

## Duodenal switch. A switch to the duodenal switch.

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### ABSTRACT:

**Background:** The duodenal Switch (DS) combines a Sleeve-forming gastrectomy (SFG) and a bilio-pancreatic diversion (BPD).

**Objectives:** To report on 950 DS patients treated from 1994 to 2011.

**Environment:** Regional teaching hospital and private institution.

**Methods:** Prospective study of 950 consecutive patients treated with CD.

**Results:** There were 518 open DS (ODS) and 432 laparoscopic DS (LDS). Surgical mortality of 0.73% (1.6% in CDA and 0.47% in CDL), 4.84% incidence of leakage, two liver failure (0.2%) and protein calorie malnutrition (PCM) in 3.1%. At 5 years, the %EWL drops by 80% and the Expected BMI by 100%.

**Conclusions:** The CD is the most aggressive bariatric technique, with the best long-term weight loss. Operative complications and long-term follow-up guidelines are described. The aim is to change the bariatric techniques to accept the CD.

### Keywords:

- Duodenal junction
- Bariatric surgery
- Vertical gastrectomy
- Bilio-pancreatic diversion
- Poliphenols.

## Introduction

The Duodenal Switch (DS) is a mixed operation that consists of two techniques, a gastric surgery, the Sleeve-forming Vertical Gastrectomy (SFG) to reduce intake and also an intestinal surgery, the bilio-pancreatic diversion (BPD) that produces intestinal malabsorption (Fig.1). It is the most complex operation in Bariatric Surgery (BS).

Scopinaro published the results of BPD in 1980 [1]. Hess [2] describes it as: 1) VG eliminates major gastric curvature, reduces gastric volume, and intake and allows for normal emptying; 2) BPD derives post-pylorus intake from duodenum to ileum, to cause malabsorption,

Hess [3] recommends measuring the entire small intestine, without tension, from Treitz to the ileocecal valve and uses 50% of its proximal length as a Bilio-Pancreatic Loop (BPL), 40% as a Alimentary Loop (AL) and 10% as a Common Loop (AC). Marceau [4,5] made standard BDP until 1991 and then switched to DS and is the first author to publish [6] in 1993 parietal gastrectomy plus BPD.

Lagacé [7] reported in 1995 the first good results of the DS in 61 patients and Marceau [8] in 1998 compared 252 BPD with distal gastrectomy and 465 DS and an operative mortality of 1.7%.

The DS [9-26] become standardized in the 1990s (Fig.1). Hess [9] sutures and invaginates the gastric division serosa to cover the staples of the VG and in the following 188 cases eliminated the leak in the staple line. Ren [27] publishes the first complete LDS in October 1999 and Baltasar [28] the 1st LDS in Europe in 10.5.2000 [29]. Paiva [30] in Brazil and Scopinaro [31] in Italy started the standard laparoscopic DBP in 2000.

## Material and method

From 1994 to 2011, 950 MO patients, 518 open (ODS) and 432 laparoscopic (LDS) were operated on after full multidisciplinary preoperative evaluation and informed consent. 782 were women (82.3%) and 168 men (17.7%). The average age was 35 years (24-63). 474 were foreign citizens (350 Americans, 26 Canadians, 73 Norwegians and 25 English) were operated on in a private center by the same team.

The average Initial Body Mass Index (IMCI) (Kg/m<sup>2</sup>) was 49.23 (Women - 49.26 and Men - 49.07). Obesity range: a) Non-severe obesity, grade 2 with comorbidities (IMCI <40), 110 patients (mean 37.66); b) Morbidly Obese (IMCI 40-50), 464 patients (mean 45.11); c) Super-obese - (SO) (BMI 50-60), 272 patients (mean 54.32) and d) patients with Triple Obesity (TO) and IMCI > 60, 104 patients (mean > 66.50). One patient had IMCI-100.

## Description of surgical techniques

### Open DS (ODS) by transverse laparotomy

The patient is in Trendelenburg position. A transverse supraumbilical incision is made between both costal margins (Fig.2 a-b). The round and falciform ligaments are divided. The gallbladder and appendix are removed.

