



## A Singular Case of Anterograde Intussusception, Internal Hernia and Volvulus of the Blind Limb after Conversion Surgery to SAJI for Failed L-RYGB

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### Abstract

Single Anastomosis Jejunum Ileal Bypass (SAJI) is an option in conversion bariatric surgery for patients with Deficient Weight Loss (DWL) or Weight Regain (WR) after Laparoscopic Roux-En-Y Gastric Bypass (L-RYGB). We present a case of simultaneous anterograde intussusception, twist/volvulus and internal hernia of the blind jejunal limb as a complication following SAJI. A 41-year-old female was re-operated on in urgency, 40 days post-laparoscopic SAJI. Adhesiolysis, untwisting the small bowel, internal hernia and intussusception reduction were successfully carried out. A segmental blind limb was removed. This triad is a possible complication as in primary bariatric surgery also in redo surgery, therefore performing SAJI we recommend to close the new mesenteric defect by absorbable suture and to routinely fix the blind limb. In alternative to remove it if greater than 50 cm in length.

**Keywords:** Intussusception; Volvulus; Internal hernia; Conversion surgery; SAJI; S-RYGB

### Introduction

Deficient Weight Loss (DWL) or Weight Regain (WR) and control failure of related metabolic syndrome, after Laparoscopic Roux-En-Y Gastric Bypass (L-RYGB) occurs in  $\leq 35\%$  of cases [1]. Therefore failure has led to an increase of redo surgery as an additional option that may be applied [2]. No standardized approach has been reached on the best conversion technique for these patients [3]. The L-RYGB to Single Anastomosis Jejunum-Ileal bypass (SAJI) conversion is not well described, because it's an emerging malabsorptive procedure (distal RYGB – Type 1 and SAGI variant). However more studies are needed for proper comparison and to explore its technical effectiveness [4-7]. According to Nimeri A. [5] and the review of the current literature [6], from 2017 to date, our results of one center, one surgeon's experience of 33 procedures of laparoscopic SAJI, allow us to believe that lengthening of the bilio-pancreatic limb (distal RYGB – Type 1) but as a variant, on the other hand, shortening of the alimentary limb by a new Single Anastomosis Jejunum-Ileal bypass (SAJI), 25 cm distal to the previous Gastro-Jejunal (GJ) anastomosis, is a technical useful and safe option and also more effective to treat DWL or WR. The final result will be that CC will have a fixed distance of approximately 275 cm and TALL will be not more than 300 cm. All this is similar to the Single Anastomosis Gastro-Ileal bypass (SAGI), also according to De Luca M. et al. [7] (Figure 1).

In our opinion why SAJI procedure is technical useful, safe option and also more effective? Because it avoid surgical major complications arising working on the gastric pouch, the gastric remnant, or the liver, ECC. Especially due to altered anatomy and firm adhesions following the primary procedure, we recommend do not disassemble the Pouch/Gastro-Jejunal (GJ) anastomosis of the primary procedure (L-RYGB), but to dissect the jejunum about 25 cm under the anastomotic complex. This technical difference avoids bile reflux; allow us also to spare operative time (mean 60 min  $\pm$  30 min) and hospital stay (mean 3 days  $\pm$  1 day). The conversion of L-RYGB to SAJI requires only a new single Jejunum-Ileal (JI) anastomosis, omega loop side-to-side jejunum-ileostomy at 275 cm proximal to the ileocecal valve and 25 cm distal to the previous Gastro-Jejunal (GJ) anastomosis. Therefore, we first perform an interruption of the jejunum using a linear stapler 25 cm under the previous GJ anastomosis and then we perform the new mechanical side-to-side single Jejunum-Ileostomy (JI). At the end of this procedure we have also created a blind limb (Figure 1). However, the development of the new bariatric procedures corresponds to an increase in short

