

## Original Article



**Received:** Apr 5, 2025  
**Revised:** Apr 10, 2025  
**Accepted:** Apr 12, 2025  
**Published online:** Apr 23, 2025

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### Funding

No funding was obtained for this study.

### Conflict of Interest

None of the author has any conflict of interest.

### Presentation

This paper was presented at IFSO APC 2025  
India.

# Early Surgical Outcomes of Metabolic and Bariatric Surgery for Super Obesity in Korean Morbidly Obese Patients

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## ABSTRACT

**Purpose:** To know about the feasibility and effectiveness of metabolic/bariatric surgery (MBS) in Korean super obese patients.

**Materials and Methods:** We reviewed the medical records of 18 super obese (body mass index [BMI]  $\geq 50$  kg/m<sup>2</sup>) patients among 131 morbidly obese patients who underwent MBS at Incheon St. Mary's Hospital, the Catholic University of Korea from May 2011 to July 2024 and investigated the early surgical outcomes of these patients.

**Results:** Male/female ratio was 10 to 8, the mean age was  $35.4 \pm 10.6$  year, the mean body weight was  $161.6 \pm 35.2$  (range 112.9–241) kg, and the mean BMI was  $58.3 \pm 8.2$  (range 50.0–78.7) kg/m<sup>2</sup>. Sleeve gastrectomy (SG) was performed in 10 patients, SG plus procedure (SG+) in 5 patients, single anastomosis duodenoileal bypass with SG (SADI-S) in 2 patients and long biliopancreatic limb Roux-en-Y gastric bypass (LBPL RYGB) in 1 patient. The mean operation time was  $170.3 \pm 64.5$  minute and the mean postoperative hospital stay was  $9 \pm 4.6$  day. There was no postoperative morbidity and no mortality. The percentage of total weight loss at 1 year after surgery was  $34.3 \pm 0.6\%$  in SG,  $23.1 \pm 3.2\%$  in SG+,  $45.8 \pm 4.5\%$  in SADI-S and 47% in LBPL RYGB.

**Conclusion:** MBS was feasible and effective in Korean super obese patients. However, SG+ was less effective than expected in these patients.

**Keywords:** Metabolic surgery; Bariatric surgery; Morbid obesity; Super obesity; Korea

## INTRODUCTION

Super obesity (body mass index [BMI]  $\geq 50$  kg/m<sup>2</sup>) is associated with a substantially increased risk of morbidity and mortality. While bariatric surgery is established as an effective intervention for morbid obesity, its efficacy and safety in super obese populations remain less well characterized. Super obese patients, compared to those with BMI 35–49.9 kg/m<sup>2</sup>, often have more severe comorbidities, higher perioperative risk, and potentially different postoperative metabolic adaptations, which may require tailored surgical strategies. In general, malabsorptive procedures like duodenal switch or single anastomosis duodenoileal bypass with sleeve gastrectomy (SADI-S) has been suggested [1,2]. Some surgeons prefer one anastomosis gastric bypass over sleeve gastrectomy (SG) or classic Roux-en-Y gastric bypass (RYGB) [3,4] and some prefer long biliopancreatic limb RYGB (LBPL RYGB) over classic RYGB [5].

In this study, the author investigated short term outcomes of metabolic and bariatric surgery (MBS) in Korean morbidly obese patients whose BMI is 50 kg/m<sup>2</sup> or more in order to know about the feasibility and efficacy of MBS in these patients and to explore the best solution for these patients.

## MATERIALS AND METHODS

The author reviewed medical records of 18 patients whose BMI 50 kg/m<sup>2</sup> or more and underwent MBS at Incheon St. Mary's Hospital, the College of Medicine, The Catholic University of Korea from 2019 to 2023. The types of surgeries performed in this study were SG, SG plus procedure (SG+), SADI-S and LBPL RYGB. In SG+ procedure, SG with loop duodenojejunal bypass (LDJB) and SG with proximal jejunal bypass (PJB) were performed.

In SG with LDJB, duodenojejunal anastomosis was performed at 2 m from the ligament of Treitz and in SG with PJB, the length of bypassed jejunal segment was 2.5 to 3 m. In SADI-S, duodenoileal anastomosis was performed at 3 m proximal from the ileocecal valve. In LBPL RYGB, the length of BPL was 2 m and the length of Roux limb was 1 m.

The definition of 'resolution of T2DM' in this study was HbA1C 6.5% or less without any medication.

