.

Table 1
Baseline and Follow-Up Patient Characteristics

Variable	Initial (n = 168)	< 12 months (n = 44)	12–23 months (n = 59)	24–35 months (n = 26)	≥ 36 months (n = 39)
Follow-up (months)	23.0 ± 18.4 (0–80)	6.5 ± 7.7 (0–11)	13.7 ± 18.5 (12–22)	27.9 ± 18.7 (24–35)	52.2 ± 19.8 (36–80)
Number of patients	168	44 (26.2%)	59 (35.1%)	26 (15.5%)	39 (23.2%)
Female, n (%)	103 (61.3%)	25 (24.3%)	33 (32.0%)	18 (17.5%)	27 (26.2%)
Age (years)	40.9 ± 8.3 (18–66)	42.3 ± 8.6 (20–66)	40.0 ± 8.4 (18–62)	40.7 ± 8.2 (29–52)	40.6 ± 8.0 (24–52)
Weight (kg)	112.3 ± 22.1 (75.0–172.0)	113.8 ± 22.7 (79.1–172.0)	115.9 ± 22.3 (76.0–167.8)	110.4 ± 22.4 (82.7–158.6)	105.2 ± 21.2 (75.0–160.0)
Initial BMI (kg/m²)	41.2 ± 7.0 (30.1–73.5)	40.8 ± 7.6 (30.1–73.5)	42.1 ± 7.1 (30.4–62.2)	41.7 ± 7.2 (30.5–56.9)	40.1 ± 6.5 (30.4–52.6)
Hemoglobin (gr/dl)	14.4 ± 1.3 (11.6–19.2)	12.3 ± 1.6 (9.4–16.2)	12.4 ± 1.7 (9.2–18.2)	11.3 ± 1.7 (9.0-14.5)	12.1 ± 1.8 (9.4-15-4)
Albumin (gr/dl)	4.3 ± 0.4 (3.4–5.2)	3.9 ± 0.4 (3.3-5-0)	4.0 ± 0.4 (2.8–5.1)	3.9 ± 0.4 (3.4–4.7)	3.9 ± 0.4 (3.4-5-2)
Mild Hypoalbuminemia (3.0–3.4 gr/dl)	3 (1.7%)	3 (6.8%)	2 (3.4%)	0	4 (10.2%)
Moderate and Severe Hypoalbuminemia (≤ 2.9 gr/dl)	0	1 (2.3%)	0	0	0
Weight at follow-up (kg)	–	86.1 ± 17.4 (55.1–130.0)	75.6 ± 16.3 (49.0–123.0)	70.3 ± 16.1 (39.8–102.5)	72.6 ± 13.7 (58.0–128.0)
BMI at follow-up (kg/m²)	–	30.8 ± 5.0 (19.2–40.4)	27.5 ± 4.7 (19.4–38.4)	26.1 ± 4.6 (17.7–36.3)	27.2 ± 3.8 (22.9–37.0)
Points of BMI loss	–	10.0 ± 7.2 (0.8–47.8)	14.6 ± 6.8 (4.9–26.1)	15.6 ± 6.9 (1.8–30.8)	13.0 ± 6.3 (1.2–26.9)
%EWL	–	66.0 ± 34.2 (7.2–183.1)	91.7 ± 30.6 (27.9–169.6)	93.1 ± 30.4 (32.7–139.4)	86.4 ± 27.1 (21.2–136.0)
Surgical time (min)	110.2 ± 28.4 (60–	106.4 ± 18.9 (90–	104.7 ± 28.6 (90–	101.6 ± 27.9 (60–	115.8 ± 34.0 (65–

Note: %EWL = percentage of excess weight loss.

Variable	Initial (n = 168)	< 12 months (n = 44)	12–23 months (n = 59)	24–35 months (n = 26)	≥ 36 months (n = 39)
	270)	180)	210)	170)	270)
Hospital length of stay (days)	1.6 ± 0.5 (1–4)	1.2 ± 0.5 (1–2)	1.7 ± 0.5 (1–4)	1.7 ± 0.5 (1–2)	2.0 ± 0.1 (2–3)
Note: %EWL = percentage of excess weight loss.					