The entire small intestine is measured from the ileocecal valve and 10% of the distal intestine (approx.100 cm) is used as a *Common Loop* (AC) and marked with a clip. The most proximal 40% is the Alimentary Loop (AL) which is divided with a proximal linear stapler (approx. 200 cm). In total, 300 cm between AL plus AC. The Bilio-pancreatic loop (BPL) starts at D-1 and is the remaining 50% proximal.

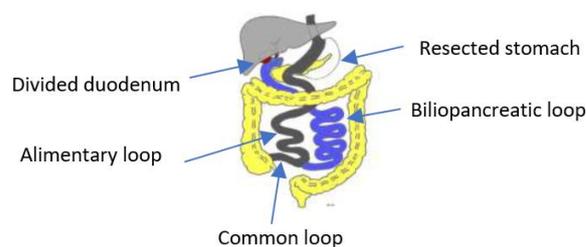


Fig. 1. Duodenal Switch = SFVG + BPD

The distal AL joins in a anastomosis jejunum-ileal end-to-side in Roux Y anastomosis (RYA) with continuous monoplane resorbable suture at the union of BPL and AC. The mesenteric defect is closed with a non-absorbable suture.



Fig. 2. A) Incision; b) Invisible scar; c) Supra pubic dermo-lipectomy

A 12 mm nasal-gastric tube is passed into the lesser curvature, which is used as a guide, for dividing and stapling the stomach lesser curvature starting at the pylorus to form the sleeve.

The entire major gastric curvature is de-vascularized starting 3 cm distal to the pylorus up to the angle of His. Both gastric walls, posterior and anterior to the staple-line, previously separated omentum, are joined with a continuous inverting suture to avoid torsion of the gastric tube and leaks.

A retro duodenal tunnel is created at D1 level, distal to the right gastric artery, to divide the duodenum with a linear stapler before the Oddi sphincter. The distal duodenal stump is reinforced with continuous inverting suture.

The proximal AL passes retro-colic to the right and a continuous Duodeno-Ileal Anastomosis (DIA) is performed. The operation has four suture lines (gastric reinforcement, ADI, RAY and the distal duodenal stump) and drains are placed, one next to the gastric tube and another in the ADI.

The abdomen is closed in two layers with continuous Maxon. After weight loss, the scar length shortens by one-third (Fig. 2b) and allows the upper transverse wound to descend to the pubic area in abdominoplasty at body contouring surgery (BCS) (Fig. 2c). We started CDA on 3.17.1994 and the average surgical time was 91 minutes.

<https://www.youtube.com/watch?v=s2WI8Jf4Jqk> [14]

#### Laparoscopic DS (LDS)

It's also done by three surgeons, each one doing a manual anastomosis. Six ports are used [35-38]. The optical trocar, Ethicon #12's "main working port" enters under direct view into the abdomen, at the lateral edge of the right rectus muscle, three finger traverses below the costal margin. To prevent slippage, we use ® Termanian non-disposable trocars. The 10 mm central supraumbilical port is used for the midline camera.



Fig 3. Placement of trocars

Four other 5 mm ports are used, two sub-costal located on the right and left, one in the left hypochondrium and the other in the epigastrium used to retract the liver (Fig 3). The rest of the procedure is as in the open technique.

All are anastomosis are hand-sewn with a continuous monolayer suture [32,35]. They begin with the sliding and self-locking point of Serra-Baltasar [36-37] and end with the Cuschieri knot [38]. The intestine is measured with marked clamps 5 cm apart to avoid injury to the intestinal serosa. The mesenteric defect is closed with continuous non-absorbable suture. The stomach is removed without a protective pouch. A Maxon suture closes the 12 mm port fascia. We started the LDS in 5.10.2000 [35]. The average operating time was 155' after the first 50 cases.

<https://www.youtube.com/watch?v=Qq70taxuwNk>

At discharge, patients received prescriptions with multivitamin complex (Centrum Forte), vitamin A 20,000 IU,

vitamin D 50,000 IU, calcium carbonate 1000 mg and ferrous sulfate 300 mg.

