Transit Bipartition SAGI, SASI, SADI

Single Anastomosis Gastro Ileal (SAGI)

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Scientific Commitee Italian Society of Obesity (SIO)
Scientific Commitee The Upper Gastrointestinal Surgeons (TUGS)

31st of August, 2023

Single Anastomosis Gastro Ileal (SAGI)

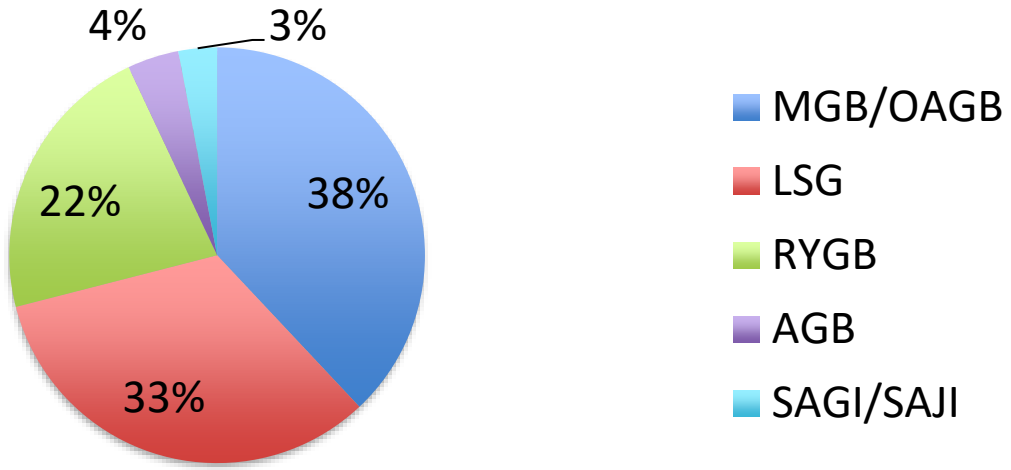
My Bariatric Experience

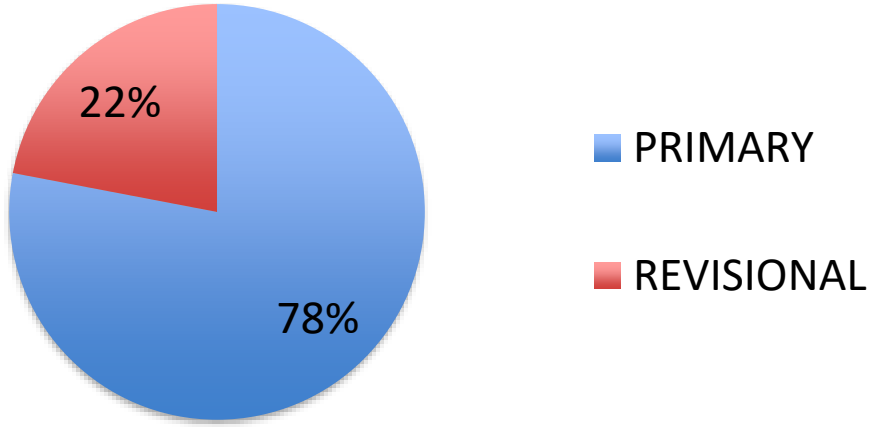
Trained in Mini-invasive Laparoscopic and Thoracoscopic Surgery

First Bariatric Procedure – Gastric Banding, 1993

~ 12000 bariatric procedure in 29 years

Last 5 years





Single Anastomosis Gastro Ileal (SAGI)

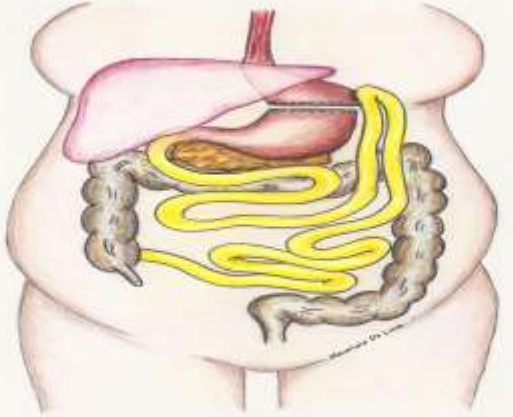
MGB and OAGB operations combines two major components:

1) First is a long **non-obstrutive gastric tube** (Collis Gastroplasty), sized equal to the diameter of the esophagus that rapidly delivers undigested food through the **non-obstructive wide gastro-jejunostomy** into the distal jejunum. This results in an exaggerated "**Post-Gastrectomy Syndrome (PGS)**" that restricts the intake of food (without "obstruction"), limits the intake of sugars, fat and large food boluses, but allows each of these in moderation.