Table 2
Comorbidities Remission Rates by Follow-Up Period

Comorbidities	Total n (%)	< 12 m (n, %)	12–23 m (n, %)	24–35 m (n, %)	≥ 36 m (n, %)
T2DM	83 (49.4%)	14 (16.9%), 57.1%	28 (33.7%), 82.1%	14 (16.9%), 85.7%	27 (32.5%), 81.5% r
Prediabetes	20 (11.9%)	4 (20.0%), 100%	11 (55.0%), 100%	0	5 (25.0%), 100%
Hypertension	74 (44.0%)	21 (28.4%), 95.2%	27 (36.5%), 88.9%	8 (10.8%), 87.5%	18 (24.3%), 83.3%
Dyslipidemia	146 (86.9%)	31 (21.2%), 96.7%	56 (38.4%), 87.5%	20 (13.7%), 80.0%	39 (26.7%), 76.9%
CKP	84 (50.0%)	15 (17.9%), 6.7%	33 (39.2%), 9.0%	15 (17.9%), 6.7%	21 (25.0%), 4.8%
OSA	92 (54.8%)	16 (17.4%), 87.5%	36 (39.1%), 88.9%	14 (15.2%), 100%	26 (28.3%), 84.6%
Reflux	19 (11.3%)	9 (47.4%), 55.6%	6 (31.6%), 83.9%	0	4 (21.0%), 25.0%
Hypothyroidism	29 (17.2%)	4 (13.7%)	11 (38.0%)	2 (6.9%)	12 (41.4%)
Smoking	35 (20.8%)	7 (20.0%)	14 (40.0%)	8 (22.9%)	6 (17.1%)
PAS	68 (40.5%)	21 (30.9%)	27 (39.7%)	6 (8.8%)	14 (20.6%)

Table 3
Diabetes-Specific Outcomes

Variable	Initial (n = 83)	< 12 months	12–23 months	24–35 months	≥ 36 months
Diagnosis time (years)	5.0 ± 4.3 (0–20)	5.3 ± 4.3 (0–13)	5.9 ± 4.4 (0–16)	5.4 ± 4.5 (0.2–20)	3.8 ± 4.3 (0–13)
Fasting glucose (mg/dL)	192.7 ± 76.7 (82.4–391.0)	190.6 ± 65.8	199.0 ± 77.1	220.5 ± 75.8	174.3 ± 79.0
C-peptide (ng/mL)	2.8 ± 0.9 (0.7–7.5)	2.7 ± 1.1	2.7 ± 0.9	2.8 ± 0.8	2.8 ± 0.4
Use of oral medications, n (%)	76 (91.6%)	14 (18.4%)	24 (31.6%)	14 (18.4%)	24 (31.6%)
Use of insulin, n (%)	16 (19.3%)	2 (12.4%)	5 (31.3%)	4 (25.0%)	5 (31.3%)
Diabetes remission, n (%)	65 (78.3%)	8 (12.3%)	23 (35.4%)	12 (18.5%)	22 (33.8%)
Diabetes improvement, n (%)	18 (21.7%)	6 (33.3%)	5 (27.8%)	2 (11.1%)	5 (27.8%)

Concomitant procedures were performed in 35 patients (20.8%). The most frequent was hiatal hernia repair (28 cases, 80%), followed by adhesiolysis (5 cases, 14.2%), lipoma resection (1 case, 2.9%), and umbilical plasty (1 case, 2.9%). Among the 19 patients who met criteria for reflux, 6 (31.5%) had a hiatal hernia, whereas among the remaining 149 patients without reflux, 18 (12.0%) had a hiatal hernia. This difference was statistically significant, with a higher prevalence of hiatal hernia in the reflux group ($p = 0.023$). All identified hiatal hernias were repaired using an anterior approach.

Comparison between early and later cohorts (Table 4) showed significant differences in mean %EWL (89.0 ± 26.6 vs. 79.4 ± 34.2; $p = 0.042$) and complication rates (76.5% vs. 23.5%; $p = 0.021$), with no difference in T2DM remission (77.6% vs. 80.0%; $p = 0.478$).