## Results

**Surgical mortality** within 30 days occurred in ODS (1.6%). The causes were: a) Leakage in the DIA - 1, b) Rhabdomyolysis - 1, c) Pulmonary embolism - 2, d) Leak in the duodenal stump - 1, e) Leak in his angle of His - 1. Two patients with CDL died (0.47%) by pulmonary emboli. The average mortality for both groups was 0.73%.

**Long-term mortality:** Undiagnosed acute appendicitis at two years. Intestinal hernia necrosis at 3 years. There were other causes of death not related to the CD (cancer, melanoma, myocardial infarction, etc.).

**Postoperative morbidity.** Reporting morbidity is an essential part of the technique.

1. **Leaks.** There were 46 leaks for a total leak rate of 4.84%.

a) Esophageal-gastric junction leaks: 21 cases (2.3% incidence). One non-extractable stent [42] was treated with stent and the rest with extractables ones [43] and drainage. Nine patients required total gastrectomy for complications, and all survived with a very acceptable quality of life [44]. Three patients with chronic leakage underwent a Y-de-Roux shunt [45,46] in leakage and this technique, which we began in 2007, is the treatment of choice for this complication when the stent fails [47].

b) Leakage of the duodenal stump. A patient suffered a leak in the duodenal stump and was repaired but died of sepsis. Since then, we protect all stapling of the duodenal stump with an inverting suture and there were no further leaks.

c) DIA leaks: 24 cases (2.5% incidence). ADI is the most difficult anastomosis to perform. There were 19 early leaks successfully treated with drainage or performed anastomosis again, 5 cases presented late leaks (up to 2-14 years later) and needed reoperation and redo anastomosis. In one case, he suffered one gastro-pleural fistula a year and was treated with total gastrectomy [48].

d) Leak at RYA. One patient had a small bowel diverticulum removed 100 cm from the ileocecal valve, and an open RNA was performed without incident. A leak occurred, radiological tests did not clarify the cause, and with a late diagnosis, the patient was re-explored, but died.

2. **Pulmonary embolism.** Two IMCI-70 and IMCI-65 patients had embolism despite prophylactic therapy and died. A deep vein thrombosis was successfully treated.

3. **Liver:** a) Liver disorders. Twelve patients suffered early alterations in their hepatic function [49] with significant elevations of bilirubin (up to 15 and 29) and resolved with medical treatment [50]. There is no evidence of prior publication of this complication.

b) *Liver failure*. Two patients suffered liver failure (incidence of 0.2%). The first occurred 6 months after surgery and was included in the urgent list of liver transplants but died due to lack of a donor. The second suffered liver failure three years after surgery, underwent a successful liver transplant [51] with reversal of BPD. And she's healthy 4 years later. Castillo [52] of Valdecilla Hospital in Santander described the first transplant worldwide after BPD and there are 10 memos published cases in the world [53] and two cases for gastric bypass (DG = gastric bypass) [54].

#### 4. Protein Calorie Malnutrition (PCM)

Nutritional deficiencies such as protein malnutrition, liposoluble vitamins (A, D, E and K), iron, B1, B9, B12, selenium, folate and calcium may appear after the DS, which must be monitored prospectively. In 33 patients (3.3%) PCM appeared and 24 required AC lengthening [55,56] in the form of lateral-lateral "Kiss-X anastomosis". In 13 of them, they were performed without complications by open surgery. In 11 patients, laparoscopic surgery was performed and in two of them, the small intestine was damaged by the dissection forceps. Both leaks were diagnosed and repaired during the operation, but escaped again and, although repaired the same day, died in the ICU [57] from sepsis.

We learned that hernias of the mucosa may occur through the weak muscular wall between the vessels of the mesentery. The dissection forceps easily injure this intestinal wall (Fig. 4) [www.youtube.com/watch?v=Hw\\_aPYLjGXl](http://www.youtube.com/watch?v=Hw_aPYLjGXl).

We do not know of any previous report of this type of hernias. For this reason, at PCM, we recommend doing them by laparotomy.

