SASI VS. SADI

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Global trend towards “one anastomosis”

The one anastomosis procedures:

One anastomosis gastric bypass -OAGB/Mini
One anastomosis duodenal switch - SADI/SIPS
One anastomosis gastric bipartition: -SASI

- **WHY?**

- **<u>Technical:</u>**

- Learning curve
- Scalability
- Reproducible
- Ease of procedure.

- **<u>Outcomes:</u>**

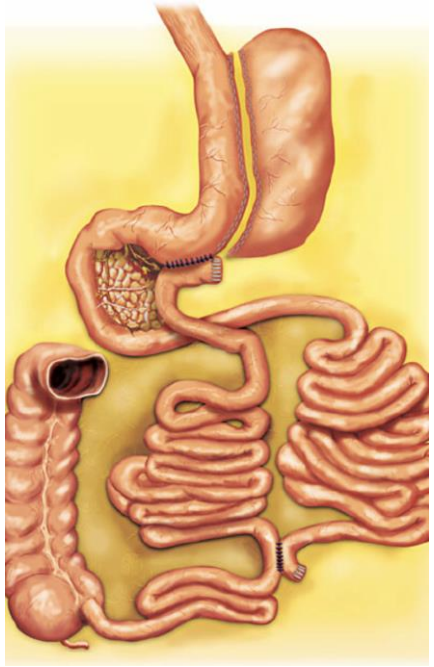
  - Obesity related comorbidity resolution
  - Improvement in metabolic defined parameters including %EWL
  - Short & long-term complications
  - Morbidity & mortality .

- **<u>Application:</u>**

  - Patient BMI
  - Primary vs revision procedure
  - Inclusion + exclusion criteria.