Table 4
Comparison Between the First 83 and Second 85 Cases

Variable	First 83 Cases	Second 85 Cases	p-value
Age (years)	40.1 ± 8 (18–62)	41.6 ± 8.6 (20–66)	0.249
Female, n (%)	50 (29.8%)	53 (31.5%)	0.338
BMI (kg/m²)	40.5 ± 5.4 (30.1–59.4)	41.3 ± 6.8 (30.4–73.5)	0.567
%EWL	89.0 ± 26.6 (21.2–139.4)	79.4 ± 34.2 (7.2–216.9)	*0.042
T2DM, n (%)	58 (34.5%)	25 (14.9%)	*0.011
T2DM remission, n (%)	45 (77.6%)	20 (80.0%)	0.478
Hemoglobin (gr/dl)	12.1 ± 1.7 (9.0-18.2)	12.2 ± 1.6 (9.4–16.2)	0.134
Albumin (mg/dl)	3.9 ± 0.4 (3.3–5.1)	4.0 ± 0.4 (2.8–5.2)	0.265
Mild Hypoalbuminemia (3.0–3.4 gr/dl)	6 (7.2%)	3 (3.5%)	0.311
Moderate and Severe Hypoalbumineamia (≤ 2.9 gr/dl)	0	1 (1.1%)	0.467
Complications, n (%)	15 (8.9%)	7 (4.2%)	*0.021
*Statistically significant			

Complications and Adverse Effects

Postoperative complications (Table 5) were assessed throughout the follow-up period while patients remained under active surveillance at our center. Complications were classified according to the Clavien–Dindo system and analyzed according to two cohorts: the first cohort (83 patients) and the second cohort (85 patients). Overall, 22 complications (13.1%) were observed among 168 patients, including 6 cases (3.6%) classified as Clavien–Dindo IIIb requiring surgical reintervention. The first cohort presented 15 complications (8.9%), whereas the second cohort had 7 complications (4.1%), showing a non-significant trend toward reduction in the second cohort (p = 0.09). No mortality was observed during the follow-up period.

Table 5
Postoperative Complications Classified by Clavien–Dindo

Clavien Dindo Classification	First Cohort (83 patients)	Second Cohort (85 patients)
I – 8 (4.8%)	• Intravenous hydration – 2 • Wound infection – 2	• Intravenous hydration – 1 • Moderate hypoalbuminemia – 1
II – 8 (4.8%)	• Moderate hypoalbuminemia – 1 • Severe anemia – 1 • Oral intolerance – 1 • Achalasia – 1 • Biliary gastritis – 1	• Postoperative bleeding – 1 • Partial sleeve stenosis – 1
IIIb – 6 (3.5%)	• Refractory moderate hypoalbuminemia requiring anastomosis takedown – 4 • Petersen internal hernia – 1 • Twisting of the gastroileal anastomosis	
Total: 22 (13.1%)	15 (8.9%)	7 (4.2%)
Moderate hypoalbuminemia: 2.5 to 2.9 gr/dl		

In the first cohort, 4 patients (2.4%) experienced Clavien–Dindo I complications. Two patients required intravenous hydration within the first two postoperative months, and two patients (1.2%) developed wound infections requiring bedside incision within two weeks. Five Clavien–Dindo II complications were observed. One patient developed moderate hypoalbuminemia (albumin 2.5–3.0 g/dL) and anemia at 6 months, which was managed with parenteral nutrition and transfusion, with full recovery. One patient (0.6%) presented severe anemia at 11 months due to iron deficiency and hypermenorrhea, requiring transfusion. One patient (0.6%) developed oral intolerance at two months requiring diagnostic endoscopy, which was normal, with subsequent spontaneous resolution of symptoms. One patient (0.6%) was diagnosed with achalasia at three months, confirmed by manometry and treated with balloon dilatation. One patient (0.6%) developed biliary gastritis at two months, diagnosed by endoscopy and managed medically. Six Clavien–Dindo IIIb complications were recorded. Four patients developed refractory moderate hypoalbuminemia (2.5–3.0 g/dL) requiring surgical takedown of the anastomosis, occurring at 8 months, 10 months in two related patients, and 2 years, respectively. All cases initially presented with weakness and mild lower extremity edema and were managed conservatively prior to surgical intervention. Anastomosis reversal resulted in prompt normalization of albumin levels in all cases. All procedures were successfully performed laparoscopically following preoperative nutritional optimization with parenteral support. One patient (0.6%) developed Petersen's internal hernia at two

weeks, requiring surgical repair; routine closure of Petersen's defect was implemented thereafter. One patient (0.6%) developed twisting of the gastroileal anastomosis at three weeks, requiring reoperation.

In the second cohort, 4 patients experienced Clavien–Dindo I complications. One patient required intravenous hydration during the first postoperative month, while three patients developed moderate hypoalbuminemia (2.5–3.0 g/dL) between 9 and 18 months, which was managed conservatively with dietary optimization and close follow-up, without the need for parenteral nutrition.