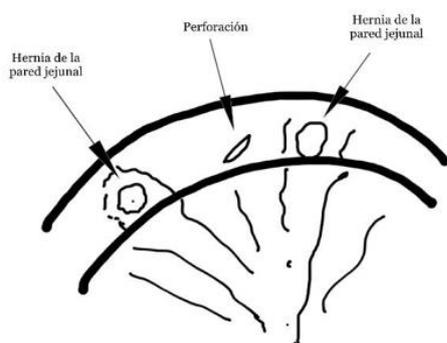


Fig. 4. Hernias in the small intestine

(d) Pancreatic-cutaneous fistula. The pancreatic capsule was injured with laparoscopic instruments and one patient had pancreatic fistulas and skin lesions (Fig. 5) that healed spontaneously [58].



Fig. 5. Skin burns from two pancreatic fistulas

e) Hypoglycemia: Two patients had recurrent episodes of hypoglycemia that required BPD reversal.

f) Evisceration in four cases without consequences after adequate repair.

g) Late intestinal obstruction: 7 cases (incidence of 0.73%). We treated two in our unit and the rest were treated in other units with resection of the small intestine.

h) Beriberi. Three cases of vitamin B1 deficiency, with neurological symptoms, gait changes and spontaneous fall, all successfully corrected. This complication needs urgent treatment.

10) Fractures due to malabsorption of Ca that required Vitamin D25 + Ca. Two cases were presented that are asymptomatic after adequate attention.

11) Toxic megacolon due to pseudo membranous colitis 16 years after surgery. The patient needed subtotal colectomy 22 cm from the anus with terminal ileostomy and then later the ileum was attached to the rectum and is asymptomatic.

12) Miscellaneous: Pneumonia-4. Seroma-4, Wound Infection-15. Hemorrhage-5 (3 requiring laparotomies). Sepsis related to the -3 catheter. A case of central catheter mediastinum perforation was successfully treated conservatively.

#### Weight loss.

Final BMI (FBMI) was measured on 60% of 914 patients per year and 30% at 8 years. The mean IMCI of 49.3 fell to an average BMI of 30 (Fig. 6).

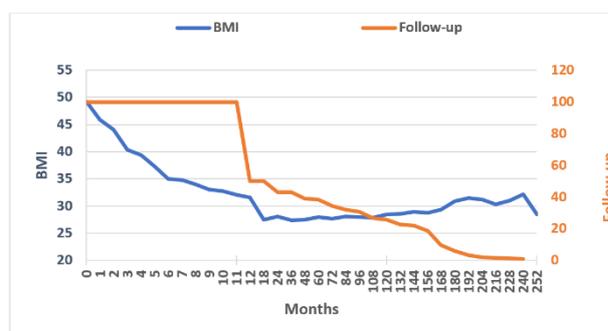


Fig. 6. BMI drop and % follow-up

In 2011, we describe [59] the concept of % the Expected BMI drop (%PIMCEsp) which depends on the different IMCI grades. We evaluated %PIMCEsp in 7,410 patients. And if the %PIMCF was 29.3, then the %PIMCEsp of this series exceeded 100% and the PSP (% of Overweight lost) was 81% at 5 years. Molina [60] has corroborated this study of %PIMCEsp.

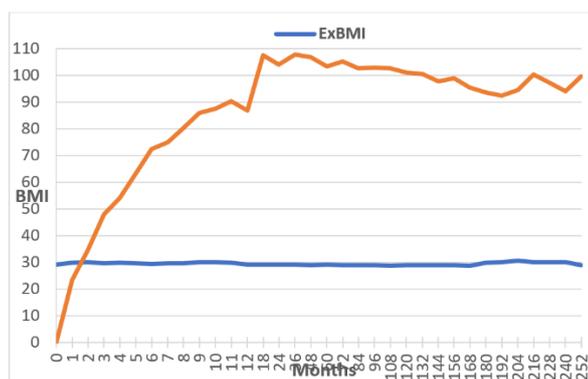


Fig. 7. The expected BMI is 30 and % of Final expected IMC is close to 100%.

The %PIMCEsp was 80% at 12 months and remained or was higher even afterwards. Therefore, the weight lost with the DS has been excellent in the series and is probably superior to any other type of operation. The %EWL is a less reliable measurements because it puts MOs with BMIs of 35 on the same list as BMIs of 60 to 70.