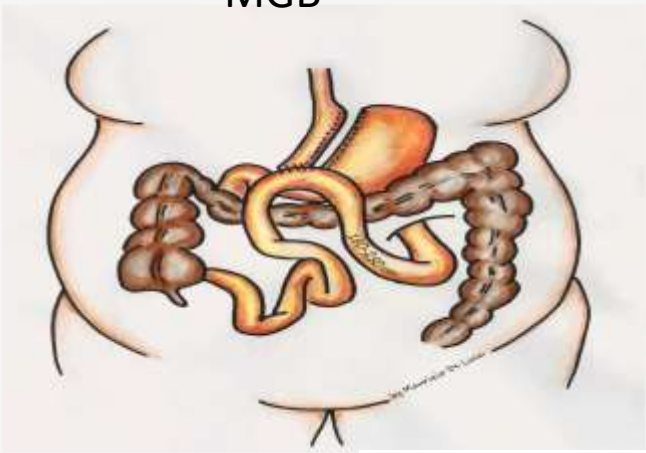
1) The PGS results in alteration of intestinal transit time, reduced acid secretion, bloating, decreased appetite, and consequently decreased caloric intake.

1) The other component of the MGB and OAGB operations is a **moderate malabsorption** due to the bilio-pancreatic limb (150 - 250 cm) combined with a Billroth II gastro-jejunostomy that results in significantly more fat malabsorption and fatty food intolerance then RNY.

Old Mason GBP



MGB



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Single Anastomosis Gastro Ileal (SAGI)

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Maurizio De Luca, Jacques Himpens, Luigi Angrisani, Nicola Di Lorenzo, Kamal Mahawar, Cesare Lunardi, Natale Pellicanò, Nicola Clemente and Scott Shikora.

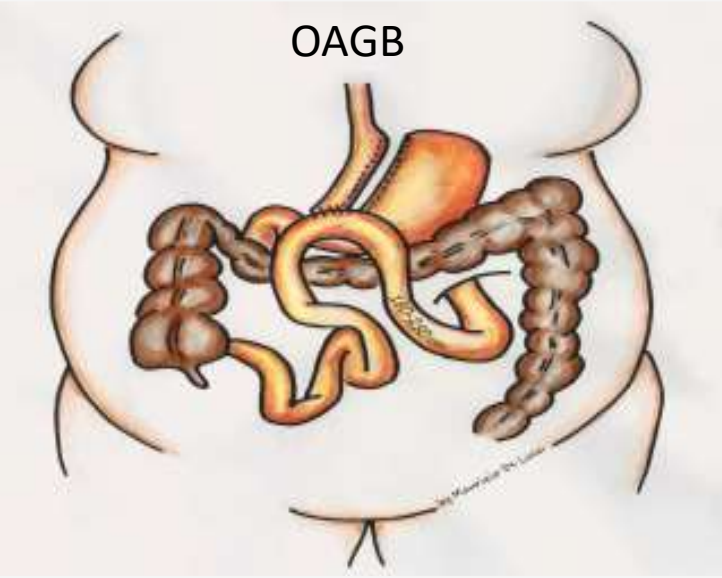
Obesity Surgery, 2017, 27, 1, 143-147

Single Anastomosis Gastro Ileal (SAGI) - Rationale

- In **OAGB** the technique of measuring involves the small bowel located cephalad to the anastomosis
- The length of the small bowel in contact with food (the so-called common channel) remains unknown

- > 150 cm BP limb: measure the entire small bowel
- < 150 cm BP limb : doesn't measure the entire small bowel

- This measurement does not allow to define the length of the common channel



Single Anastomosis Gastro Ileal (SAGI)

SAGI: a low invasive malapsorbitive procedure

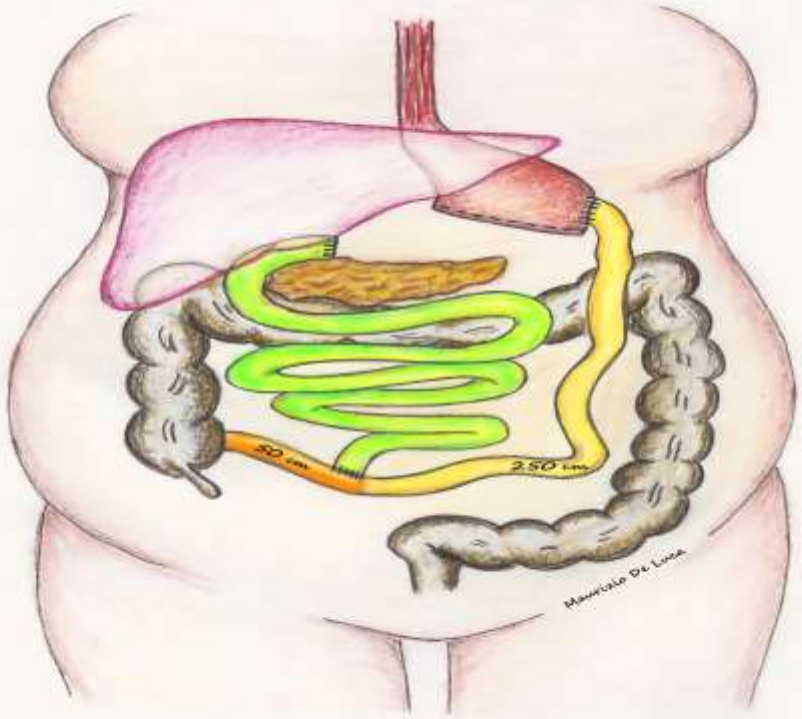
Rationale

BilioPancreatica Diversion

(Scopinaro 1976)

- distal gastrectomy
- gastric reservoir 200-300 ml
- common channel 50 cm
- alimentary channel 200 cm

Standard BPD



Single Anastomosis Gastro Ileal (SAGI)