Three Clavien–Dindo II complications were observed. Two patients (1.2%) developed postoperative bleeding within the first 24 hours, requiring red blood cell transfusion, pharmacologic management with etamsylate, absolute bed rest, and prolonged hospital stay. One patient (0.6%) developed partial sleeve stenosis within two weeks, associated with biliary reflux and severe esophagitis, requiring three sessions of balloon dilatation.

Long-term adverse effects not classified as complications included mild hypoalbuminemia (3.0–3.4 g/dL) in 9 patients (5.4%), diarrhea affecting quality of life in 7 patients (4.2%), foul-smelling stools in 1 patient (0.6%), and increased fatigue in 8 patients (4.8%). Additionally, 2 patients (1.2%) required cholecystectomy at 8 and 12 months postoperatively.

Discussion

The pursuit of an ideal bariatric procedure—one that is safe, technically reproducible, and capable of achieving durable weight loss with effective remission of obesity-related comorbidities—remains a central challenge in metabolic surgery. The Santoro technique [7, 8] established the conceptual foundation for bipartition procedures; however, the single-anastomosis sleeve ileal (SASI) bypass has gained increasing attention as a simplified and physiologically appealing evolution of this concept.

A principal advantage of SASI bypass is the preservation of physiological alimentary flow while simultaneously diverting a portion of nutrient transit to stimulate GLP-1 and FGF-19 secretion, thereby enhancing metabolic effects. When combined with sleeve gastrectomy, ghrelin production is further reduced, in contrast to procedures that preserve a nonfunctional gastric remnant [9]. By preserving gastric vasculature, SASI may reduce the risk of anastomotic ischemia compared with pouch-based procedures [10], while uniquely maintaining endoscopic access to the duodenum and biliary tract.

At our center, SASI bypass was initially introduced as an alternative to one-anastomosis gastric bypass (OAGB) and Roux-en-Y gastric bypass (RYGB), with the aim of combining technical simplicity with metabolic efficacy. Early experience highlighted not only its feasibility but also the preservation of pyloric function, offering an additional physiological pathway for gastric emptying.

The present study builds upon this initial experience, providing a comprehensive analysis of 168 primary SASI bypass procedures performed by a single surgeon at a single center, including the original cohort of 83 patients, and contributes to the growing body of evidence supporting this evolving technique.

The primary outcome was %EWL, which averaged 84% in our cohort, consistent with our previous report (85.6% at one year) and with a review by Oliveira reporting a mean %EWL of 87.1% at one year [11]. Peak %EWL reached 93.1% between 24 and 35 months postoperatively, comparable to the 96.7% reported by Khalaf [12]. After 36 months, a slight decline was observed (86.4%), consistent with Hoseini's report of 80.6% at three years [13]. Data on SASI bypass beyond three years remain limited. In comparison, a meta-analysis by Magouliotis reported %EWL at two years ranging from 57% to 87% for RYGB and from 64% to 104% for OAGB [14], while SADI-S has shown %EWL between 61% and 91% at one year [15]. Overall, these findings suggest that SASI bypass achieves weight loss outcomes comparable to, or exceeding, those of established bariatric procedures.

T2DM remission was 78.3%. Patients with < 12 months of follow-up showed lower remission rates (57.1%), reducing the overall percentage. Remission increased after 12 months, peaking at 85.7% between 24 and 35 months, coinciding with maximal %EWL. All patients not meeting full remission criteria demonstrated significant improvement, confirming the metabolic effectiveness of SASI bypass at mid- to long-term follow-up. Cross-study comparisons remain limited by heterogeneity in remission definitions. Emily et al. reported a 95.8% improvement rate after SASI bypass [16], consistent with our findings, while Mahdy reported 83.9% diabetes remission, 15.4% partial improvement, and only 0.7% without benefit [17]. For other malabsorptive procedures, including OAGB and RYGB, diabetes remission rates range from 56% to 95% depending on follow-up duration, patient characteristics, and remission criteria [18–19]. Although direct comparisons should be interpreted cautiously, SASI bypass appears at least comparable to other bariatric procedures.

At our center, SASI bypass was initially reserved for patients with mild to moderate gastroesophageal reflux disease (GERD) and later extended to those with more severe symptoms. Nineteen patients with GERD (11.3%) were evaluated, with remission rates of 83.9% at 12–23 months, decreasing to 25% after 36 months; however, all patients reported symptomatic improvement. Oliveira reported GERD improvement/remission rates of 75–100% at 12 months [9]. These findings suggest that SASI bypass improves GERD through mechanisms similar to OAGB, including reduced gastric acid production, enhanced gastric emptying, and decreased gastric stasis.