#### **Correction of comorbidities:**

##### **Type 2 diabetes (DMII)**

DS is a very effective operation to treat diabetes. 98% of our patients are normoglycemic with normal glycosylated hemoglobin. Two non-diabetic patients suffered severe hypoglycemia and the BPD had to be reversed. In our first diabetes surgery [61], the patient had a low BMI-35 and we successfully performed a LDS but without GV.

Hypertension was corrected in 73% of cases and sleep apnea in 100%.

##### **Quality of life**

The Horia-Ardelt Classification [62] was used on the BAROS scale to evaluate changes in patients' quality of life. Changes after surgery included: self-esteem, physical activity, social activity, work activity plus sexual activity on a scale from -1 to +1. The average score was 2.03 out of a maximum of 3 points in 348 patients, which means a significant improvement in their quality of life.

Gastrointestinal symptoms were rated from a minimum of 1 as excellent to a maximum of 5 as very bad. In the 558 patients evaluated, food intake of all types was 1.4, vomiting-1.3, appetite-1.96, stool type (from pasty to liquid)- 2.2, frequency (no problem to intolerable) -1.8, stool odor - 3.35, abdominal swelling- 2.26. Therefore, the sum of all

measurements was 12.14, for a total score of 5 (excellent) to 35 (poor). The worst side effect was the bad smell of feces with an average of 3.35.

#### **Discussion**

Ideally, BS should have a low morbidity-mortality, provide optimal and sustained BMI drop and minimal side effects. There is not successful or durable bariatric technique for all patients and Buchwald [63] believes that there is no standard procedure for treating obesity. And we will never be able to treat all OM with BSB.

VG leaks are a major cause of morbidity manifested at the Deitel and Gagner monographic meetings [64]. Prior to the 1990s, this complication was rare and the CD surgeons (the "Switchers") were the first to communicate it. The serose invaginating suture of the staple-line with omentum prevents gastric tube torsion and leakage [9].

DS patients have four suture lines, and it is essential to detect early possible leaks. Mason [65] called attention to tachycardia as the first warning sign of leakage and no patient should be discharged with tachycardia.

Today in BS early discharge is performed even as ambulatory surgery [66]. We instruct patients, at the time of admission, to check their pulse and temperature digitally, and we are notified of these parameters every four hours for two weeks, as a warning system, to a database by simple telematic medicine [67,68]. Patients with any significant change in these parameters need immediate and urgent consultation.

Buchwald [63] at the 2004 consensus conference stated that in MO, BS should be considered for patients with class I obesity (BMI 30-34.9 kg/m<sup>2</sup>) and associated comorbid conditions. DS is a long and difficult procedure that requires expert surgeons and adequate experience with low mortality <1% and operative morbidity <5%. Intestinal continuity can be restored to normal, but the part of VG is irreversible. LDS can be performed in two stages, with VG as the initial operation, in high-risk patients and/or with IMCI>60.

DeMaria [69], with the two-year longitudinal bariatric outcome (BOLD) database (2007-2009), reported that 450 institutions and 800 American surgeons participated in the BSCOE 2009 program. Only 517 (0.89%) of the 57,918 patients operated for obesity underwent got a LDS. In 1,328 patients have the VG (2.29%) done and 95% were LSGF.

English [70] ASMBS-2016 reports that obesity has increased alarmingly over the past 5 decades, from 13.4% to 36.4% in 2014. The indirect costs of obesity and the overall economic impact are estimated at \$1.42 trillion, equivalent to 8.2% of gross domestic product and more than double the amount spent on defense. Obesity is the 5th most important risk factor for mortality worldwide.

In 2016 [71], 685,874 bariatric operations were performed. The SFG was more frequent with 54% and the GBP 30% all bariatric operations. BPD-DS accounted for less than 2% of bariatric surgeries performed worldwide. Only 1187 BPD (2.33%) were DS (0.6%) and only 26% of them LDS. There were 685 single anastomosis DS's (SADI) and 85% (585) were performed in Europe.