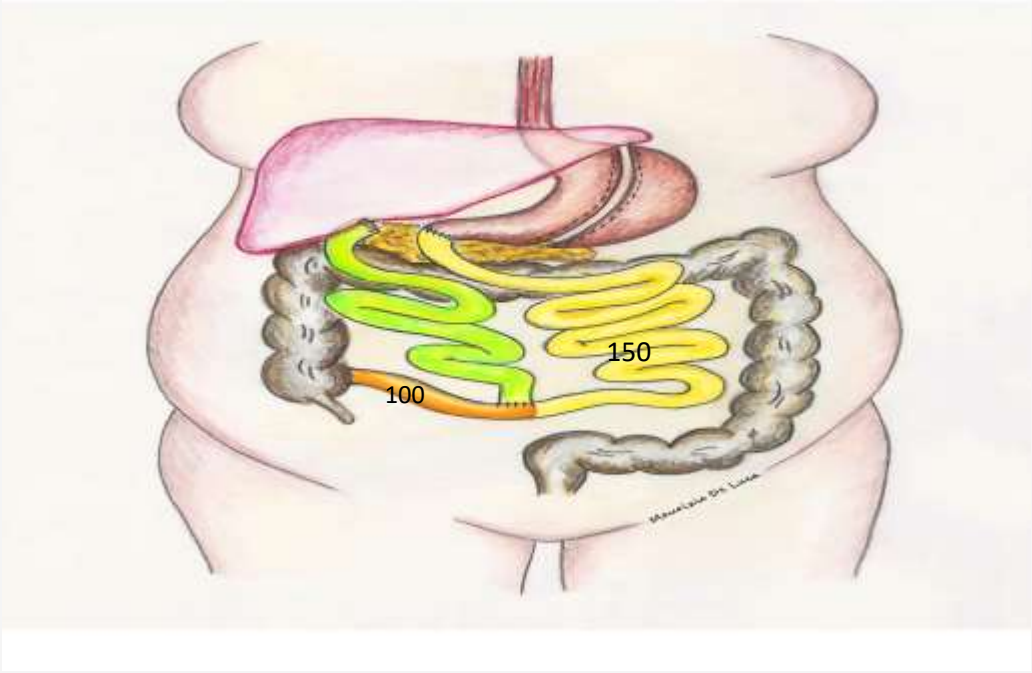
Rationale

Bilio Pancreatic Diversion - Duodenal Switch

(Douglas Hess 1988)

- vertical gastrectomy
- antrum preservation
- gastric reservoir 80-100 ml
- duodenal switch
- common channel 100 cm
- alimentary channel 150 cm

BPD-DS



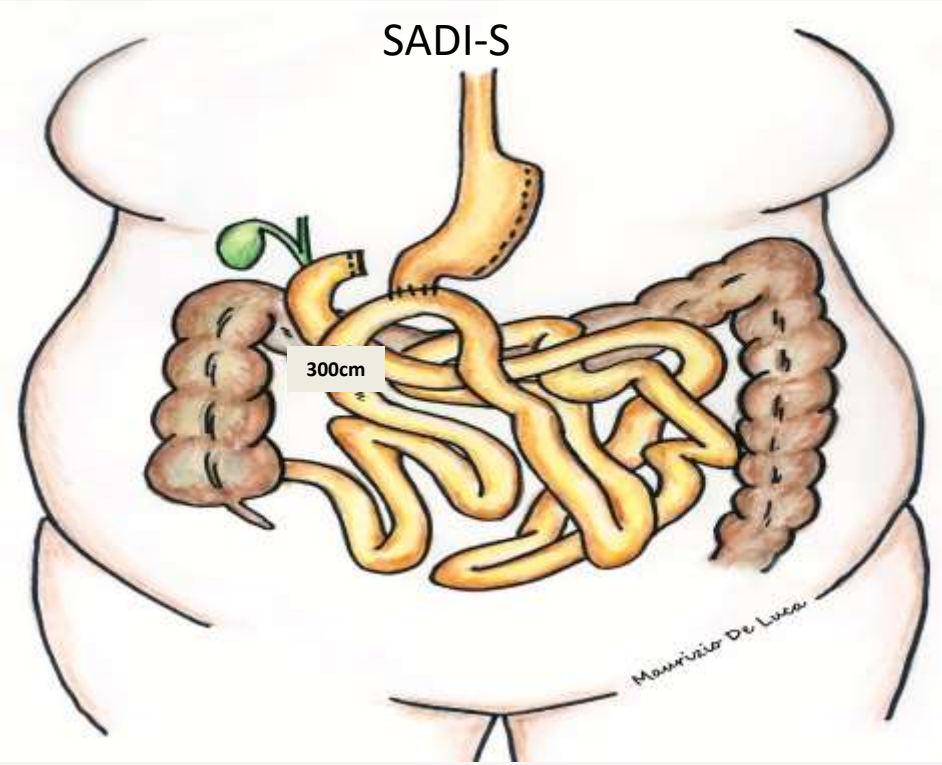
Single Anastomosis Gastro Ileal (SAGI)

Rationale

Single Anastomosis Duodeno-Ileal with Sleeve Gastrectomy (SADI-S)