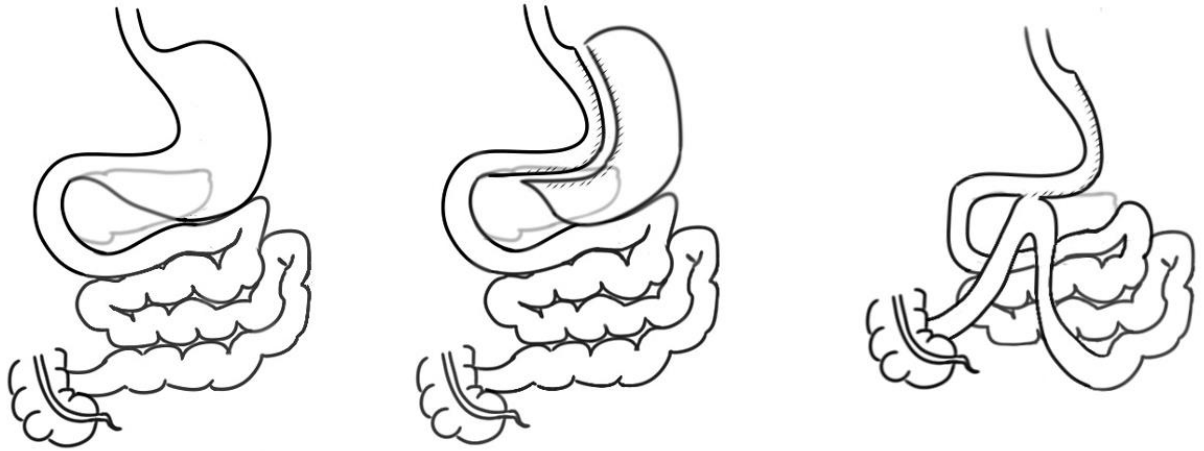
SASI - History

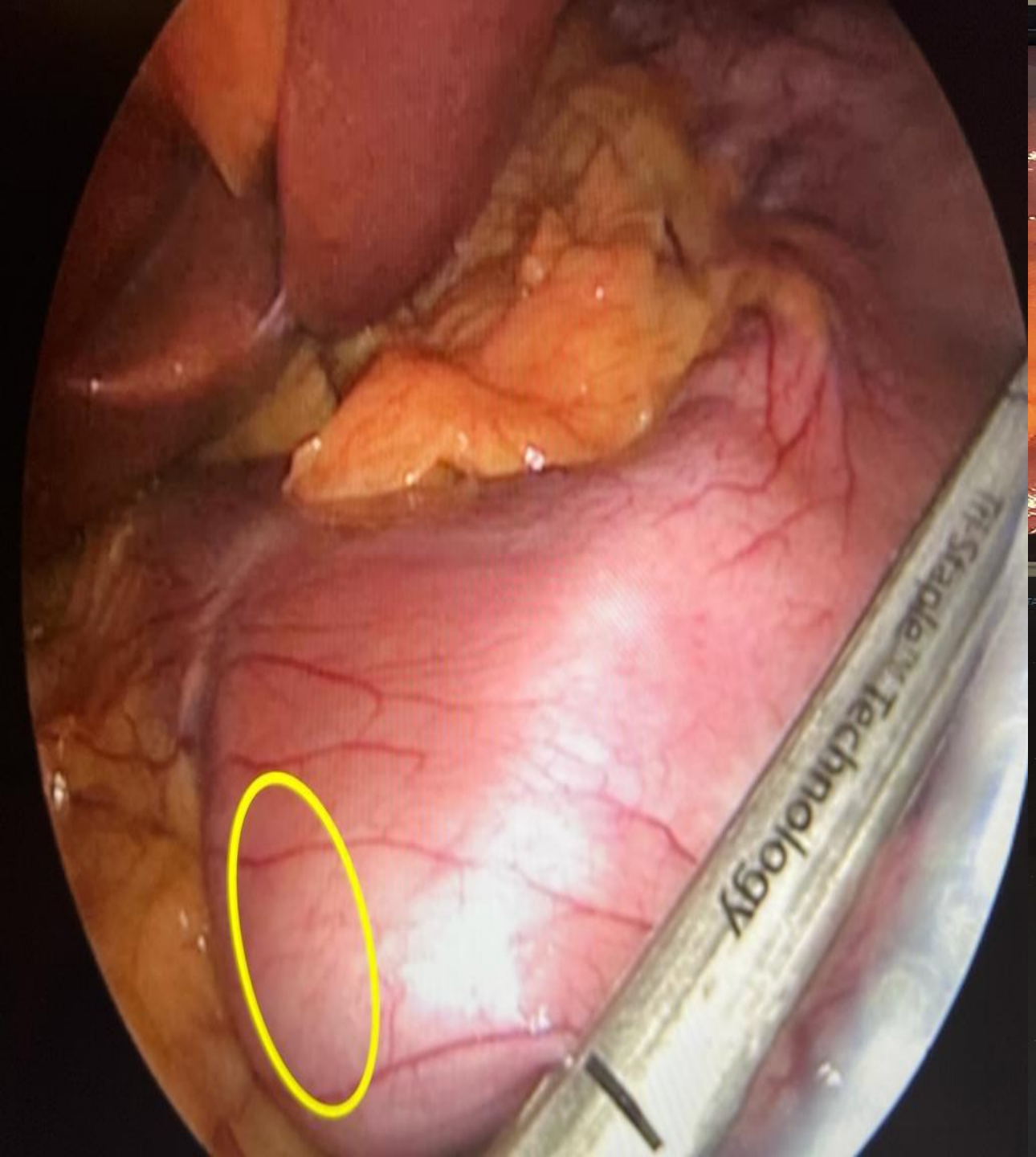
- SASI is an adaptation of the transit loop bipartition pioneered by Dr Sergio Santoro.
- Original Santoro IIIB operation involved a gastric sleeve and an anastomosis between gastric antrum and ileum, and anastomosis between remaining small bowel and distal ileum (jejuno-ileal anastomosis).
- This involved a common limb length of 80cm without duodenal exclusion.
- This results in only partial diversion of food, which reduces the risk of malnutrition but still promoting weight loss.
- In 2016, Dr Tarek Mahdy further simplified the procedure by creating a single anastomosis.