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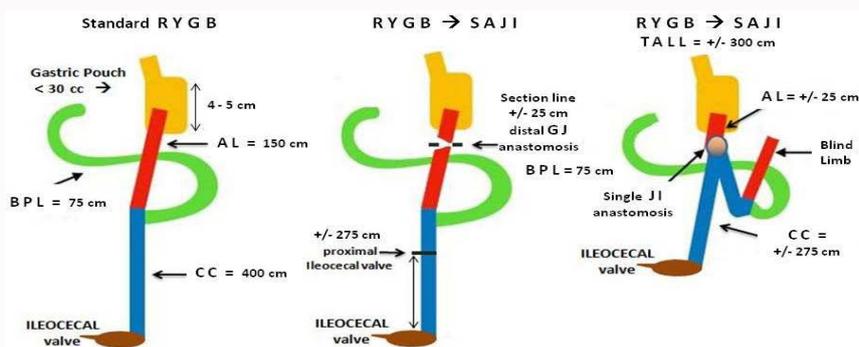
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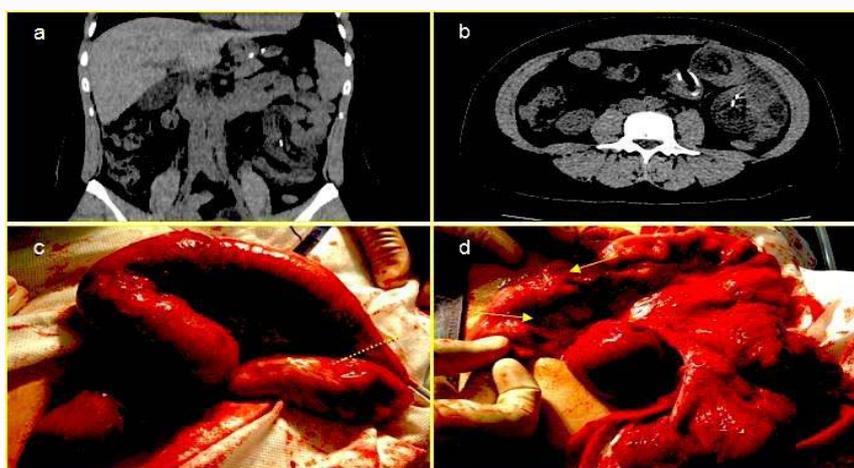
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**Figure 1:** Schematic representation of the conversion procedure from standard RYGB to SAJI.

RYGB: Standard Roux-en-Y Gastric Bypass; SAJI: Single Anastomosis Jejunio-Ileal bypass; BPL: Bilio Pancreatic Limb; AL: Alimentary Limb; CC: Common Channel; TALL: Total alimentary limb length; GJ: Gastro-Jejunal; JI: Jejunio-Ileal



**Figure 2:** (A) Coronal view of the abdomen CT scan with “donut shape” and (B) Axial view with “thickening and hypodensity” of the jejuna blind limb intussusception in the left side of the abdomen, before J-J Roux anastomosis. (C) Intraoperative findings: Intussusception, twist/volvulus and internal hernia of the blind limb. (D) Intraoperative image after untwisting the blind limb, reduction of the internal hernia and intussusception. The arrows indicate the JJ Roux-anastomosis and the mesenteric defect. The dashed line indicates the intussusception limit.

and long-term complications. Intussusception (0.1% to 1.2%), volvulus (2.1%) and internal hernia (0.9% to 5.6%) are rare surgical complications described following primary L-RYGB, but they have not been described, in the current literature, for a bariatric conversion procedure such as SAJI [8]. We describe a case treated in our center, of a simultaneous anterograde intussusception, twist/volvulus and internal hernia of the blind jejunal limb as a singular complication following SAJI.

**Case Presentation**

First in October 2017, a 38-year old female underwent to LS-RYGB for severe obesity with Arterial Hypertension (AHT). The BMI was 53 Kg/m<sup>2</sup>, Weight (W) 130 Kg, Excess BMI (EBMI) 29, Excess Weight (EW) 72 Kg. Then in January 2020, the BMI was 35 Kg/m<sup>2</sup>, Weight (W) 85 Kg, Excess BMI (EBMI) 11, Excess Weight (EW) 27 Kg. Upper gastrointestinal and esophagogastroduodenoscopy showed no evidence of fistula with a normal pouch diameter and length, with stoma size of 2.5 cm. Blood test showed no significant micro/macronutrient deficiencies. Due to a morbid obesity refractory to L-RYGB it was our belief that conversion to SAJI was the best alternative compared to distal RYGB or SAGI. So she was re-operated on laparoscopic SAJI for Deficient Weight Loss (DWL). Then in March, 2020 the patient was readmitted to the emergency department,

26 months post L-RYGB as primary procedure for morbid obesity and 40 days post laparoscopic SAJI for DWL. The patient had a negative medical history and was not taking any medications. She denied trauma or trigger for the pain. However she complained of non specific, intermittent abdominal pain about 5/10, several days before the readmission without recurrent bowel obstruction and bleeding per rectum. At the emergency room she presented with no fever, a history of abdominal pain gradually worsening to 10/10. Clinically the patients was vitally stable and were no signs/symptoms of Small Bowel Obstruction (SBO), no palpable mass, no bloody stools but exquisite abdominal tenderness to palpation localized in the left upper quadrant. Laboratory results showed a mild leukocytosis and metabolic acidosis. Abdominal Computed Tomography (CT) scan revealed “target signs” as it happens approximately in 81% of cases [9]. They were present “wall thickening and hypodensity” of the small bowel without dilatation and the characteristic “donut shape”, due to jejuno-jejunal intussusception before JJ Roux anastomosis, was evident. Not clear was the “mesenteric swirling” of the mesenteric vessels or fat (Figure 2a, 2b). In our case due to difficulty in identification and in finalizing a specific diagnosis, emergency laparotomy was necessary and a midline incision was performed. The intraoperative findings confirmed the small bowel intussusception caused by telescoping invagination of the mechanical sutured head