Pernaute and Torres 2006

- sleeve gastrectomy
- duodenal-ileal anastomosis
- 250-300 cm from the ileo-cecal valve
- mainly a malabsorpitive procedure



Sanchez-Pernaute A, Herrera MA, Perez-Aguirre ME, Talavera P, Cabrerizo L, Matia P, Diez-Valladares L, Barabash A, Martin-Antona E, Garcia-Botella A, Garcia-Almenta EM, Torres A.
Single anastomosis duodeno-ileal bypass with sleeve gastrectomy (SADI-S). One to three-year follow-up.
Obes Surg 2010, 20:1720–1726

Single Anastomosis Gastro Ileal (SAGI)

2016:
Single Anastomosis Gastro-Ileal (SAGI)

- OAGB principles
- non obstructive gastric tube
- gastro-ileal anastomosis
- 250-300 cm from the ileo-cecal valve
- malapsorbitive procedure

SAGI

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World Journal of Emergency Surgery

RESEARCH Open Access

Complex duodenal fistulae: a surgical nightmare

Ari Leppäniemi[1,2*], Matti Tolonen[1] and Panu Mentula[1]

Abstract

Introduction A common feature of external duodenal fistulae is the devastating effect of the duodenal content rich in bile and pancreatic juice on nearby tissues with therapy-resistant local and systemic complications. This study analyzes the results of different management options with emphasis on successful fistula closure rates.

Methods A retrospective single academic center study of adult patients treated for complex duodenal fistulas over a 17-year period with descriptive and univariate analyses was performed.

Results Fifty patients were identified. First line treatment was surgical in 38 (76%) cases and consisted of resuture or resection with anastomosis combined with duodenal decompression and periduodenal drainage in 36 cases, rectus muscle patch, and surgical decompression with T-tube in one each. Fistula closure rate was 29/38 (76%). In 12 cases, the initial management was nonoperative with or without percutaneous drainage. The fistula was closed without surgery in 5/6 patients (1 patient died with persistent fistula). Among the remaining 6 patients eventually operated, fistula closure was achieved in 4 cases. There was no difference in successful fistula closure rates among initially operatively versus nonoperatively managed patients (29/38 vs. 9/12, $p = 1.000$). However, when considering eventually failed nonoperative management in 7/12 patients, there was a significant difference in the fistula closure rate (29/38 vs. 5/12, $p = 0.036$). The overall in-hospital mortality rate was 20/50 (40%).

Conclusions Surgical closure combined with duodenal decompression in complex duodenal leaks offers the best chance of successful outcome. In selected cases, nonoperative management can be tried, accepting that some patients may require surgery later.

Keywords Duodenal leak, Duodenal fistula, Enteric fistula, Postoperative peritonitis, Intra-abdominal infection, Duodenal diversion

SAGI: Indications

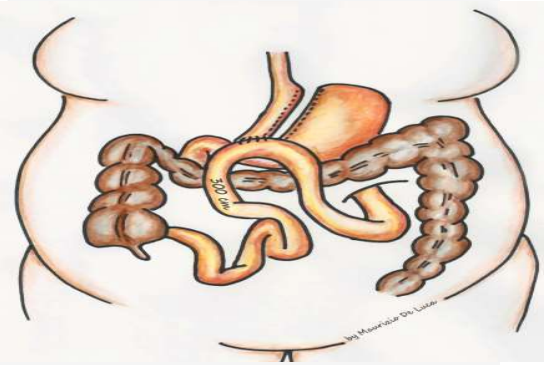
Best candidates for SAGI may be:

1) Insufficient weight loss or weight regain after **Gastric Banding** and **Sleeve Gastrectomy**, especially when the reason of failure is related to patient lack of compliance, and not related to gastric pouch dilatation

1) Insufficient weight loss or weight regain after **MGB**

1) primary surgery for OAGB/MGB candidate patients **with short small bowel**

SAGI



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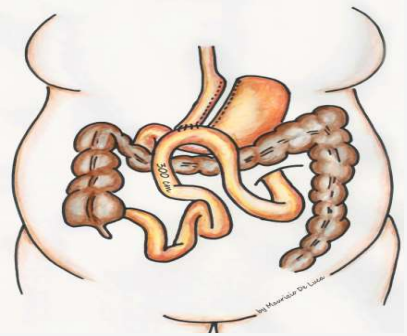
SAGI vs SADI-S, DS and OAGB

- Gastro-ileal anastomosis is easier to do than duodeno-ileal anastomosis. SAGI vs SADI-S and DS
- Surgeons have **fear** of the duodeno-ileal anatomosis leak. DS series report this complication. SAGI vs SADI-S and DS
- The endoscopic/laparoscopic management, in case of leak and/or hemorrhage of the gastro-ileal anastomosis, is easier. SAGI vs SADI-S and DS
- Fixed length of the common channel may allow more consistent outcomes than MGB and OAGB and should do away with the uncommon long term complications of OAGB, like severe hypoalbuminemia, anemia and/or malnutrition (i.e. patients with short small bowel). SAGI vs OAGB

SAGI



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Nelson L, Moon R, Teixeira A. Duodenal stump leak following a duodenal switch: A case report. Int J Surg, 2015, 14: 30-32.