Other diseases showed favorable outcomes. Hypertension (HBP) remission averaged 89.1%, with early remission in 95% within 12 months and sustained remission of 83.3% at three years. Oliveira reported a mean remission/improvement rate of 75.8%, while Hosseini [13] and Emili [20] reported 80% and 51%, respectively. Dyslipidemia remission reached 96.7% in patients with < 12 months of follow-up and remained between 76.9% and 88% beyond one year, comparable to Hosseini [13] (100%) and Emili [20] (76.6%). Obstructive sleep apnea (OSA) remission ranged from 85% to 100%, similar to Oliveira [11] (median 89.3%) and Hosseini [13] (100%); however, variable remission definitions warrant cautious interpretation. Chronic knee pain showed complete remission in 5–9% of cases, although all patients reported symptomatic improvement; this outcome has been infrequently reported after SASI bypass.

The surgical technique in this series followed established protocols for sleeve construction and gastroileal anastomosis. Mean operative time was 110.2 minutes, comparable to the 111.3 minutes reported by Emili. Operative times reported for other bariatric procedures vary widely: OAGB (35–147 minutes), RYGB (88–205 minutes) [12], and SADI-S (68–152 minutes) [13]. During the study period, technical modifications were introduced, including reduction of anastomosis diameter (from 45 mm to < 30 mm) and adjustment of alimentary limb length (350 cm for patients with BMI 30–35 kg/m²) after the first 83 patients, allowing internal comparison. Greater %EWL was observed with a 300-cm limb and a 45-mm anastomosis, whereas lower %EWL occurred with longer limbs and smaller anastomoses, a logical finding given increased absorptive surface and reduced anastomotic diameter. No significant differences in diabetes remission were observed, possibly due to the limited number of diabetic patients. These findings are consistent with Ataya et al. [21], who reported improved weight loss with a 250-cm common limb and an anastomosis diameter > 3 cm, and with Hosseini et al. [13], who also demonstrated greater weight loss with larger anastomotic diameters and improved hypertension control associated with longer biliopancreatic limbs, potentially mediated by ghrelin and GLP-1.

Comparison between the early (n = 83) and later (n = 85) cohorts revealed comparable operative times (116.9 vs. 104.2 minutes), indicating that procedural standardization did not substantially impact surgical efficiency. However, the overall complication rate (13.1%) was disproportionately driven by the early cohort, particularly Clavien–Dindo IIIb events requiring reintervention. This pattern strongly reflects the influence of the learning curve, where preventable technical factors—such as the absence of routine mesenteric defect closure leading to Petersen's hernia, and suboptimal configuration of the gastroileal anastomosis resulting in twisting—played a decisive role.

Importantly, not all complications were technical. A considerable proportion were nutritional and, therefore, intrinsically linked to procedural design rather than execution. The technical refinements adopted in the later cohort—namely elongation of the alimentary limb and reduction of the anastomotic diameter—resulted in a marked decrease in hypoalbuminemia and the need for surgical reversal. However, this improvement in safety was accompanied by a measurable trade-off in weight loss efficacy, underscoring a fundamental balance between metabolic potency and nutritional risk that remains unresolved in SASI bypass.

We believe that this effect may be driven, to a greater extent, by the size of the gastroileal anastomosis rather than the length of the alimentary limb. In SASI bypass, total small bowel length is not routinely measured, as also reported by several surgeons performing this procedure. When comparing mean albumin levels and the overall incidence of hypoalbuminemia between cohorts, no statistically significant differences were observed, suggesting that the majority of patients may not be substantially affected by anastomotic size alone. However, in selected individuals, it is conceivable that a disproportionate amount of alimentary flow is diverted preferentially through the ileal limb, effectively bypassing the pyloric pathway. Although this remains a theoretical consideration, current SASI configurations do not allow for objective quantification of nutrient distribution between the duodenal and

ileal routes, representing an important limitation in understanding the mechanistic basis of nutritional complications.