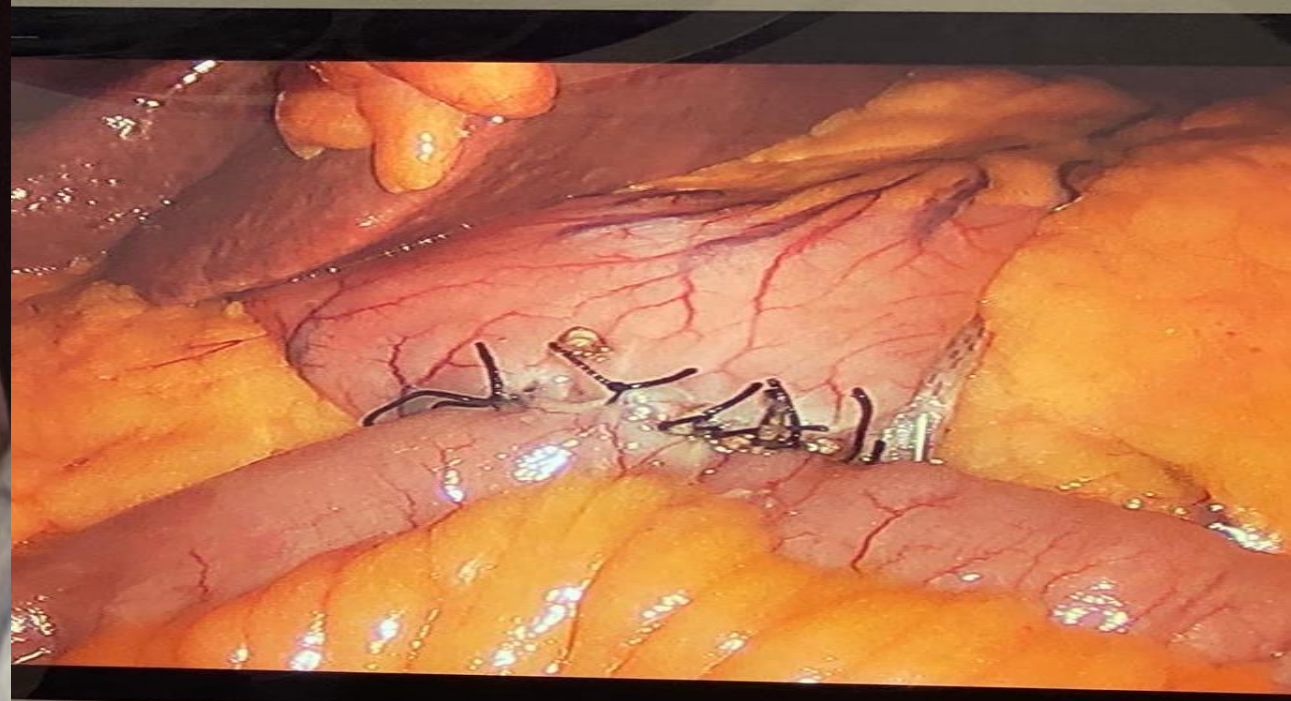


SASI - Technique

- Sleeve gastrectomy 6cm from pylorus, 40F bougie created.
- 250-300cm of ileum is measured from ileo-caecal junction and brough up in a loop to the antrum of the stomach.
- Anastomosis created between this loop of ileum and anterior wall of gastric antrum with either a linear stapler or handsewn anastomosis.
- Common channel of 300cm reduces risk of malnutrition but achieves adequate weight loss.




Endoscopic Technology

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SASI - Studies

Table 2. Characteristics of SASI studies

Study	Type	Country	Follow up	Number	Male	Age
Emile et al, 2020 [24]	Retrospective	Egypt	12 months	58	13	37.9
Khalaf et al 2020 [9]	Retrospective	Egypt	24 months	322	124	37.4
Madyan et al, 2020 [25]	Retrospective	Egypt	12 months	27	10	35.4
Mahdy et al, 2016 [1]	Retrospective	UAE	12 months	50	17	40.5
Mahdy et al, 2021 [26]	Retrospective	UAE	12 months	46	23	38.4
Mahdy et al, 2019 [27]	Retrospective	UAE	12 months	551	161	39.1
Mahdy et al, 2021 [28]	Retrospective	UAE	12 months	74	22	39.0
Reiser et al, 2021 [29]	Observational	Germany	12 months	100	21	43.9
Mohamed et al, 2019 [30]	Retrospective	Bahrain	12 months	34		