Statistic analyses were conducted using descriptive statistics in most cases. All values were reported as mean±standard deviation. Student's t-test was used for continuous variables.

## RESULTS

### 1. Early general surgical outcomes

There were 10 male and 8 female patients and the mean age of the patients was 35.4±10.6 year. The patients had mean 3±1.4 comorbidities. Ten patients underwent SG, five patients underwent SG+, two patients underwent SADI-S and one patient underwent LBPL RYGB. In SG+, one patient underwent SG with LDJB and four patients underwent SG with PJB. The mean body weight (BW) of the study group was 161.6±35.2 (range 112.9–241.0) kg and the mean BMI was 58.3±8.2 (range 50.0–78.7) kg/m<sup>2</sup>. The mean operation time was 170.3±64.5 minute. The mean hospital stay was 9.0±4.6 day. There was no postoperative complication and no mortality. The mean BW, the mean BMI, the mean operation time and the mean hospital stay of the SG group (n=10) were 154.2±23.4 kg, 54.9±5.6 kg/m<sup>2</sup>, 126.7±28.5 minute and 7.2±2.3 day, the SG+ group (n=5), 139.8±18.2 kg, 56.3±2.6 kg/m<sup>2</sup>, 200.8±36.5 minute and 8.8±5.5 day, the SADI-S group (n=2), 232.0±12.7 kg, 75.3±4.1 kg/m<sup>2</sup>, 287.5±67.2 minute and 17.5±3.5 day, and the LBPL RYGB (n=1), 203.6 kg, 68.0 kg/m<sup>2</sup>, 220.0 minute and 11.0 day (**Table 1**).

**Table 1.** Early general surgical outcomes

| Type of surgery | BMI (kg/m <sup>2</sup> ) | Operation time (minute) | Hospital stay (day) | Complication | Mortality |
|-----------------|--------------------------|-------------------------|---------------------|--------------|-----------|
| SG (n=10)       | 54.9±5.6                 | 126.7±28.5              | 7.2±2.3             | -            | -         |
| SG+ (n=5)       | 56.3±2.6                 | 200.8±36.5              | 8.8±5.5             | -            | -         |
| SADI-S (n=2)    | 75.3±4.1                 | 287.5±67.2              | 17.5±3.5            | -            | -         |
| LBPL RYGB (n=1) | 68.0                     | 220.0                   | 11.0                | -            | -         |
| All (n=18)      | 58.3±8.2                 | 170.3±64.5              | 9.0±4.6             | -            | -         |

BMI = body mass index, SG = sleeve gastrectomy, SG+ = sleeve gastrectomy plus procedure, SADI-S = single anastomosis duodenoileal bypass with sleeve gastrectomy, LBPL RYGB = long biliopancreatic limb Roux-en-Y gastric bypass.

## 2. Weight loss outcome at 1 year after surgery

The mean BW, the mean BMI and the mean percentage of total weight loss (%TWL) at 1 year after surgery of SG group (n=10) are 106.1±22.0 kg, 36.1±6.1 kg/m<sup>2</sup> and 33.8±8.0%, SG+ group (n=5), 111.3±5.2 kg, 42.8±1.3 kg/m<sup>2</sup> and 23.9±2.7%, SADI-S group (n=1), 128 kg, 41.8 kg/m<sup>2</sup>, and 42.6%, LBPL RYGB group (n=1), 108 kg, 35.7 kg/m<sup>2</sup> and 47.0%. %TWL at 1 year after surgery of SG+ group was significantly worse than that of SG group (P=0.001) (Table 2, Fig. 1).

## 3. Resolution of diabetes at one year after surgery

Type 2 diabetes mellitus (T2DM) was observed in 10 patients (5 in SG, 4 in SG+, 1 in SADI-S and none in LBPL RYGB). Resolution rate of T2DM at 1 year after surgery was 100% in SG group (5/5), 25% in SG+ group (1/4) and 100% in SADI-S group (1/1).

## DISCUSSION

The main MBS procedure for morbid obesity at author's institution is SG like at most other institutions. This policy is not different in the treatment of patient whose BMI is 50 kg/m<sup>2</sup> or more because similar outcomes could be expected [6]. However, SG+ procedure is more vigorously used in these patients. When the patients have mild T2DM and the BMI is 50 kg/m<sup>2</sup> or more, the author usually chooses SG with PJB and when the patents have severe T2DM the author chooses SG with LDJB. When the patients whose BMI is between 35 and 50 kg/m<sup>2</sup> have mild T2DM the author usually chooses SG alone and when these patients have severe T2DM the author chooses SG with PJB first and sometimes SG with LDJB according to the severity of T2DM. Malabsorptive procedure like SADI-S is usually performed in patients whose BMI is around 70 kg/m<sup>2</sup> or more and if these patients have severe gastroesophageal reflux disease preoperatively, LBPL RYGB is performed instead. These conservative policies, especially associated with control of T2DM, were derived from the concern about severe postoperative hypoglycemia that could be resulted from bypass procedures [7,8].