These findings align with the long-term data reported by Mahdi et al. [22], who demonstrated superior nutritional outcomes and lower reversal rates with longer limb lengths (3.5 m) and narrower anastomoses (2.5 cm), compared to shorter limbs and wider anastomoses. Our own evolution—from a 3 m limb with a 4.5 cm anastomosis to a 3–3.5 m limb with a 2.5–3 cm anastomosis—mirrors this paradigm shift, suggesting that procedural calibration is critical to optimize outcomes.

Although biliary reflux remains a theoretical concern in loop-based configurations, its clinical impact in this series was limited, with only one case of biliary gastritis managed conservatively. Reports of conversion to Roux-en-Y gastric bypass remain anecdotal [12], but the absence of robust long-term comparative data precludes definitive conclusions.

This study has several limitations that should be acknowledged. First, its retrospective design and the absence of a control group limit the strength of causal inferences. Additionally, there was a degree of loss to follow-up, particularly beyond the first postoperative year, which may affect the interpretation of mid-term outcomes. Heterogeneity in the definitions of metabolic remission across studies further limits comparability with existing literature. Furthermore, although our results suggest favorable outcomes, SASI bypass should still be considered an investigational procedure, and its long-term durability and safety profile remain to be clearly established. Another important limitation is the assessment of gastroesophageal reflux disease (GERD), which in our study was based primarily on clinical parameters rather than objective diagnostic methods such as endoscopy, histology, or pH impedance monitoring. This may have influenced both the diagnosis and reported remission rates of GERD.

Similarly, other outcomes such as obstructive sleep apnea and knee pain were evaluated based on clinical criteria without confirmatory diagnostic studies, which may limit the accuracy of these findings. Finally, a proportion of patients were followed up via telemedicine consultations. While this approach allowed continued patient monitoring, the lack of in-person physical examination may have influenced the accuracy of clinical assessment. These limitations should be considered when interpreting the results of this study

In conclusion, the findings of this study support SASI bypass as a promising and adaptable metabolic procedure. Overall, SASI achieves weight loss and diabetes remission outcomes that are comparable or potentially superior to other established bariatric techniques, with emerging evidence suggesting improvement in postoperative GERD [23]. Its complication profile further supports its role as a viable primary metabolic procedure.

However, the nutritional impact of SASI remains an area requiring further investigation. Technical factors —particularly alimentary limb length and anastomosis size—appear to play a critical role in balancing efficacy and safety. Our findings suggest that favoring an anastomosis ≤ 2.5–3 cm and an alimentary

limb of approximately 3 to 3.5 meters may reduce nutritional complications, albeit with a potential trade-off of slightly reduced weight loss efficacy.

A deeper understanding of the functional distribution of nutrient flow between both limbs of the bipartition is essential to optimize outcomes and refine patient selection. Further studies are needed to better define this balance and strengthen the evidence supporting this evolving technique.

Declarations

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Ethical Approval: Approved by the ethical committee.

Author Contribution

- Rey Jesus Romero: Drafted the complete manuscript, critically revised the entire manuscript for important intellectual content, and approved the final version to be published.- Mariana Cabral-Nunes Ravell: Drafted the introduction and discussion sections, performed the literature review, critically revised the manuscript for important intellectual content, and approved the final version.- Susana Aguirre-Paez: Drafted the methods and results sections, analyzed the data, prepared the tables, and approved the final version.- Raquel Colorado-Subizar: Analyzed the data, prepared the tables, contributed to the methods and results sections, and approved the final version.- Violeta Madrigal-Lopez: Managed the manuscript submission process, critically revised the manuscript and tables, contributed to the discussion section, and approved the final version.

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References

1. - Mui WL, Lee DW, Lam KK (2014) Laparoscopic sleeve gastrectomy with loop bipartition: A novel metabolic operation in treating obese type II diabetes mellitus. Int J Surg Case Rep 5(2):56–58
2. - Mahdy T, Al Wahedi A, Schou C (2016) Efficacy of single anastomosis sleeve ileal (SASI) bypass for type-2 diabetic morbid obese patients: Gastric bipartition, a novel metabolic surgery procedure: A retrospective cohort study. Int J Surg 34:28–34

