

Original Research

The Mini-Gastric Bypass original technique

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ABSTRACT

Introduction: Mini-Gastric Bypass (MGB) is becoming more and more popular as shown by the numerous articles published over the past 15 years, supporting the operation as a short and simple procedure with excellent outcomes and low complication rates. There is still confusion amongst surgeons on the technique of the operation. The purpose of this paper is to review and describe the technique of MGB by its originators.

Methods: With 20 years of experience of performing the original MGB, the authors present the details of the MGB.

Results: The MGB consists of a long conduit from below the crow's foot extending up to the left of the angle of His. It is similar to, but importantly, not the same as the pouch of the Sleeve Gastrectomy. MGB has a wide gastro-jejunal anastomosis to an anti-colic loop of jejunum 150–200 cm distal to the ligament of Trietz. The power of MGB comes from the fact that it is both a “Non-Obstructive” restrictive procedure and it also has a significant fatty food intolerance component with minimal malabsorption.

Conclusion: In this article we describe the original Rutledge technique of Mini-Gastric Bypass. Notably this is neither a “Single Anastomosis bypass”, nor an “Omega Loop Bypass” and also not the “One Anastomosis Bypass of Carbajo”. It is a particular technique first created by Rutledge in 1997 and associated with low risk and excellent outcomes. The goal of this manuscript is to help avoid complications and problems seen when the operation deviates from some of the basic principles of general surgery used in the original operation.

1. Introduction

The Laparoscopic Mini-Gastric Bypass has become a popular bariatric surgery procedure. It is now being done as a routine procedure in most countries around the world [1–4]. In India MGB is the 2nd commonest procedure following the sleeve Gastrectomy, outpacing the standard Roux-en-Y Gastric Bypass [RYGB] [5]. MGB was designed to overcome the limitations of RYGB and improve its outcomes. MGB constructs a lesser curvature gastric conduit to or below the “crow's foot” and an anastomosis to an anti-colic loop of jejunum 150–200 cm distal to the trietz ligament.

The MGB was first performed by Rutledge in 1997 in the era of open bariatric surgery and at the dawn of the era of Minimally Invasive Surgery. The operation is based on sound general surgical principles combining a “non-obstructive” Collis Gastroplasty, which is an esophageal lengthening procedure with a Billroth II ante-colic Loop gastro-jejunosomy. As the medically accurate name (Collis Gastroplasty with Antecolic Billroth II Loop gastro-jejunosomy) was a bit much; and as it was the dawn of the era of Minimally Invasive Surgery, the simple

application of these two routine general surgical procedures was named “Mini” Gastric Bypass [1].

Mini-Gastric Bypass has important technical details like the pouch size, gastro-jejunosomy size and bypass length. When these individual components of the operation are used in different ways, these give different results [6]. There are reports of bypass being used from 150 cm to up to more than 300 cm. Mini-Gastric Bypass gives different results as per the length of the bypass [6]. In addition to this, different surgeons are performing gastrojejunosomy in different ways with different staples varying from 30 mm to 60 mm staple sizes and hand sewn instead of total stapled anastomosis.

Various reports have been published from different parts of the world to document this procedure giving sustained and long-term weight loss comparable to or even better than the classical Roux-en-Y gastric bypass [3,7,8]. Mini-Gastric Bypass has only one anastomosis which makes it easy to perform, revise or reverse [7,9]. There is a growing number of publications supporting this operation to be a short and straightforward procedure with low complication rates and excellent outcomes [2,4,8,10,11]. MGB addresses many perceived

Abbreviations: MGB, Mini-Gastric Bypass

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limitations of other procedures and offers many features of an ideal bariatric surgery. It has now been shown in many short and long term studies, as well as in many controlled prospective randomized trials, to result in excellent weight loss, good resolution of associated medical illness and very high levels of patient satisfaction [12].

The mechanism of action and the power of MGB is complex and cannot be completely covered here in this technique focused monograph. Suffice to say that a patient survey on over 3000 of Dr. Rutledge's MGB patients demonstrated a unique non-obstructive restrictive component and a minimal malabsorptive component along with significant fatty food intolerance (unpublished data).