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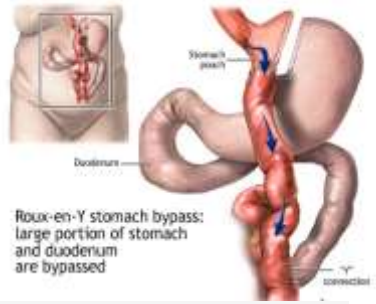
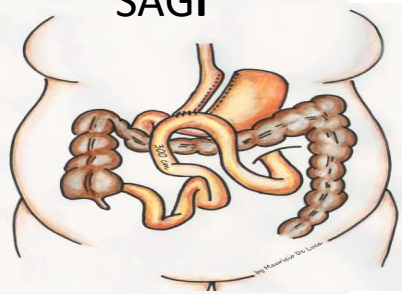
SAGI (and OAGB) vs GBP

- Gastro-ileal anastomosis is placed lower on the stomach, hence **allows a *tension-free anastomosis*** that contrasts with the more proximal and challenging anastomosis close to the esophagogastric junction **(as in GBP**). OAGB and SAGII vs GBP
- Placing the anastomosis low on the stomach pouch also *circumvents common anatomical obstacles such as* ***massive left-liver lobe hypertrophy*** that may obscure this area. OAGB and SAGI vs GBP
- Avoiding a Roux-en Y limb eliminates the risks related to a ***second anastomosis*** **and to the *division of the mesentery*** such as obstruction, hematoma and internal hernia OAGB and SAGI vs GBP
- Moreover, in case of acute obstruction MGB, OAGB and SAGI **allow an easy exploration of the jejunal or ileal limbs and prompt repair.** OAGB and SAGI vs GBP
- Finally MGB, OAGB and SAGI can be **easily revised, reversed, or resleeved** if necessary. OAGB and SAGI vs GBP

GBP



SAGI



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ELSEVIER

Surgery for Obesity and Related Diseases 17 (2021) 1489–1496

SURGERY FOR OBESITY AND RELATED DISEASES

2021

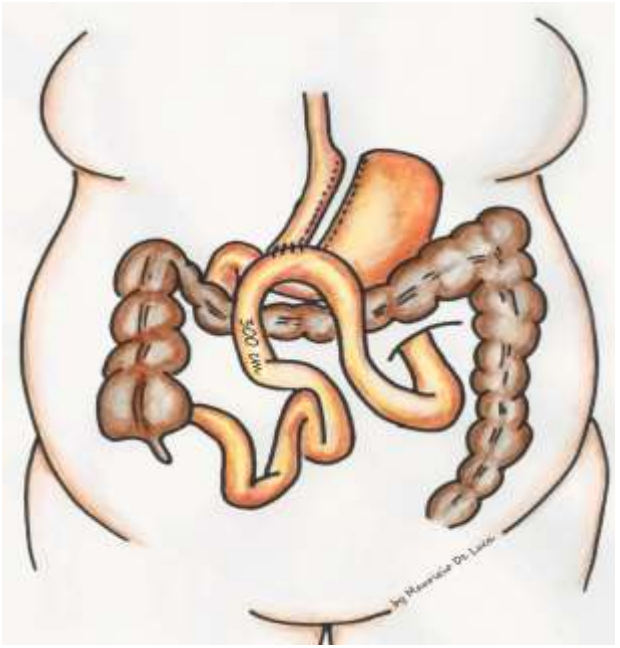
Review article

Reversal to normal anatomy after one-anastomosis/mini gastric bypass, indications and results: a systematic review and meta-analysis

Mohammad Kermansaravi, M.D.[a], Shahab Shahabi Shahmiri, M.D., M.P.H.[b], Amir Hossein Davarpanah Jazi, M.D.[c], Rohollah Valizadeh, Ph.D.[d], Rudolf A. Weiner, M.D.[e], Sonja Chiappetta, M.D., Ph.D.[f,*]

In our systematic review OAGB/MGB reversal showed an overall incidence of 10.9% for perioperative complications and included bleeding (1.6%), intestinal obstruction (.8%), leakage (3.2%), stenosis (3.2%), and death due to severe liver failure (1.6%) with leakage and stenosis of gastro-gastrostomy being the most common major complications after reversal surgery. This reflects an important advantage of OAGB/MGB. Complication rate seems to be 3 times higher after RYGB reversal compared with OAGB/MGB reversal (29% versus 10.9%). This is explained by the more challenging technical procedure in RYGB reversal due to the small gastric pouch and the second entero-entero anastomosis, which has to be reversed. Operation time in our systematic review was 139.1 minutes. None of the studies reported operation time for RYGB reversal, but 19% of the reported operations underwent reversal by an open approach, which might be due to more adhesions and an open approach for RYGB in the past [27].