of the jejunal blind loop into itself, up to a few centimeters before the JJ Roux anastomosis that was normal. The intussusception was anterograde with the afferent limb constituting the intussusceptum. The mesenteric twist/volvulus on itself and internal hernia through the mesenteric defect were present (Figure 2c). The procedure included adhesiolysis, untwisting the small bowel, internal hernia and intussusception reduction (Figure 2d). The entire segmental edematous blind limb with bluish color, almost 100 cm from the head of telescoping tract, was removed by linear stapler. The remaining was fixed to BP limb by running suture V-Loc TM 90, 3-0 size, and the closure of the mesenteric defect completed the surgical procedure as to prevent recurrence. The patient had an unremarkable post-operative course, not including ICU stay. She started eating the day after surgery; no complications were observed in the ward and have been discharged on PO day 4. On outpatient follow up, 4 weeks later she had no complaints or further complications.

## Discussion

In 2019, the first consensus statement on Revisional Bariatric Surgery (RBS), published on Surgical Endoscopy, has stressed that lengthening of bilio-pancreatic limb (Type 1 - Sugermann) was the only consensus RBS option after RYGB (94.3%) [3]. In order to reduce failure rates, Protein Calorie Malnutrition (PCMN) and vitamin deficiencies we think that for a conversion procedure [5,6], according with the consensus statement on RBS, we must push on the malabsorptive aspect at expense of the common channel (CC= +/- 275 cm) but in our opinion also at the expense of the alimentary limb (AL = +/- 25 cm). The total alimentary limb length will be +/- 300 cm (TALL = +/- 300). This procedure is technically easily feasible and safer, sectioning +/- 25 cm under the previous Gastro-Jejunal (GJ) anastomosis and then simply counting from the ileocecal valve, almost 275 cm of ileum. Then to conclude we perform the new side to side single jejuno-ileostomy at 275 cm proximal the ileocecal valve. It remains a blind loop on the Roux limb. To date, we have not fixed it by an absorbable suture nor removed in order to avoid further dissections or bleeding from mesentery and sparing operative time. This procedure represents the conversion of the L-RYGB to SAJI (Figure 1). Our results of laparoscopic SAJI encourage it as an effective conversion procedure but however we need further analysis about the Blind Loop Syndrome (BLS) and Small Bowel Bacterial Overgrowth Syndrome (SBBOS). Unfortunately the patient of this case report (3.0% - 1/33), complained a singular triad of complications such as intussusception, twist/volvulus and internal hernia that have not been described to present simultaneously after a conversion surgery procedure. In our case probably the unusual lead point is represented by mechanical linear stapler section of the blind loop. Also impaired peristaltic movements and postoperative adhesions played a role of absolute importance in development of anterograde/isoperistaltic telescoping, twisting and internal hernia of the jejunal blind loop, but the length of the limb, the free movements of the loop, can also promote them. Usually these complications occur with bowel obstruction at the JJ anastomosis in primary L-RYGB patients but in SAJI conversion, we must suspect the intussusception of the blind loop when clinically there are not signs and symptoms of SBO. In the SAJI procedure, volvulus at the gastro-jejuno-stomy has never been described maybe the previous anastomosis is not dismantled and is often fixed by adhesions. Internal hernia post L-RYGB involves a loop of bowel that herniated through the mesenteric defect acquired during the primary surgery which enlarges at the end of weight loss. Incidence of internal hernia after L-RYGB has been shown to

decrease when a mesenteric defect is closed intra-operatively, an antecolic approach and a "double loop" technique is utilized (0.9% to 4.5%), but the conversion to other procedures change the anatomical aspect creating a new mesenteric port, therefore it may also occur, perhaps even more frequently.

## Conclusion

According with the recent increase in the bariatric redo surgery, there are developing many complications that general surgeons must face. Knowledge of these can guide in prevention and treatment. The proposed SAJI after failed L-RYGB has had a very good outcome and not bile reflux in our short series. It is not technically challenging, has a steep learning curve and is easily reproducible. We did not have anastomotic complications or 30-days perioperative mortality. We hope therefore in the next future that it could be safely integrated into a redo bariatric treatment program. Performing SAJI conversion procedure, in order to prevent the above complications we recommend closing the new mesenteric defect and in all cases to routinely fixing by absorbable suture the blind limb. In alternative we recommend to remove it, if greater than 50 cm in length in order to avoid the Blind Loop Syndrome (BLS) and Small Bowel Bacterial Overgrowth Syndrome (SBBOS). We think it is difficult to make a differential diagnosis between BLS and normal symptoms after revisional surgery due to the overlap. However a combination of probiotic strains has been found to produce better results than therapy with the antibiotic drug metronidazole.

We performed an exhaustive current literature review, and we think that the presented surgical complications following SAJI are the first one, so we need further cases for a better analysis and conclusion.

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