Single anastomosis duodenal switch: a novel procedure for obesity and metabolic surgery

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Abstract: After the introduction of biliopancreatic diversion (BPD), it is modified by adding duodenal switch (DS) to BPD-DS. Although its technical difficulty and high complication rates, it is accepted as one of the most effective procedure for the treatment of obesity. Many modifications have been developed in order to ease the technique and to overcome the complications. Present paper explains our modified technique of single anastomosis duodenal switch (SADS) and results in 2 years follow-up.

Keywords: Obesity surgery; metabolic surgery; diabetes; duodenal switch (DS); single anastomosis duodenal switch (SADS); weight-loss; remission

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Introduction

Biliopancreatic diversion (BPD) was introduced by Scapinaro *et al*. and consisted of a distal gastrectomy with a long roux-n-Y reconstruction. In this operation entero-enterostomy is placed at 50 cm from the iliocecal valve (1). Scapinaro's procedure was modified by Hess into the BPD-duodenal switch (DS) (2). Hess proposed a vertical sleeve gastrectomy (SG) and also modified the length of the common channel to 100 cm (2). This procedure considered as one of the best and effective procedure for the treatment of obesity and metabolic disorders (3). As the procedure itself is very complex and difficult, for worldwide use with minimally invasive techniques, it was simplified. Sánchez-Pernaute *et al*. described single anastomosis duodeno-ileal bypass with sleeve gastrectomy (SADI-S) in 2007 (4). In their technique, preservation of pylorus eliminates the bile reflux therefore bile diversion is unnecessary. Since then they modified the technique and many other modifications have been developed including Cottam, Huang, Lee and Ozmen (5-8) (*Figures 1*,*2*).

I introduced the technique of single anastomosis duodenal switch (SADS) and performed over hundred procedures with success on weight-loss and metabolic control (8,9). The present paper explains the steps of the procedure for both laparoscopic and robotic approaches.

Surgical technique

I will explain the technique for both laparoscopic and robotic approach in ten steps.

(I) Procedure will start with the positioning of the patient for which we prefer French position (supine position with the legs spread apart and surgeon stands between legs). The operating table could be tilted in 30° reverse Trendelenburg position as the surgeon needs. Insufflation is usually performed from the first trocar insertion site. It can be over or at the umbilical region of the patient. However, there are two pitfalls during the establishment of the pneumoperitoneum. The first important point is that obese individuals have a wider upper abdomen, and if the initial trocar is placed low near the umbilicus, the dissection of the upper abdomen can be more difficult. The second pitfall is bypassing the falciform ligament. In obese individuals, the falciform ligament can be hypertrophied due to adipose tissue hyperplasia. If insufflation is to be

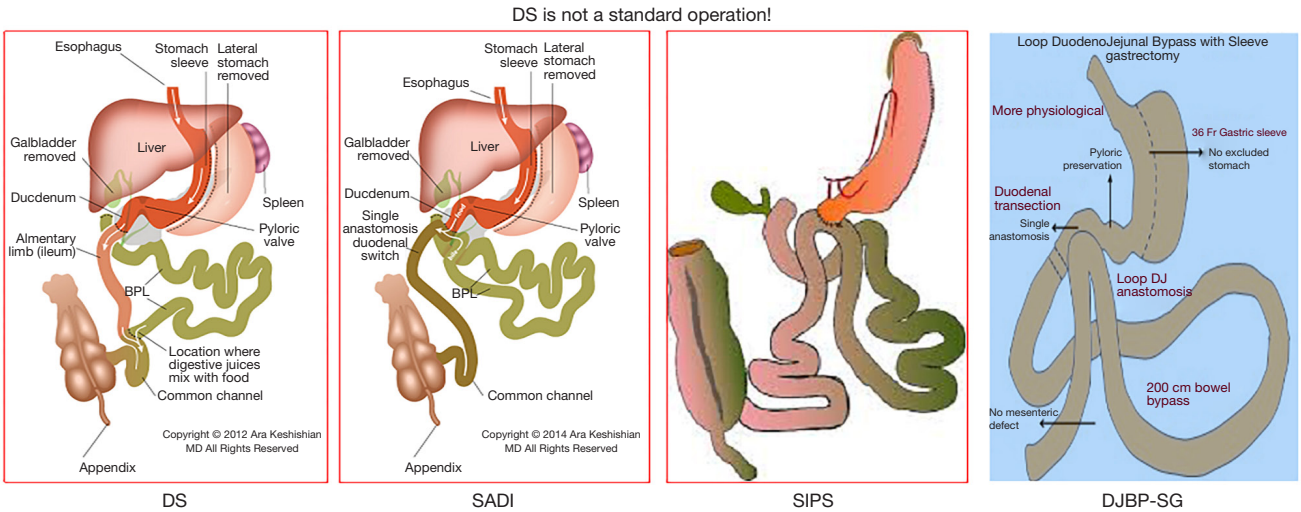

Figure 1 DS and its modifications. DS, duodenal switch; SADI, single anastomosis duodeno-iliostomy; SIPS, stomach intestinal pylorus sparing surgery; DJBP-SG, duodenojejunal bypass-sleeve gastrectomy.