Nelson [72] showed that early reintervention rates were higher with DS (3.3% vs. 1.5%) than with GBP. The fall in BMI was greater with DS. SO lost more weight with DS-79% than with GBP-67%. The improvement in comorbidities (DM2, hypertension and sleep apnea) was superior in the DS (all  $P < 0.05$ ).

Revisions, including conversions, may soon exceed the number of primary GS procedures and suggest the need to develop better evidence-based algorithms to minimize the use of new operations. It is evident that the number of *failures is very high and more effective initial operations are needed*.

Hess [9] had already in 2005 in 1,150 patients with IMCI-50.9 treated with DS. In 15 years, there were 8 reversals (0.61%) and 37 revisions (3.7%). DM2 cured in 98% of patients. The 19 adolescents (14-18 years old) improved with the DS. He concluded that the DS is a safe and effective operation for the treatment of morbid obesity. the problem with the follow-up of the patient with DS is that other doctors and/or surgeons do not understand and know how to prevent or treat long-term complications.

Iannelli [73] in 110 patients with BMI>50 found a reduction in the rate of postoperative complications by performing a two-stage DS. And when studying the procedure, 35.5% were satisfied with SFG and 64.5% of patients were spared the BPD.

Biertho [74] 2006-2010 in 1000 patients with DS the conversion rate in the laparoscopic group was 2.6% with only one postoperative death (0.1%) due to embolism. The mean hospital stay was shorter in the LDS group, 6 days versus 9 days at ODS ( $P < 0.01$ ). Complication rates were 7.5%, with no significant differences. There was no difference in abscesses or abdominal leakage.

Biertho [75] treated 566 patients between 2011-2015 had BMI-49 the LDS and and no 90-day mortality. The average hospital stay was 4.5 days. Complications greater than 30 days occurred in 3.0% of patients and minor complications in 2.5%. Weight loss was 81% at 12 m, 88% at 24 m, and 83% at 36 months. Patients with HbA1C > 6 decreased from 38% to 1.4%. Readmission was 3.5% and 0.5% of patients needed a new operation. The short-medium term complication rate of CDL is as in other mixed bariatric procedures and with excellent metabolic results.

Biron [76] studied the quality of life of 112 patients at 8.8 years and observed good quality of life for 1-2 years after

surgery, the so-called "honeymoon period". This study confirms that the DS improves quality of life in the short and long term.

Prachand [77] observed %EWL at 2 years in 350 patients. %BMI loss was 54% in 152 patients with GBP and 68% in 198 patients with DS with only one deceased ( $P =$  not significant). Direct comparison of 3-year FBMI results between DS = 68.9% was much higher than with GBP = 54.9% and showed that DS is more effective. Strain [78] also obtained IMCI falls of 23.8% with DS and 16.5% with GBP.

Topart [79, 80] in 2002-2009 performed 83 DS and 97 GBP, with IMCI-55 with unsatisfactory results in 20% of cases. Vitamin and micronutrient levels remained stable over time. However, there was a trend towards increased PTH levels and difficulties in maintaining a normal vitamin D level despite updated vitamin supplements. After 3 years of follow-up, the mean %EWL was 63.7% after GBP and 84.0% after DS ( $P > 0.0001$ ). 83.5% GBP and 98.7 DS were successful ( $P < 0.0005$ ). In conclusion, the results were significantly better with DS than with GBP.

Våge [81] treated 182 consecutive patients with DS between 2001 and 2008, with no 30-day mortality. Six patients needed surgical revision for PCM, similar as our figures.

Despite starting with a significantly higher IMCI, patients undergoing DS reduce the IMCF more than patients with GBP. So why are so few patients receiving a DS? Is BPD too complex an operation or are the CD results not as good?

Søvik [82] showed higher %EWL after DS than with GBP in patients; however, comparative data on changes in gastrointestinal symptoms, bowel function, feeding behavior, dietary intake and psychosocial functioning are limited. Average weight decreased 31.2% after GBP and 44.8% after DS.

Rabkin [83] reports that the DS is not associated with extensive nutritional deficiencies. Laboratory studies, which are required after any type of bariatric operation, appear to be sufficient to identify unfavorable trends. In selected patients, Fe and calcium supplements are necessary.