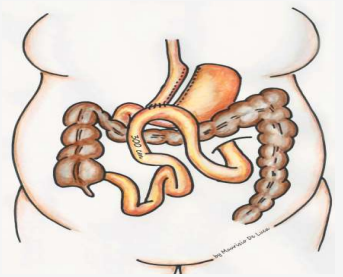
On the other hand, laparoscopic reversal of OAGB/MGB might be technically simple but remains challenging due to the presence of the clinical condition of protein-energy malnutrition. Alarmingly, single studies reported an overall



Single Anastomosis Gastro Ileal (SAGI)

- SAGI patients 68
- SAGI patients with 12 months FU: 37 (F/M 25/12)

	SAGI/primary surgery (n=7)	SAGI/AGB group* (n=19)	SAGI/SG group (n=10)	SAGI/OAGB (n=1)	p
Age (years) at SAGI surgery	36,9 ± 9,4	39,5 ±11,8	38,3 ± 10,1	*47,1*	*0,4*
BMI at AGB/SG/OAGB surgery		46,7 ± 11,4	47,3 ± 9,1	*51*	*0,6*
BMI at SAGI surgery	49,4 ± 6,7	42,6 ± 7,1	44,8 ± 6,8	*49,9*	*0,01*
Body Weight at AGB/SG/OAGB surgery (Kg)		127,2 ± 23,2	129,1 ± 20	*149,5*	*0,7*
Body Weight at SAGI surgery (Kg)	137,5 ± 15	116,9 ± 20,1	120,1 ± 18,7	*146,2*	*0,1*
Months between operations		80,6 ± 16,8	66,7 ± 33,3	*6*	*0,5*
Operative time (minutes)	115 ± 35	130 ± 50	105± 43	*105*	*0,2*
Hospital stay (days)	4 ± 1	4 ± 3	3 ± 2	*4*	*1*



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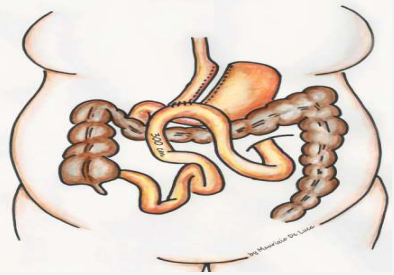
Single Anastomosis Gastro Ileal (SAGI)

1. SAGI primary
2. SAGI/AGB group
3. SAGI/SG group
4. SAGI/ OAGB group

- SAGI patients 68
- SAGI patients with 12 months FU: 37 (F/M 25/12)



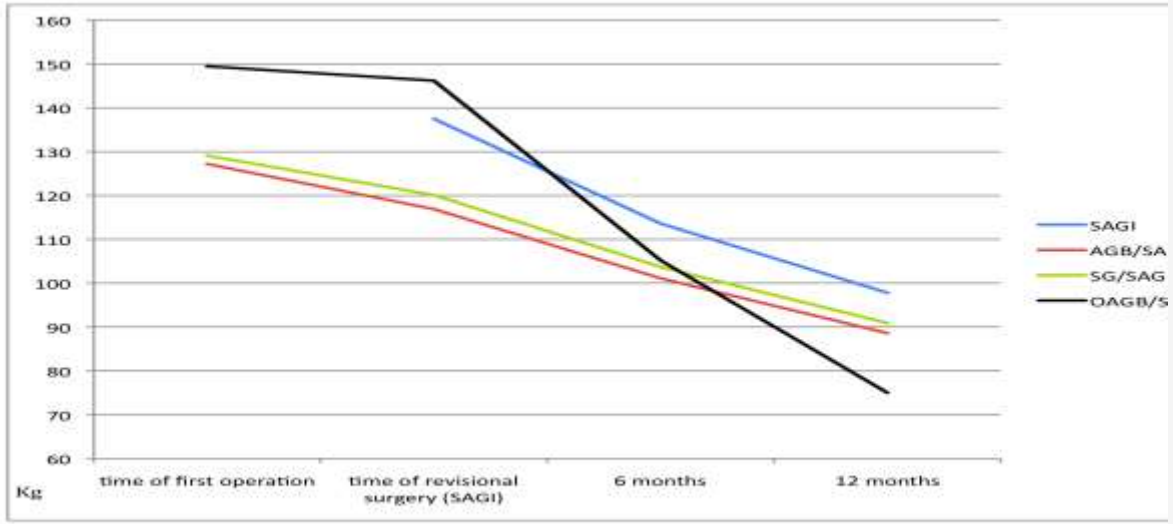
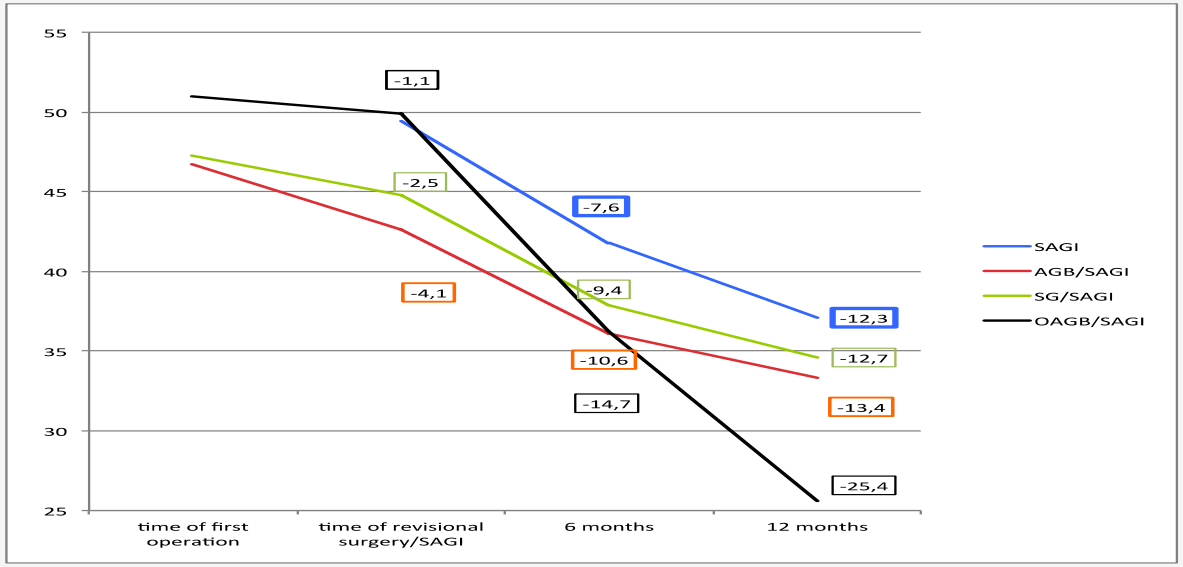