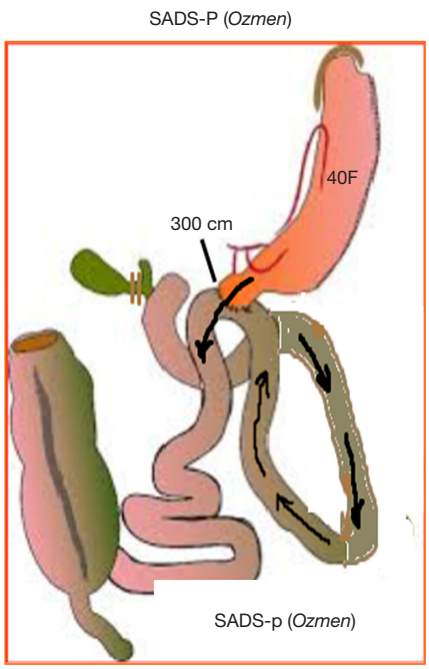

Figure 2 SADS-proximal approach (Ozmen's modification). SADS, single anastomosis duodenal switch.

carried out near the midline, the falciform ligament can make insufflation and initial trocar insertion technically challenging. If the procedure is being done laparoscopically four trocars including the liver retractor will usually be enough. However, if any difficulty in dissection is encountered, then, right and left lateral hypochondriac region can be used to insert 5 mm port for traction and exposure purposes. If the procedure is being done robotically then 5 to 6 trocars will be used including the liver retractor. Trocar placements for both robotic (using daVinci Xi) and laparoscopic approaches are shown in the *Figure 3*.

(II) After abdominal exposure, If possible, cholecystectomy should be the first. Following cholecystectomy, before mobilization of the greater curve oesophagogastric junction (OGJ) should always be checked to make sure that there is no hiatal hernia and then the fundus is released.

(III) Mobilization of greater curve might start from the mid-corpus and first go upwards to OGJ. During this stage attention should be paid to the short-gastric vessels especially superior gastrosplenic vein. Surgeon should not hesitate to clip if it is visible! The mobilization continues further down to the gastroduodenal artery or 3 cm from the pylorus (whichever comes first). In order to avoid any bleeding or tears meticulous and careful dissection is necessary around duodenum.

(IV) After mobilization, duodenum is transected using stapling device with 45 mm blue cartridge. After transection procedure continues with gastric

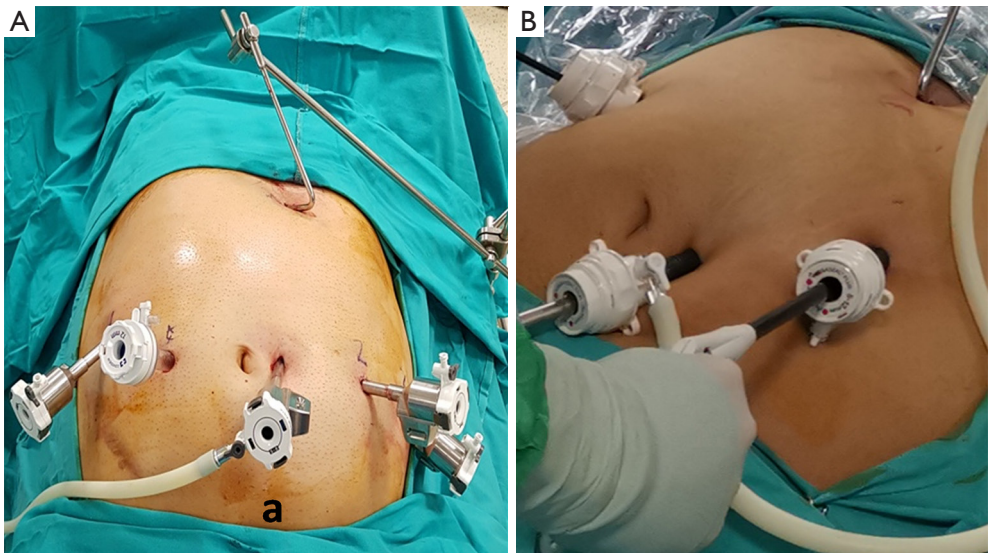

Figure 3 Port placements for SADS for both (A) robotic (daVinci Xi) and (B) laparoscopic approach. SADS, single anastomosis duodenal switch.

resection to create a loose sleeve with the bougie size 42 and over. If you are using 36 F bougie for standard sleeve then staple line should stay 1 cm away from the 36 F bougie. Till this step, procedure is similar to SADI-S.