Additionally, MGB produces hormonal changes and also affects patient's bile acid pool [13]. Numerous general surgery and bariatric studies show that operations which includes both a gastric and an intestinal component out performs purely gastric restrictive procedures, like the Gastric Band and Sleeve Gastrectomy [14–16].

Numerous articles over the past 15 years have demonstrated that the original MGB technique leads to excellent results, and in the vast majority of patients avoids complications and problems such as bile reflux gastritis, and excessive or inadequate weight loss.

In this article, we present the Dr. Rutledge's technique of Mini-Gastric Bypass for patients with morbid obesity.

2. Methods

The technique is based on the experience of 10402 patients carried out by the authors between September 1997 to December 2017 in USA and India collectively. This work has been reported in line with the PROCESS criteria [17].

3. Technique

This is the technique described by Rutledge and used by many but not all MGB Experts. The surgeon stands on the patient's right side, and the assistant surgeon stands on the patient's left side. The patient is placed on the operating table in a supine position, which is inclined to a maximum reverse Trendelenburg position and with the left side maximum up. This requires secure patient immobilization onto the table. The surgeon should slowly test this position prior to draping the patient, to confirm security of positioning and stability of the vital signs. Carbon dioxide pneumo-peritoneum is created. The intra-abdominal pressure is maintained at 14–17 mm Hg.

The “Classic Rutledge Technique” includes: Five ports placed in a “diamond-shaped” pattern in the upper abdomen (Fig 1). First, a 12 mm camera port in the midline approximately two handbreadths below the xiphi-sternum (ignoring the location of umbilicus). Second, a 12 mm

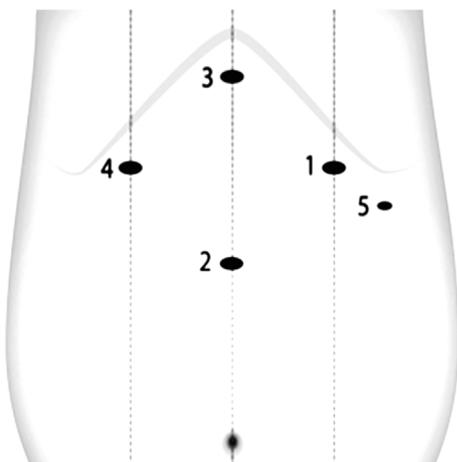


Fig. 1. Port sites.

port in between the right midclavicular and anterior axillary line, 2–3 finger breadths below the right costal margin. Third, a 12 mm midline port (the surgeon's left hand working port) 2–3 finger breadths below the xiphi-sternum. Fourth, a 12 mm port in left midclavicular line two to three finger breadths below the patient's left costal margin as the surgeon's right-hand working port. Fifth, a 5 mm assistant port in the left anterior axillary line, 2–3 finger breadths below the left costal margin. A 30° angle telescope is used routinely to provide better visualization of the gastro-esophageal junction.

The restriction of MGB comes from rapid gastric emptying into the jejunum. The surgical procedure is akin to the Collis Gastroplasty. The MGB pouch should be no more obstructive than the esophagus itself. Thus, the Gastric tube should as be wide as the esophagus and not tight or obstructive as in a sleeve, and similarly the gastro-jejunostomy should be large and non-obstructive. The length of the pouch is a critical success factor. The goal of the gastric pouch in MGB is to remove the reservoir function of the stomach and convert the stomach into a non-obstructed extension of the esophagus, where food does not stay in a reservoir but is dumped into the lumen of the jejunum. In cases where the surgeon is not attentive, the gastro-jejunostomy may end up close to the esophagus and result in crippling bile reflux esophagitis.

A Billroth II Loop Gastro-jejunostomy should NEVER be placed adjacent to the esophagus (i.e. as in the Old Mason Loop Gastric Bypass). On the other hand, when placed low on the stomach distant from the esophagus the result is excellent (i.e. MGB) the pouch should be started at or beyond the Crow's Foot (junction of body and antrum of the stomach) about 3–4 cm proximal to pylorus.

The dissection to create a window should be started on the lesser curvature between the crow's foot and pylorus. Dissection is done to enter into the lesser sac by carefully freeing the posterior adhesion between the stomach and pancreas. Once this is done, the first staple firing is done through sub-xiphoid port (Fig 2). A 45 mm load is ideal. Two precautions are to be taken at this point: The staple should come at a right angle to the antrum from the lesser curvature. Care should be taken to avoid a complete transection of the antrum.