3. - Santoro S (2020) The bipartition may be better, and not just for super obesity. Surg Obes Relat Dis 16(8):e49–e50
4. - Romero RJ, Colorado-Subizar R, De Uriarte-Lorente M et al (2021) Single Anastomosis Sleeve Ileal Bypass (SASI Bypass): Short-Term Outcomes and Concerns. Obes Surg 31(5):2339–2343
5. - Riddle MC, Cefalu WT, Evans PH et al (2021) Consensus Report: Definition and Interpretation of Remission in Type 2 Diabetes. Diabetes Care 44(10):2438–2444
6. - Chung F, Yegneswaran B, Liao P et al (2008) STOP questionnaire: a tool to screen patients for obstructive sleep apnea. Anesthesiology 108(5):812–821
7. - Santoro S, Velhote MC, Malzoni CE et al (2006) Preliminary results from digestive adaptation: a new surgical proposal for treating obesity, based on physiology and evolution. Sao Paulo Med J 124(4):192–197
8. - Santoro S, Castro LC, Velhote MC et al (2012) Sleeve gastrectomy with transit bipartition: a potent intervention for metabolic syndrome and obesity. Ann Surg 256(1):104–110
9. - Kalinowski P, Paluszkiewicz R, Wróblewski T et al (2017) Ghrelin, leptin, and glycemic control after sleeve gastrectomy versus roux-en-Ygastric bypass-results of a randomized clinical trial. Surg Obes Relat Dis 13(2):181–188
10. - Baker RS, Foote J, Kemmeter P et al (2004) The science of stapling and leaks. Obes Surg 14:1290–1298
11. - Oliveira CR, Santos-Sousa H, Costa MP et al (2024) Efficiency and safety of single anastomosis sleeve ileal (SASI) bypass in the treatment of obesity and associated comorbidities: a systematic review and meta-analysis. Langenbecks Arch Surg 18(1):221
12. - Khalaf M, Hamed H (2021) Single-anastomosis sleeve ileal (SASI) bypass: hopes and concerns after a two-year follow-up. Obes Surg 31(2):667–674
13. - Hosseini SV, Moeinvaziri N, Medhati P et al (2022) The effect of single-anastomosis sleeve ileal (SASI) bypass on patients with severe obesity in three consecutive years. World J Surg 46(11):2744–2750
14. - Magouliotis DE, Tasiopoulou VS, Tzovaras G (2019) One Anastomosis Gastric Bypass Versus Roux-en-Y Gastric Bypass for Morbid Obesity: an Updated Meta-Analysis. Obes Surg 29(9):2721–2730
15. - Spinos D, Skarentzos K, Esagian SM et al (2021) The Effectiveness of Single-Anastomosis Duodenoileal Bypass with Sleeve Gastrectomy/One Anastomosis Duodenal Switch (SADI-S/OADS): an Updated Systematic Review. Obes Surg 31(4):1790–1800
16. - Emile SH, Madyan A, Mahdy T et al (2021) Single anastomosis sleeve ileal (SASI) bypass versus sleeve gastrectomy: a case-matched multicenter study. Surg Endosc 35(2):652–660
17. - Mahdy T, Emile SH, Madyan A et al (2020) Evaluation of the Efficacy of Single Anastomosis Sleeve Ileal (SASI) Bypass for Patients with Morbid Obesity: a Multicenter Study. Obes Surg 30(3):837–845
18. - Eskandaros MS, Abbass A, Ebeid EF et al (2022) Remission of Type II Diabetes Mellitus 1-Year Postoperative Following One Anastomosis Gastric Bypass in Correlation with ABCD, DiaRem, and

DRS Scores. Obes Surg 32(2):450–456

19. - Balasubaramaniam V, Pouwels S (2023) Remission of Type 2 Diabetes Mellitus (T2DM) after Sleeve Gastrectomy (SG), One-Anastomosis Gastric Bypass (OAGB), and Roux-en-Y Gastric Bypass (RYGB): A Systematic Review. Medicina (Kaunas) 19;59(5):985
20. - Emile SH, Mahdy T, Schou C et al (2021) Systematic review of the outcome of single-anastomosis sleeve ileal (SASI) bypass in treatment of morbid obesity with proportion meta-analysis of improvement in diabetes mellitus. Int J Surg 92:106024
21. - Ataya K, Patel N, Aljaafreh A et al (20214) Global Obesity Collaborative. Outcomes of Single Anastomosis Sleeve Ileal (SASI) Bypass as an Alternative Procedure in Treating Obesity: An Updated Systematic Review and Meta-Analysis. Obes Surg 34(9):3285-97
22. - Hamed H, Tarek M, Gado W et al (2026) Ten-Year Outcomes of Single-Anastomosis Sleeve Ileal (SASI) Bypass: Surgical Configuration Determines Long-Term Efficacy and Safety. Obes Surg 36(3):960–970
23. - Mahdy T, Emile SH, Alwahedi Al et al (2021) Roux-en-Y gastric bypass with long biliopancreatic limb compared to single anastomosis sleeve ileal (SASI) bypass in treatment of morbid obesity. Obes Surg 31(8):3615–3622