(V) We count the small bowel starting from the Treitz ligament and it should always be kept in mind that it is very important to count whole length of the bowel. Three hundred cm in length of jejunum should be measured and fixed to the duodenum using continue vicryl suture which might be used as the posterior layer of the anastomosis.

(VI) Then, 1 cm holes are created on both sides (duodenotomy and jejunotomy) for the anastomosis and nasogastric tube is passed to efferent loop in this stage.

(VII) Single layer anastomosis is done using pre-tied 3/0 V-lock suture. Extra sutures might be inserted on the anterior wall especially at the corners. Leak test using methylene blue is always done to control the anastomosis and the bowel loops.

(VIII) SG material is removed through the 12 mm trocar on the left side (during laparoscopic) or from the assistant port (during robotic).

(IX) We always insert a drain to the subhepatic area.

(X) After completing all these steps, trocars are removed and trocar sites are closed following desufflation.

Discussion

SADS is the modification of standard BPD/DS and there are many modifications of SADS also (10). Metabolic and weight-loss outcomes of SADI/SIPS techniques are known (4,5,10,11). However, the certain amount of the patients suffer from malnutrition and GI symptoms such as diarrhea after SADI or SIPS (10,11). There is a clear need of alternative procedures with fewer side-effects.

We first introduced our approach as an alternative to SADI/SIPS in 2014 and presented first 13 laparoscopic cases during ELSA congress in 2015 and then again in ELSA congress in 2017, I gave a talk on robotic SADS: proximal approach (8). Since we performed the first case, we have used this technique either laparoscopic or robotic in more than hundred cases with morbid obesity and diabetes and results were partly presented elsewhere (9). Results shown in *Table 1* includes total of 1,349 patients with 2 years follow-up. Patients with the median [range] age of 37 [22–69] years with BMI of 49 [41–73] kg/m^2 underwent DS. Eighty-two patients had type 2 diabetes with a median [range] of 45 [3–100] months with 8.6% (4.9–9.9%) of HbA1C levels. After surgery HbA1C levels decreased to 5.1% (4.8–5.6%) in 12 months (remission rate of 100%). The procedure seems to be effective for both weight-loss and metabolic control for type 2 diabetes especially in patients with high BMI. In our practice we found that robotic approach is better in those patients as it creates better view, better maneuver

Table 1 Patient characteristics and effect of different procedures on diabetes

Procedure	No	Age (years)	BMI (kg/m^2)	T2DM (no)	DM-duration (months)	Remission (%)
SG	682	40 [18–66]	42 [35–57]	158	21 [3–60]	75
MGB/OAGB	567	50 [26–62]	54 [42–69]	315	68 [3–240]	93
SADS	100	37 [22–69]	49 [41–73]	82	45 [3–100]	100

SG, sleeve gastrectomy; MGB/OAGB, mini-gastric bypass/one anastomosis gastric bypass; SADS, single anastomosis duodenal switch; T2DM, type 2 diabetes mellitus.

ability and give chance to surgeon in order to do the difficult jobs in a narrow space.

We also studied the fecal elastase levels in order to check exocrine pancreatic function after surgery (12). We compared levels after SG, mini-gastric bypass/one anastomosis gastric bypass (MGB/OAGB) and SADS. We concluded that almost every patients after gastric bypass or DS are suffering from pancreatic exocrine insufficiency, whereas only 7–14% are having symptoms of malnutrition (4,10). Although there are many modifications, except for one study with 5 years follow-up, follow up data remains limited to 1 year which means more patients might suffer from malnutrition, weight gain and metabolic failure.

Therefore in patients with the symptoms, pancreatic enzyme replacement therapy might be the solution (12).

Conclusions

SADS is technically easier and has fever complications, shorter hospital stay and similar metabolic effects with standart DS. Our technique (SADS-Ozmen modification) with 2 years follow up seems better than other modifications in terms of complications and metabolic effects.

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Footnote

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