Sufficient channel should be left to allow gastric juice to pass through pylorus. The second staple firing load comes from the right hypochondrial port at a right angle to the previous firing, longitudinally dividing the antrum almost in its center. A gastric calibration tube should be engaged along the lesser curvature of the stomach at this junction as a guide. Subsequent firings to create the gastric pouch should be made from the left hypochondrial port using 60 mm blue loads (Fig. 3). The gastric calibration tube helps as a guide. While creating the pouch beware of a “Twist in the Pouch” and keep about 1 cm away from the Bougie. As the staple is taken up to completion, the temptation to dissect the EG junction and the crura, should be avoided. In the case of MGB, leaving some fundus is very acceptable and

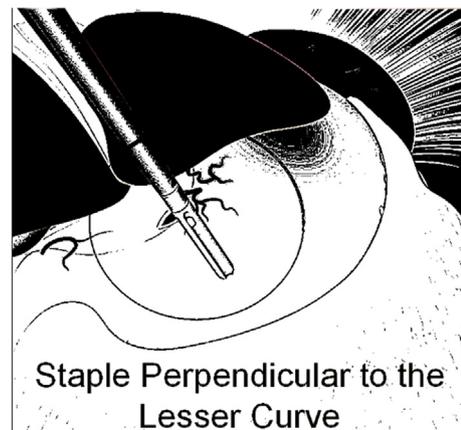


Fig. 2. First firing of staple.

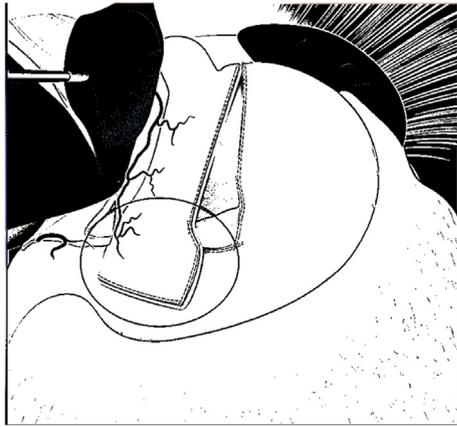


Fig. 3. MGB Gastric Pouch, what's important !.

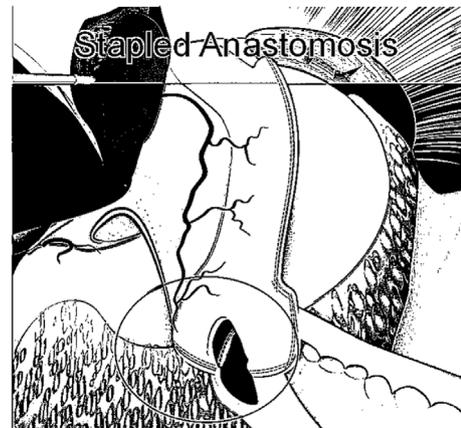


Fig. 4. Stapled anastomosis.

surgeons are instructed to avoid the EG by about 1–2 cm.

3.1. Bilio-pancreatic bypass/bilio-pancreatic limb length and Omental division

Creating the correct form of Bilio-pancreatic limb (BPL) is a critical factor in the success of the operation. However, experience has shown that as the length of the bypassed jejunum increases, the risk of excess weight loss and malnutrition increases. In some studies, it can result in weight loss of more than 90%. The authors have together an experience of over 10000 cases and have never felt the need to divide the omentum; but instead is to maneuver and to retract the omentum medially. Because of lack of precision it is always better to be conservative in creating the bilio-pancreatic limb.