Keshishian [84] performed a preoperative needle liver biopsy in 697 patients with DS. There was transient worsening of AST (13% of baseline,  $P < .02$ ) and ALT (130-160% of baseline,  $P < .0001$ ) up to 6 months after DS. And progressive improvement of 3 degrees in NASH severity and a 60% improvement in hepatic steatosis at 3 years after DS.

#### Diabetes Mellitus type 2 (DM2)

Buchwald [85] reports that DS and GBP solve diabetes in 90% DS and 70% GBP.

Våge [86] thinks that DS is effective in DMII, hypertension and hyperlipidemia. And the duration of diabetes and the age of the patients are the most important preoperative predictors.

If you decide to make the DS in stages, which part of the operation should be done first? DBP or SFG? Most surgeons recommend doing SFG first. However, Marceau [88] treated 1,762 patients all scheduled for DS from 2001 through 2009. The 1st-stage procedures were 48 isolated BPD without SFG and 53 SFG-only cases. The conclusions were that VG and BPD independently contribute to beneficial metabolic outcomes. Long-term outcomes in terms of weight loss and resolution of metabolic abnormalities were better with complete BPD alone than with SFG alone. And single-stage DS results were superior to two-stage results. With these results in mind, we should make *BPD first as it is a totally reversible procedure and no more difficult than SFG.*

Moustarah [89] treated 49 SO patients with BPD without SFG. With IMCI-52.54 the drop of 14.5 Kg/m<sup>2</sup> was very significant (p <0.001).

BPD without SFG is rare as a single weight loss procedure, but there are patients whose clinical indications justify the omission of SFG. Isolated BPD has better %EWL results. BPD without GV is also reversible and is another advantage, as SFG can be added at any later time

Follow-up of DS patients is very important. At discharge we provide with a detailed technical explanation of the operation with explanation of each of the necessary post-operative laboratory test for life, the possible complications and their correction We record all LDS operations, and give patients the DVDs of their operation, because if a new operation is necessary, the surgeon should know the details of the original technique.

Serum albumin is the most important long-term data to detect PCM. PTH and vitamin D-25 (to detect calcium absorption and deficits and protect bone pathology), hemogram to correct deficits of Fe with intravenous therapy and deficits in all trace elements such as Mg, Cu.

The "Kissing-X anastomosis" as a jejune-jejunal lengthens the AC and treats more serious DS complication which is the PCM. Surgical correction is simple when using the technique preferably by laparotomy.

We are privileged to have endocrinology units, compared with 15 years ago when these services did not believe in BS and their support was very limited. We also have the support of nutritionists and bariatric nursing which is very important.

Larrad [92,91] made several BPD publications original of his BPD technique and Solano [92], Ballesteros [93] and Hoyuela [94] should be highlighted. Sánchez-Pernaute and Torres [95] have made a very important contribution with the one anastomosis DS technique (SADI) and which is being recognized by the bariatric world.

***How to change and implement a change to the DS in clinical practice.***

*Halawani [96] explains that obesity has progressively increased to alarming levels. More than one-third (34.9%) of American adults are obese and no state had an obesity prevalence of less than 20% in 2012. The role of surgery continues to be challenged with weight reduction and related concomitant diseases.*

*It is evident that BS is the most effective method for losing weight in obese patients. The different options of weight loss and metabolic surgery are adapted to the patient's needs. And the DS has the highest success rate in terms of weight loss, comorbid resolution and maintenance of weight loss.*

*Unfortunately, the number of DS in the whole country is less than 1% for the years 2011-2015. The substantial challenges of adding this option to the bariatric surgeon's resources are real. Barriers include the inherent prejudice of the past, a fragile understanding of the procedure and its benefits, and its technical complexity. However, the procedure and the infrastructure it requires can be incorporated into any bariatric surgery program through appropriate educational programs and multiple supervision.*

*In this article, our goal is to illustrate bariatric surgeons how to add the CD to their practice.*