Fig 1 Weight loss (Kg) during follow-up among the different groups



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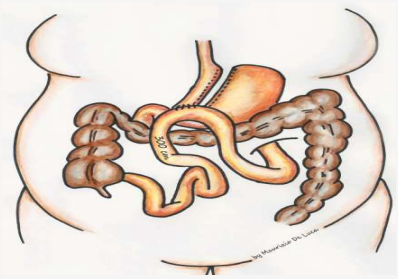
Single Anastomosis Gastro Ileal (SAGI)

Comorbidities

Total n of SAGI patients 12 m FU: 37

1. SAGI primary
2. SAGI/AGB group
3. SAGI/SG group
4. SAGI/ OAGB group



Comorbidity	Number of patients	Improvement	Remission	p
T2DM*	14 (number of total patients)	14	12	0,7
SAGI group	4	4	3	
SGB/SAGI	7	7	6	
SG/SAGI	3	3	3	
OAGB/SAGI	0	0	0	
Hypertension §	17 (number of total patients)	13	10	0,9
SAGI group	5	5	5	
SGB/SAGI	9	6	4	
SG/SAGI	3	2	1	
OAGB/SAGI	0	0	0	
Hyperlipemia °	22 (number of total patients)	21	20	0,8
SAGI group	5	5	5	
SGB/SAGI	12	12	11	
SG/SAGI	4	3	3	
OAGB/SAGI	1	1	1	
OSAS √	15 (number of total patients)	15	12	1,0
SAGI group	3	3	2	
SGB/SAGI	8	8	8	
SG/SAGI	3	3	1	
OAGB/SAGI	1	1	1	
Osteoarthritis x	23 (number of total patients)	21	4	0,4
SAGI group	5	5	2	
SGB/SAGI	13	11	0	
SG/SAGI	6	6	1	
OAGB/SAGI	1	1	1	
Urinary Incontinence∃€	3 (number of total patients)	3	1	0,8
Plasma liver enzyme levels ∞	7 (number of total patients)	7	4	0,7
SAGI group	3	3	2	
SGB/SAGI	2	2	0	
SG/SAGI	2	2	2	
OAGB/SAGI	0	0	0	

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Single Anastomosis Gastro Ileal (SAGI)

Complications

Total n of SAGI patients 12 m FU: 37

1. SAGI primary
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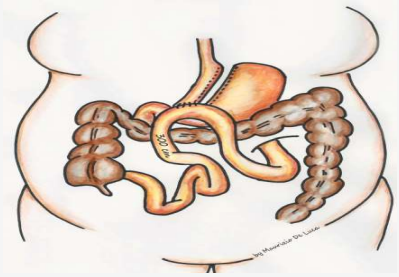

Complications	Number of patients months post-op	Treatment	Recovery	p
Marginal Ulcer*	1 (total n. of patients)	-	-	1,0
SAGI group	0	-	-	
SGB/SAGI	1 (7 m post-op)	1 conservative	Complete (EGDS findings)	
SG/SAGI	0	-	3	
OAGB/SAGI	0	-	-	
Reflux §	3 (total n. of patients)	-	-	0,8
SAGI group	2 (3,7 m post-op)	2 conservative	2 Partial (1 EGDS findings)	
SGB/SAGI	0	-	-	
SG/SAGI	1 (7 m post-op)	1 conservative	1Partial (EGDS findings)	
OAGB/SAGI	0	-	-	
Malnutrition √	1 (total n. of patients)	-	-	0,4
SAGI group (1)	1 (11 m post-op)	1 surgery	1 complete	
SGB/SAGI (2)	0	-	-	
SG/SAGI (3)	0	-	-	
Diarrhea (>4/day) °	5 (total n. of patients)			0,9
SAGI group	3 (4,4, 6 m post-op)	3 conservative	3 partial	
SGB/SAGI	0	-	-	
SG/SAGI	2 (6,7 m post-op)	1 conservative	1 partial	
OAGB/SAGI	0	-	-	

***We didn't record any case of leak, hemorrage, small bowel obstruction in these four groups of patients at 12 months*.**

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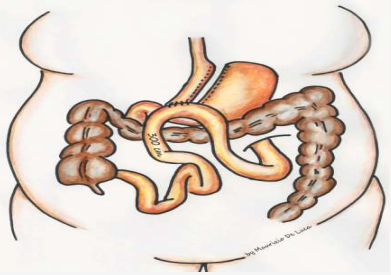
SAGI patients with 12 months follow up: 37