Figures

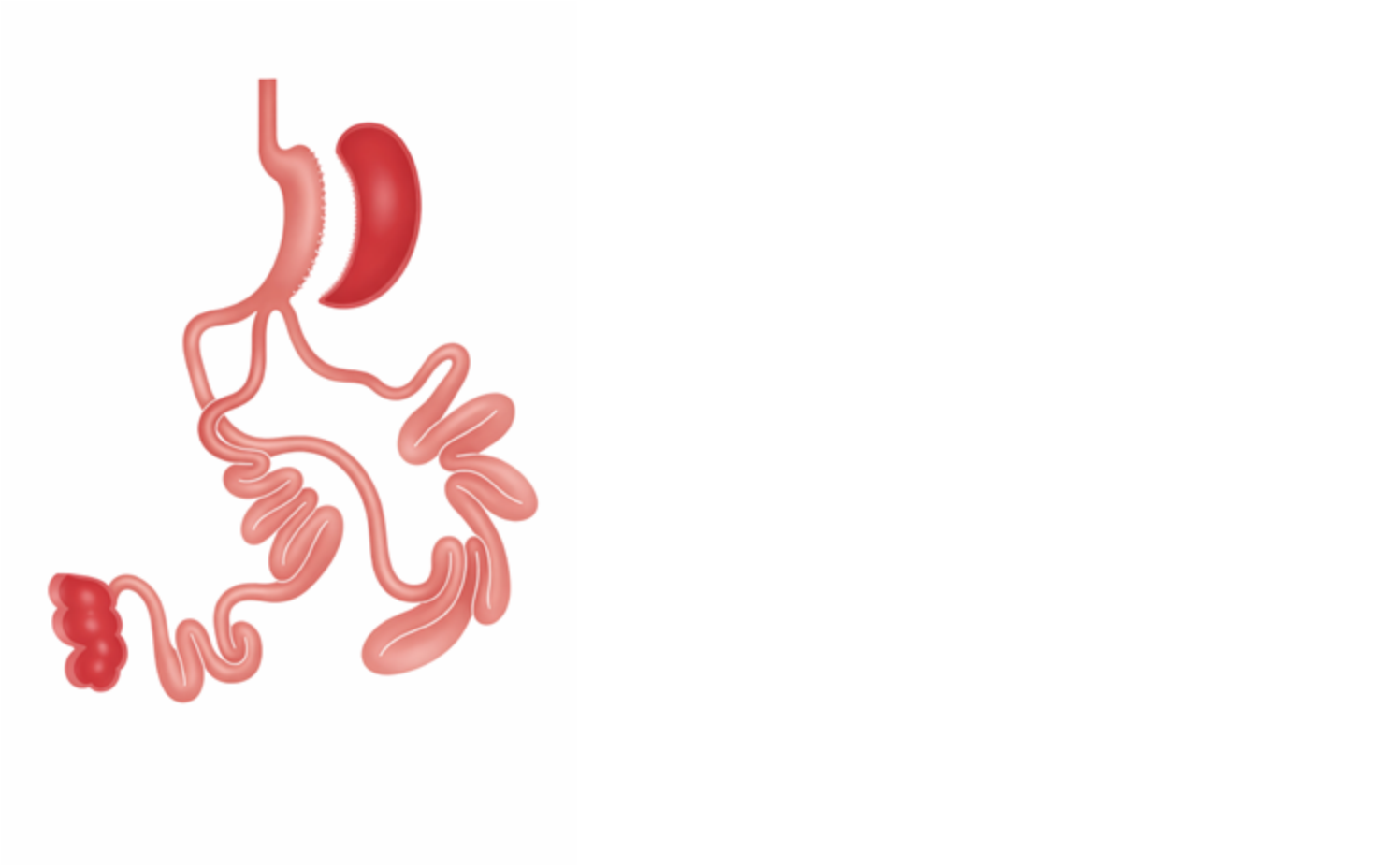


Figure 1

Single Anastomosis Sleeve Ileal Bypass (SASI Bypass)

Supplementary Files

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- Graphicalabstract.png