SASI - Outcomes

Table 4. Weight loss after SASI bypass

Study	Preoperative BMI (kg/m^2)	TWL% at 12 months	BMI at 12 months (kg/m^2)	%EWL at 12 months
Emile et al, 2020	48.9	37.7	30.6	72.6
Khalaf et al 2020	50.1	44.2		86.9
Madyan et al 2020	53.7	38.6	33.6	65.2
Mahdy et al, 2016	48.7			90.0
Mahdy et al, 2021	44.4	30.4	32.0	78.5
Magdy et al, 2019	43.2	27.4	31.2	63.9
Mahdy et al, 2021	42.1	36.1	26.6	87.6
Reiser et al, 2021	49.9	36.3	31.4	74.7
Mohamed et al, 2019	58.3	43.0	33.8	

Morbidity & Mortality

Table 10. Operation time and complications after SASI bypass

Study	Operation time (min)	Length of hospital stay (days)	Mortality (within 30 days)	Severe complications (leak, bleed, intraabdominal abscess, bowel perforation, reoperation)	Other complications
Emile et al, 2020	108.7		0	1	Bowel obstruction, pneumonia
Khalaf et al 2020	98.8		0	13	Wound infection, pneumonia, thromboembolic complications
Madyan et al 2020	97.7		0	0	Pneumonia, ileus
Mahdy et al, 2020	114	2.9	0	3	Pulmonary embolism, marginal ulcer
Mahdy et al, 2021				1	Bowel obstruction, GERD, persistent vomiting, pulmon embolism
Magdy et al, 2019			2	3	Vomiting, diarrhoea, stomal ulcer, obstructive jaundice, pulmonary embolism, intestinal obstruction
Mahdy et al, 2021				3	Nutritional deficiencies, pancreatitis
Reiser et al, 2021	123.5	3.4	0	3	Wound infection, diarrhoea, anastomotic ulcers, malnutrition
Mohamed et al, 2019				2	Not specified

ADVANTAGES OF SASI

- Highly effective in inducing weight loss and T2DM remission.
- Functional restriction is created by early passage of gastric content to terminal ileum.
  - This potentiates release of terminal ileal hormones (GLP-1 and polypeptide YY) which resulted in slower gastric emptying and intestinal transit.
- T2DM remission rates at 1-year ranges from 90-100%.
- Technically simplicity- short learning curve.
- Low incidence of internal herniation.
- Can improve GERD as the gastro-ileal anastomosis reduces intragastric pressure.
- Double outlet ensures easy endoscopic access to duodenum and biliary system.
- Easily reversible to native sleeve gastrectomy.

DISADVANTAGES OF SASI

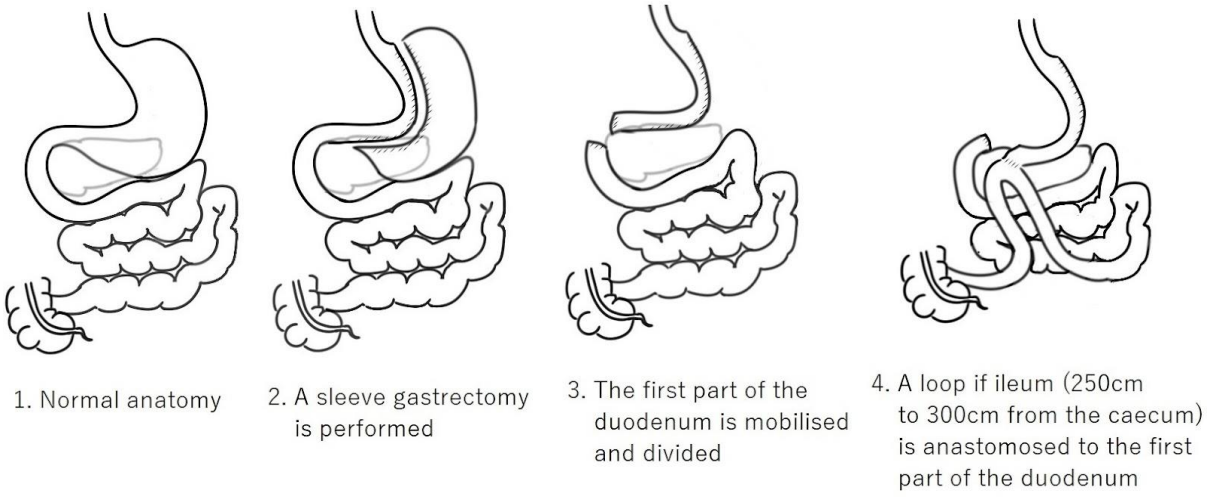
- Lack of long-term studies on SASI outcomes.
- No established data on biliary reflux and subsequent biliary diversion.
- Stomal ulceration, stenosis.
- Variability and unpredictability of the proportion of gastric contents passing through the gastro ileal anastomosis.
- Increased incidence of long term nutritional adverse events.