3.2. Gastro-jejunostomy

The loop of bowel has to be identified and it is to be moved gently to the left upper quadrant at the level of the transverse colon. In general, this is approximately 1.5–2 m distal to the ligament of Treitz. At this point the loop is grasped usually by the assistant and gently moved into the left upper quadrant. Then, by using the two surgeon's working ports of the right and left hand, the bowel is picked up. A harmonic scalpel is used to create a jejunostomy on the anti-mesenteric margin of the bowel. After creating a gastrotomy in the middle of the vertical staple line of the gastric pouch, a blue 45 or 60 mm cartilage cartridge is used for the gastrojejunostomy between the posterior wall of the gastric pouch and the anti-mesenteric border of the jejunum. There should be no tension on the bowel. If we use the clock face for the gastric pouch, we should expect to see the gastrotomy anterior to the staple line between the three and nine o'clock position as we look on and into the gastric pouch. The staple gun is fired thus creating an anterior gastric pouch with a posterior gastro-jejunostomy and a persistent 3–5 cm defect in the closure of the gastro-jejunostomy (Fig. 4). We always insist on “waiting for enough lapse of time with the stapling device closed before firing” to allow for optimum tissue compression. Verify haemostasis in the stapled lines for the gastrojejunostomy. Final closure of the gastro-jejunostomy can be hand sewn. The GJ creation may also be stapled via a stapler inserted from the patient's right subcostal 12 mm port. In general, the experienced MGB surgeons should have a completely dry field and minimal bleeding. A drain should only be used in cases of bleeding due to other unexpected reasons.

4. Discussion

In short, a Billroth II reconstruction after a distal gastrectomy/an-trectomy is appropriate while using a Billroth II reconstruction following a total or subtotal gastrectomy is never appropriate [18].

Simply, the loop Billroth II gastro-jejunostomy was inappropriate when the anastomosis was placed adjacent to the esophagus in the Old Mason Loop Gastric Bypass [19]. This will lead, predictably, to rapid failure because of severe bile reflux esophagitis, an expected outcome from the experience of 100 years of gastric surgery. Distal gastrectomy reconstructed with a Billroth II loop is a routine general surgery practice by surgeons around the world including General, Trauma and Cancer surgeons. A recent study by leading Oncologic surgeons from all across America concluded that the Roux-en-Y and the Billroth II are essentially equivalent and long term risks of gastric cancer and bile reflux can simply be dismissed [20].

The gastrojejunostomy carried in MGB follows the Billroth II reconstruction. The other remarkable feature of MGB is the large series of MGB publications with near uniform agreement of safety, effectiveness, and durability, with extremely high levels of patient satisfaction and ease of revisability [21].

The general thrust of this paper is simple: MGB when carefully adopted after adequate training and education has been reported to result in good to excellent results. On the other hand when MGB is carried out without attention to details, the outcomes can be poor with preventable complications. When Billroth II was carried out inappropriately, in the 1900's when gastrectomy was extended up closer and closer to the EG junction. We now know that when a Billroth II Loop Gastro-jejunostomy is created adjacent to the esophagus after total or near total gastrectomy, this inevitably will lead to devastating bile reflux esophagitis. The same error will happen when the Mason Loop (the Gastro-jejunostomy) is placed adjacent to the esophagus with predictable severe bile reflux esophagitis. ¹⁹⁵

Even adding on the old Alison and Hill crural repair did not improve the bile reflux esophagitis and the procedure has now been abandoned. In contrast MGB leads to a downward traction on the EG junction reducing the EG junction to an intraabdominal position, causes massive weight loss thus decreasing abdominal pressure leading better gastric drainage and resolution of symptoms of GERD [22].

The decision on the length of the biliopancreatic limb has been a common error for new MGB surgeons, especially for those surgeons who have limited expertise and training in MGB. The key educational teaching point is to recognize that the addition of extra 1–2 m of length to the routine MGB can cause significant excess weight loss and malnutrition and thus this decision of going beyond the routinely used lengths needs to be applied judiciously in only super obese or revision cases. In addition to this, the gastrojejunostomy needs not to be tighter than 4.5 cms as MGB outlet is not designed to be obstructive.

5. Conclusion

Mini-Gastric Bypass has been shown to be a valuable addition to the armamentarium of bariatric surgery. Its popularity is increasing around

the world. MGB has been shown to be a simple, low risk and effective weight loss surgery which has a durable weight loss with a high level of patient satisfaction. It has a short learning curve. The new surgeons should be aware of the tricks and traps of this operation to avoid complications. MGB is simple to reverse or revise.

Provenance and peer review

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Ethical approval

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Author contribution

Dr Rutledge, Kular and Manchanda were personally involved in the study concept, design, data collection, data analysis, interpretation and writing the paper.

Conflicts of interest

None.

Research registration number

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijso.2018.10.042>.

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