1. SAGI primary
2. SAGI/AGB group
3. SAGI/SG group
4. SAGI/ OAGB group

Nutritional Deficiences

Vitamins, electrolites, albumin		A	D	E	K	B1	B6	Folate (B9)	B12	Iron	Calcium	Albumin
Type of surgery	N pts with 12 m blood test	2	8	0	0	1	2	9	4	8	6	6
SAGI group	7	1	2	0	0	0	0	2	1	2	2	2°
AGB/SAGI	14	1	3	0	0	1	1	3	2	3*	2	2
SG/SAGI	7	0	2	0	0	0	1	3	1	2	2	1
OAGB/SAGI	1	0	1	0	0	0	0	1	0	1	0	1



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SINGLE ANASTOMOSIS GASTRO-ILEAL (SAGI): TECHNICAL DETAILS AND PRELIMINARY RESULTS
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Transit Bipartition SAGI, SASI, SADI

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ORIGINAL CONTRIBUTIONS

Omega Loop Gastroileal Bypass (OLGIBP/SAGI) Versus One Anastomosis Gastric Bypass (OAGB): Medium-Term Results

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Table 1 Patients characteristics

	OAGB (*N* = 23)	OLGIBP (*N* = 17)
Male	2 (8.7%)	1 (5.9%)
Age (years)	35	38
Body weight before the surgery	121.7	116.6
BMI before the surgery	44.84	45.3
Previous bariatric surgery	8 (34.8%)	4 (23.5%)
Diabetes mellitus	1 (4.3%)	4 (23.5%)
Hypertension	5 (21.7%)	3 (17.6%)
Sleep apnea syndrome	3 (13%)	1(5.9%)
Dyslipidemia	1 (4.3%)	1(5.9%)
Arthralgia	3 (13%)	0 (0%)

Table 3 Outcomes of patients (data on follow up and complications)

	OAGB (*N* = 23)	OLGIBP (*N* = 17)
% TWL at 3 years	43.6 + − 6.2	48.2 + − 7.4
Bile reflux at 3 years	5 (21.7%)	3 (17.6%)
Conversion en RYGB	2 (8.7%)	1 (5.9%)
Malnutrition (albumin)	0 (0%)	0 (0%)
Vitamin deficiency	1 (4.3%)	1 (5.9%)

N number, *OAGB* one anastomosis gastric bypass, *OLGIBP* omega loop gastroileal gastric bypass, *BMI* body mass index, *TWL* total weight loss, *RYGB* Roux-en-Y gastric bypass

Single Anastomosis Gastro Ileal (SAGI)

Multicenter data collection on 420 patients

Anthropometrics

N of Patients	112 patients as primary surgery	121 patients after AGB	160 patients after SG	27 patients after OAGB
Age	37, 1 years	39.4 years	38.2 years	44.1 years
BMI first operation		47.1	48.0	47.3
BMI at SAGI surgery	53.1	42.3	41,3	39.3
Body Weight at SAGI surgery	141.7 kg	117.9 kg	112.6 kg	107.9 kg
Months between operations		83.6 months	61.7 months	37.4 months

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Weight Loss (BMI)

BMI at SAGI operation	53.1 primary (112 pts)	42.3 after AGB (121 pts)	41.3 after SG (160 pts)	39.3 after OAGB (27 pts)
BMI at 1 year	42.4 (88 pts)	37.2 (100 pts)	38.0 (131 pts)	34.2 (20 pts)
BMI at 2 years	39.3 (71 pts)	33.3 (86 pts)	34.5 (110 pts)	33.2 (12 pts)
BMI at 3 years	38.1 (55 pts)	31.3 (70 pts)	33.1 (64 pts)	31.5 (7 pts)
BMI at 4 years	34.4 (33 pts)	31.0 (31 pts)	33.2 (31 pts)	30.2 (7 pts)
BMI at 5 years	34.5 (12 pts)	30.5 (21 pts)	31.3 18 pts)	30.3 (3 pts)
BMI at 6 years	33.0 (7 pts)	29.1 (19 pts)	30.2 (10 pts)	28.3 (1 pts)

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Complications

Mortality: 0

Reoperation rate 1.9% (8 cases)

1 blleeding of the gastric pouch	1st post-op day
1 incisional hernia	34° post-op day
1 internal hernia	8° post-op month
1 untractable GERD	14° post-op month
4 malnutrition vs diarrohea	13°, 21°, 23°, 33° post-op month

Single Anastomosis Gastro Ileal (SAGI)

Conclusion

- SAGI as a variant of MGB/OAGB is based on solid (and old!!) physiopathologic principles.
- SAGI is a safe and easy malapsorbitive procedure.
- It is a mixed restrictive and malbsorpitive procedure, mainly malabsorpitive in the long-term
- SAGI main indications are:

1) Insufficient weigh loss or weight regain after **Gastric Banding** and **Sleeve Gastrectomy**
2) Insufficient weight loss or weight regain after **OAGB**
3) Primary surgery for OAGB candidate patients with short small bowel

- In general the measurement of entire small bowel for patients candidate to OAGB **can avoid severe hypoalbuminemia,** anemia and/or malabsorption when there is a short small bowel
- Standardization and studies on long term results are necessary

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Thanks!

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