SADI - History

- SADI was pioneered by Sanchez-Pernaute and Torres in 2007 as a simplification of the duodenal switch (DS)
- Technically less demanding than traditional Duodenal Switch and had good outcomes for weight loss and obesity related comorbidity resolution.
- Preservation of the pylorus in SADI also stabilises blood sugar levels (BSLs) and reduces risk of biliary reflux from the duodenum and dumping syndrome, as the pylorus maintains gastric emptying at a physiological rate.
- Single anastomosis between the duodenum and the ileum 250 - 300cm from the caecum

Technique of SADI

- Creation of 36-50F sleeve gastrectomy
- Duodenual dissection- minimal dissection vs wide dissection. Question regarding maintaining innervation of pylorus and ligation of the right gastric artery.
- 2-2.5cm duodenual cuff with duodenal-ileal anastomosis. Stapled, handsewn, single vs multiple layers.
- There is no consensus or standardisation on the optimal length of ileum for the duodeno-ileal anastomosis.
- 2013 Daniel Cottam and Mitch Roslin- SIPS Stomach Intestinal pylorus sparing surgery SIPS. 300cm common channel



SADI - Studies

Table 1. Characteristics of SADI studies

Study	Type	Country	Follow up (months)	Number	Male	Age	Common channel length (cm)
Sang et al, 2021 [6]	Retrospective	China	24	26	12	35.5	300
Yashkov et al, 2021 [11]	Retrospective	Russia	60	226	68	42.0	250
Bashah et al, 2020 [12]	Retrospective	Qatar	12	42	12	38.0	250-300
Andalib et al, 2021 [13]	Prospective	Canada	12	42	15	45.0	250
Cottam et al, 2020 [14]	Prospective	USA	12	118	38	46.2	300
Enochs et al, 2020 [15]	Retrospective	USA	24	160	35	46	300
Finno et al, 2020 [4]	Retrospective	Spain	24	181	55	50.8	300
Ceha et al, 2018 [16]	Retrospective	Netherlands	12	32	6	46.9	250
Osorio et al, 2021[7]	Retrospective	Spain	24	46	13	48.4	300
Surve et al, 2020 [17]	Retrospective	USA	60	750	277	49.3	300
Surve et al, 2020 [18]	Retrospective	Australia	24	91	30	43.2	300
Wang et al, 2021 [19]	Retrospective	China	24	26	12	35.5	300
Zaveri et al, 2018 [8]	Retrospective	USA	48	437	161	46.6	300
Zaveri et al, 2019 [20]	Retrospective	USA	24	96		44.8	300
Sanchez-Pernaute et al, 2010 [21]	Retrospective	Spain	36	50	18	46	200
Sanchez-Pernaute et al, 2015 [22]	Retrospective	Spain	60	97	45	50	200
Sanchez-Pernaute et al, 2020 [23]	Retrospective	Spain	60	51	16	42	250-300