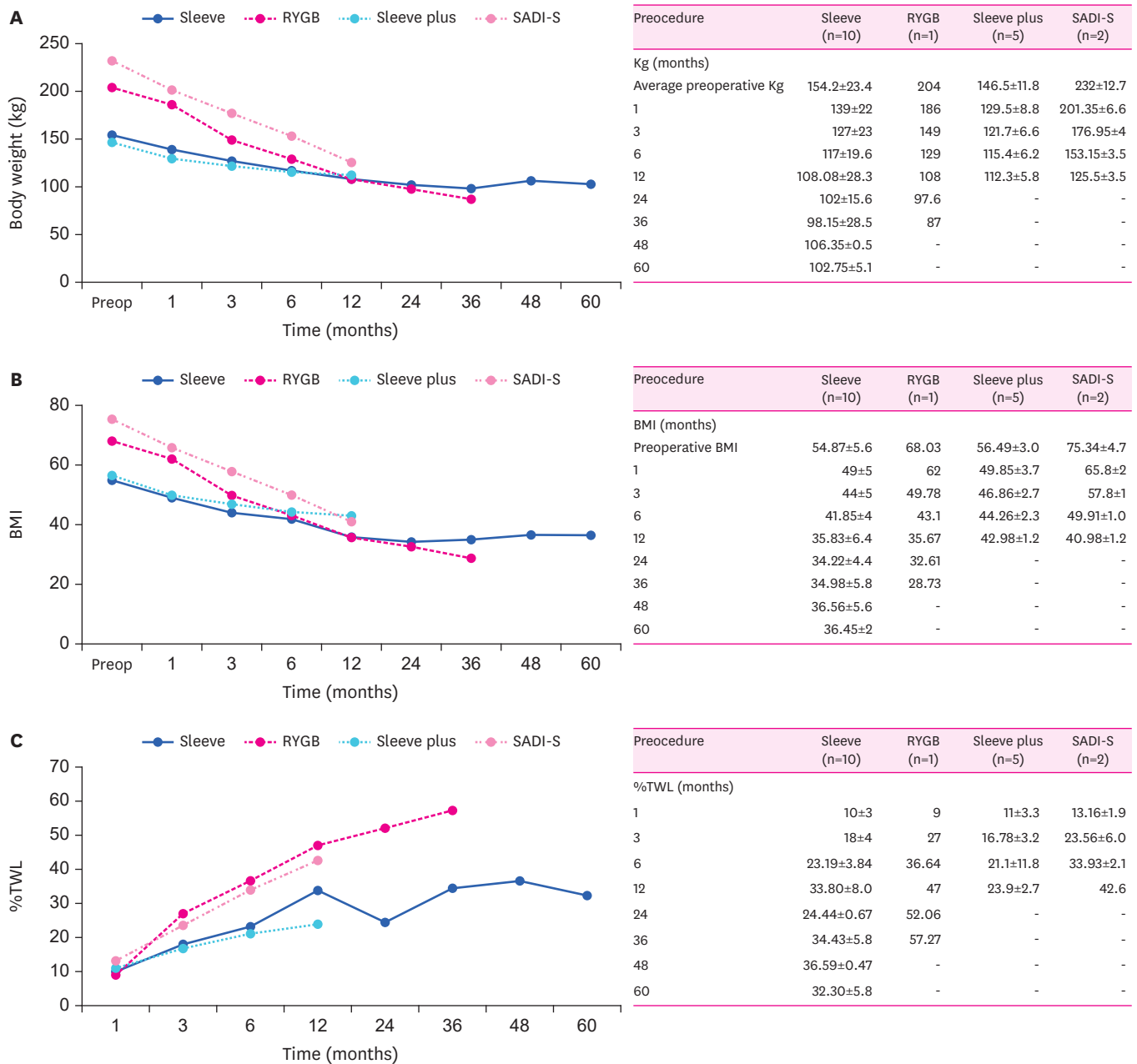
MBS was safe and feasible in the treatment of super obesity at author's institution because the early general surgical outcomes were acceptable although the number of patients is small. %TWL at 1 year after surgery of SG group was acceptable but %TWL at 1 year of SG+ group was significantly lower than that of SG group (23.9±2.7% vs. 33.8±8.0%, P=0.001) and unacceptable. The reason for this phenomenon is quite unsure and out of the common sense. Most (four out of five patients) of the patients of SG+ were diabetics and one patient who underwent SG with LDJB had severe T2DM. The life style of these patients may be more unfavorable to the weight loss outcome than that of the patients in SG group. In other words, these patients may need more powerful surgical methods than SG+ that contains proximal small bowel bypass. On the other hand, five out of ten patients in SG group had T2DM and three out of these five patients were diagnosed during the preoperative work up. This difference in patient's characteristics may be one possible reason for this unexpected phenomenon. The resolution rate of T2DM at 1 year after surgery of SG group