#### ***Why change to the DS?***

*In the spirit of the "Center of Excellence in Obesity" (CEO), all centers share a responsibility to serve a wide variety of patients' needs, regardless of their degree of obesity or bariatric surgical status and add all available procedures to our resources.*

*DS gives superior excess weight loss with the lowest rate of weight recovery. The DS is a better design than the GBP. It preserves the pylorus and produces a better and a slower gastric emptying. The pylorus is a natural mechanism that controls the flow of nutrients. It is also part of our natural defense of spills and ulcers.*

*With adjustments to the length of the AC and the size of the gastric tube, any obese patient may be a candidate for the CD.*

*Patients with BMI <50 may also be candidates. The CD is a viable option due to its flexibility. The standard AC (75 - 100 cm) can be adjusted. A surgeon can adjust the size of the TG and alter the impact of the restriction. The length of AC from 100 to 150 cm depends on the clinical parameters. CC <50 are more likely to cause malnutrition and diarrhea.*

*The CD is good for chronic patients, such as nonsteroidal anti-inflammatory drugs and steroids.*

#### ***Anticipated Obstacles***

*A) A learning curve perceived as dangerous. There is concern that this process is time-consuming and requires time, but this is untrue. In our opinion, the learning curve is steep. Experienced GBP surgeons can make a relatively seamless transition to more complex techniques.*

B) The need for a robust and costly follow-up program. Surgeons who participate in a CEO are already prepared to handle these problems. The transition requires education of staff to the DS and efficient use of resources. This can be more difficult in a private environment. Hospital programs should encompass this expansion, as it attracts more than 75 patients and serves a larger segment of the community with weight problems.

C) The stigma of creating a nutritional catastrophe. DS is associated with an increased risk of deficiency in vitamins and other micronutrients. Common nutritional deficiencies include protein malnutrition, fat-soluble vitamins (A, D, E and K), iron, B1, B9, B12, selenium, folate and calcium.

With a registered dietitian, patient compliance with regular vitamin supplements and protein intake is paramount in aftercare. The critical denominator is an educated patient who works with a multidisciplinary team for life.

#### D) New Operating Techniques

One of the deterrents to surgeons not offering the CD is its degree of technical difficulty. The laparoscopic learning curve is achievable like any other technique adopted by an experienced and motivated surgeon. The procedure can be divided into four parts. The formation of the gastric tube, duodenal dissection, the RNY and the duodeno-ileostomy. Each part is made by a surgeon in our group, who has the great advantage that emits the team stimulus.

#### Preceptor Program:

A well-structured scholarship program with four parts; didactic sessions, program orientation, live cases and proctorship. Selection of patients with BMI 45-55 years without previous surgery.

#### Outcome and Mortality

Buchwald's meta-analysis of the impact of bariatric surgery showed the superiority of the DS with 71% excess weight loss. It is the ideal procedure for DMII. Marceau reported with the longest cohorts in the literature, with a follow-up of up to 20 years. The cure for diabetes, dyslipidemia and hypertension was 93.4%, 80% and 64%, respectively. Nutrition is the centerpiece of success because if patients understand the nutritional need for their particular surgery, they are more likely to meet and succeed in the long term. Cost is an important consideration that patients and providers ignore.

In Marceau's 20-year long-term follow-up study, blood levels of B12, folic acid, vitamin D 1-25 (OH), iron, ferritin, and albumin improved or did not change since before surgery. While vitamin A, hemoglobin, and calcium levels decreased slightly.

Loss of follow-up may underestimate the exact percentage of nutritional deficiencies reported in the literature. However, the maintenance of long-term vitamin intake by patients with frequent adjustments remains a key point.

The higher rate of early mortality compared to LSG (0.73%) is slightly higher (0.28%), 0.43% in our practice. Biertho reported a mortality rate of 0.1% for 1000 consecutive series. Although the mortality rate and DS complications have been reduced over the past 20 years, it is still considered a complex high-risk procedure and the results should be viewed with caution.

CD is versatile and can offer comprehensive management of obesity and metabolic comorbidities. With dedication, adequate training, and comprehensive education, the CD can be implemented in practice.

#### Conflict of interests

No author has a conflict of interest.

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