SADI - Outcomes

Table 3. Changes in weight parameters for SADI patients

Study	Preoperative BMI (kg/m^2)	TWL% at 12 months	BMI at 12 months (kg/m^2)	%EWL at 12 months
Sang et al, 2021	34.4	27.0	24.5	
Yashkov et al, 2021	48.9	40.0		77.0
Bashah et al, 2020	43.7	23.7	34.1	57.6
Andalib et al, 2021	48.2	38.8	28.9	86.8
Cottam et al, 2020	47.4	36.6	29.8	70.5
Enochs et al, 2020	48.2	36.0	29.9	83.3
Finno et al, 2020	50.9	37.5	31.5	74.7
Ceha et al, 2018	57.5	33.7		
Osorio et al, 2021	39.2	40.0	35.8	73
Surve et al, 2020	50.0	35.2	32.6	74.5
Surve et al, 2020	43.2	34.6	27.9	69.2
Wang et al, 2021	34.4	28.8	24.5	76.9
Zaveri et al, 2018	49.8		31.9	77.7
Zaveri et al, 2019	52.8	20.0	43.5	26
Sanchez-Pernaute et al, 2010	44.2			94.7
Sanchez-Pernaute et al, 2015	44.3	39.0		91.0
Sanchez-Pernaute et al, 2020	52.0	39.0	31.0	79.0

Morbidity & Mortality

Table 9. Operation time and complications after SADI bypass

Study	Operation time (min)	Length of hospital stay (days)	Mortality (within 30 days)	Severe complications (leak, bleed, intraabdominal abscess, bowel perforation, reoperation)		Other complications
Sang et al, 2021	90	3	0	0		Nausea, emaciation, hypalbuminaemia, anaemia, alopecia, functional dyspepsia, cholecystolithiasis, hypoglycaemia, hypotension, hypocalcaemia, serum iron deficiency, hypomagnesemia, folic acid deficiency, vitamin B12 deficiency
Yashkov et al, 2021			1	3		Wound infection, pneumonia, pulmonary embolism, protein deficiency, incisional hernia, small bowel obstruction, calcium deficiencies, reflux
Bashah et al, 2020			0	1		Steatorrhea, nutritional deficiency, mortality
Andalib et al, 2021	211	2	0	1		Renal colic, anastomotic stricture, biliary pancreatitis, cholangitis secondary to choledocholithiasis, steatorrhea
Cottam et al, 2020			0	1		Retrograde filling of afferent limb, gastric stricture, cholelithiasis
Enochs et al, 2020						
Finno et al, 2020		2.7	1	13	Unique	Pancreatitis, wound infection, pulmonary thromboembolism, respiratory complications, incisional hernia, internal hernia, small bowel obstruction, GERD
Ceha et al, 2018			0	2		Nutritional deficiencies, alteration in bowel habits
Osorio et al, 2021		2.2	0	3		Pancreatitis, hernia wound infection, pulmonary embolism, respiratory complications, reflux, small bowel obstruction, nutritional deficiencies
Surve et al, 2020	67.7	1.5	1	8		Nausea, wound infection, altered bowel habits, portal vein thrombosis, hematemesis, hepatic abscess, dehydration, stricture, cholelithiasis, nutritional deficiencies, hernias
Surve et al, 2020	121.8	1.4	0	1		Port site bleed, respiratory complication, diabetic ketoacidosis
Wang et al, 2021	90.0	3	0	0		Nausea, emaciation, nutritional deficiencies, anaemia, dyspepsia, alopecia, hypoglycaemia, cholelithiasis, hypotension
Zaveri et al, 2018	67.9	1.6	1	7		Nausea, wound infection, portal vein thrombosis, diabetic ketoacidosis, dehydration, stricture, altered bowel habits, retrograde filling of afferent limb, malnutrition
Zaveri et al, 2019	98.7	1.2	0	0		Nausea, wound infection, diarrhoea, vomiting, retrograde filling of afferent limb
Sanchez-Pernaute et al, 2010	135.0		0	4		Nutritional deficiencies, hernia
Sanchez-Pernaute et al, 2015				3		Not specified
Sanchez-Pernaute et al, 2020				0		No severe complications