**Table 2.** The weight loss outcome at 1 year after surgery

| Type of surgery | Preop BW (kg) | 1 year BW (kg) | Preop BMI (kg/m <sup>2</sup> ) | 1 year BMI (kg/m <sup>2</sup> ) | 1 year %TWL (%) |
|-----------------|---------------|----------------|--------------------------------|---------------------------------|-----------------|
| SG (n=10)       | 154.2±23.4    | 106.1±22.0     | 54.9±5.6                       | 36.1±6.1                        | 33.8±8.0        |
| SG+ (n=5)       | 139.8±18.2    | 111.3±5.2      | 56.3±2.6                       | 42.8±1.3                        | 23.9±2.7        |
| SADI-S (n=2)    | 232.0±12.7    | 128            | 75.3±4.1                       | 41.8                            | 42.6            |
| LBPL RYGB (n=1) | 203.6         | 108            | 68.0                           | 35.7                            | 47.0            |

BW = body weight, BMI = body mass index, %TWL = percentage of total weight loss, SG = sleeve gastrectomy, SG+ = sleeve gastrectomy plus procedure, SADI-S = single anastomosis duodenoileal bypass with sleeve gastrectomy, LBPL RYGB = long biliopancreatic limb Roux-en-Y gastric bypass.

# Outcomes of MBS for Super Obesity



**Fig. 1.** The change in weight loss outcome. (A) Body weight change. (B) BMI change. (C) %TWL change.

RYGB = Roux-en-Y gastric bypass, SADI-S = single anastomosis duodenoileal bypass with sleeve gastrectomy, BMI = body mass index, %TWL = percentage of total weight loss.

was 100% (5/5), that of SG+ group was 25% (1/4) and that of SADI-S group was 100% (1/1). The significantly lower percentage of total weight loss and reduced diabetes resolution rate observed in the SG+ group compared to the SG group may be attributable to several interrelated factors. First, technical heterogeneity within the SG+ group, which includes different types of intestinal bypass procedures (LDJB and PJB), could result in variable malabsorptive effects and hormonal responses that influence weight loss and glycemic control. Second, patients undergoing SG+ may represent a subgroup with more complex metabolic disease or more severe insulin resistance, thereby requiring more aggressive interventions than a proximal small bowel bypass alone. Third, psychosocial factors such as

adherence to postoperative dietary guidelines, physical activity levels, and access to follow-up care may disproportionately affect outcomes. These findings underscore the need for prospective studies with larger cohorts to validate the effectiveness of SG+ in super obese patients and to explore whether extended limb lengths or alternative bypass strategies may yield superior outcomes.

To better understand the metabolic impact of each procedure, future studies should report and compare pre- and postoperative metabolic markers, such as fasting glucose, HbA1c, lipid profiles, liver enzymes, and blood pressure. These clinical parameters provide essential information about the mechanism of weight loss and are often as important as the weight loss itself when determining long-term success of bariatric surgery. Moreover, it is beneficial to classify outcomes not only by type of surgery but also by presence or absence of pre-existing metabolic conditions such as hypertension, T2DM, or dyslipidemia.

The limitations of this study are first, retrospective nature of this study, second, the number of patients is small, third, the follow-up period is only one year. Therefore, there could be a lot of bias in this study. However, to the author's knowledge, this is the first report about the surgical outcomes of MBS in super obesity in Korea.

## CONCLUSION

In conclusion, MBS in super obesity was safe and feasible. The early surgical outcomes were acceptable. However, SG+ procedure that includes proximal small bowel bypass may not be effective in weight loss and in resolution of severe T2DM in super obesity.

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