ADVANTAGES OF SADI

- Technically less demanding than conventional DS.
- Shorter operating time compared to DS.
- However, weight loss and metabolic outcomes similar, to DS and greater than RYGB.
- Avoids complications associated with entero-enterostomy.
- Incidence of stomal ulcers, bleeding & stricture favorable when compared to gastric bypass OAGB and RYGB.
- Suitable in smoker population.
- Less reported incidence of bile reflux.
- More stable and physiological CGM traces relative to OAGB or RYGB

DISADVANTAGES OF SADI

- Limited long-term studies on SADI outcomes.
- Limited established data on biliary reflux and subsequent biliary diversion.
- Higher incidence of diarrhea, steatorrhea and nutritional adverse events compared to RYGB with 250cm biliopancreatic limb, secondary to malabsorption.
- Major complications, although uncommon result in higher stake of morbidity.
- Lack of biliary system access.
- Development of reflux disease and technical difficulty of surgical revision.

SYSTEMATIC REVIEW SADI VS SASI

- 17 studies on SADI and 9 studies on SASI were included.
- Five SADI studies were conducted in Spain, five in USA, two conducted in China, one in Canada, Russia, Qatar, Netherlands & Australia.
- Four SASI studies were conducted in UAE, three in Egypt, one in Bahrain and one in Germany.
- The studies chosen included 3733 patients.
- Mean preoperative BMI was similar in both study groups, 46.4 kg/m^2 in SADI and 48.8 kg/m^2 in SASI.
- Mean %EWL at 12 months in the SADI group was 74.1%, compared to 77.4% in the SASI group.
- Both employ combination of the restrictive nature of LSG & the hypo-absorptive advantages of RYGB.
- SADI & SASI stimulate neuroendocrine hormones Glucagon-Like-Peptide 1 (GLP-1) by facilitating rapid transit of undigested chyme into the distal small bowel

COMPARISON

Similarities

- Both SADI and SASI involves a single anastomosis, reducing risks associated with entero-enterostomy including strictures, internal hernias.
- Role in both primary and revision surgery.
- Reduces operating time.
- Both are safe, effective procedures for weight loss.

Differences

- Pylorus- value and function.
- Higher risk of bile reflux with SASI.
- Higher risk of acid reflux with SADI.
- Revision options available.
- Majority complications although rare, have higher morbidity in SADI group.

COMPARISON

Table 5. Grouped comparison of weight parameters for SADI and SASI patients

		Male (%)	Age (years)	Preoperative BMI (kg/m²)	TWL% at 12 months	BMI at 12 months (kg/m²)	%EWL at 12 months
SADI	**Mean**	31.7	44.5	46.4	34.0	31.2	74.1
	Median	32.2	46.0	48.2	36.0	31.0	76.9
	Range	46.4	15.3	23.1	20.0	19.0	68.7
SASI	**Mean**	32.7	39.0	48.8	36.7	31.3	77.4
	Median	31.9	38.7	48.9	37.0	31.4	76.6
	Range	29.0	8.5	16.2	16.8	7.2	26.1

Table 8. Grouped comparison of diabetic parameters for SADI and SASI patients

		HbA1c pre op (%)	HbA1c 12 months post op (%)	Fasting blood glucose pre op (mmol/L)	Fasting blood glucose 12 months post op (mmol/L)	Resolution in diabetes (%)
SADI	**Mean**	7.5	5.4	8.6	5.4	78.5
	Median	7.6	5.3	8.6	5.5	85.7
	Range	2.3	1.4	2.0	0.5	77.8
SASI	**Mean**	8.3	5.4	9.7	5.3	89.0
	Median	8.1	5.3	9.1	5.6	90.0
	Range	2.8	0.7	4.7	1.0	26.3

COMPARING PROCEDURES

Technical

- Much greater technical demand in SADI dissection. Anatomically sensitive area.

Outcomes

- Similar obesity comorbidity resolution.
- complications and reoperation.
- Higher incidence of bile reflux in SASI but higher incidence of GERD in SADI.
- No QOL studies/functionality available.

Application

- Similar patient cohort suitability.
- Both suitable as primary and revision procedure.