Obesity Surgery (2021) 31:2453–2463
https://doi.org/10.1007/s11695-021-05276-2

ORIGINAL CONTRIBUTIONS

Areas of Non-Consensus Around One Anastomosis/Mini Gastric Bypass (OAGB/MGB): A Narrative Review

Mohammad Kermansaravi[1] · Amir Hossein DavarpanahJazi[2] · Shahab ShahabiShahmiri[2] · Miguel Carbajo[3] · Antonio Vitiello[4] · Chetan D. Parmar[5,6] · Mario Musella[4]

Received: 8 November 2020 / Revised: 2 February 2021 / Accepted: 8 February 2021 / Published online: 17 February 2021

Abstract

Purpose One anastomosis/mini gastric bypass (OAGB/MGB) is now an established bariatric and metabolic surgical procedure with good outcomes. Despite two recent consensus statements around OAGB/MGB, there are some issues which are not accepted as consensus and need more long-term data and research.

Material and Methods After identifying the topic of non-consensus from the two recent OAGB/MGB consensuses, PubMed, Scopus, and Cochrane were searched for articles published by November 2020.

Results In this study, we evaluated these non-consensus topics around OAGB/MGB and all related articles on these topics were assessed by authors to have an argument on these items.

Conclusion There is enough evidence to include OAGB/MGB as an accepted standard bariatric and metabolic surgical procedure. However, long-term data and more research are needed to have a consensus in all aspects including these non-consensus topics.

Keywords One anastomosis gastric bypass · Mini gastric bypass · Bariatric surgery · Consensus

Introduction

One anastomosis/mini gastric bypass (OAGB/MGB) is a recognized and established bariatric and metabolic surgical (BMS) procedure with good efficacy and acceptable complications [1]. OAGB was born in 2002 as modification of the MGB [2], and there are several technical differences between them. However, most of surgeons are performing a mixed technique. Despite two recent consensuses statements around OAGB/MGB [3, 4], there are some issues and controversies where there is non-consensus including the following: OAGB/MGB in adolescents and youths, in patients with gastro-esophageal reflux disease (GERD), esophagitis, and Barrett's esophagus, in presence of hiatal hernia (HH) and need for routine HH repair, liver cirrhosis, the minimal length of gastric pouch, whole small bowel length measurement and

✉ Chetan D. Parmar
drcparmar@gmail.com

Mohammad Kermansaravi
mkermansaravi@yahoo.com; kermansaravi.m@iums.sc.ir

Amir Hossein DavarpanahJazi
davarpanahjazi@gmail.com

Shahab ShahabiShahmiri
shshahabi@yahoo.com

Miguel Carbajo
doctorcarbajo@obesos.info

Antonio Vitiello
antoniovitiello_@hotmail.it

Mario Musella
mario.musella@unina.it

[1] Minimally Invasive Surgery Research Center, Division of Minimally Invasive and Bariatric Surgery, Department of Surgery, Rasool-e Akram Hospital, Iran University of Medical Sciences, Tehran, Iran

[2] Minimally Invasive Surgery Research Center, Isfahan University of Medical Sciences, Isfahan, Iran

[3] Centre of Excellence for the Study and Treatment of Obesity and Diabetes, Calle Estacion, No. 12, 1, 47004 Valladolid, Spain

[4] Advanced Biomedical Sciences Department, "Federico II" University, Naples, Italy

[5] Whittington Hospital NHS Trust, London, UK

[6] University College London Medical School, London, UK

it's appropriate technique, ideal percentage for biliopancreatic limb length adjustment, the appropriate pouch side for performing gastrojejunostomy, specific criteria in Roux-en-Y conversional procedure for persistent symptomatic bile reflux, Braun's jejunojejunostomy as an option in resistant postoperative GERD, routine prophylaxis with ursodeoxycholic acid and proton-pump inhibitors (PPIs) after surgery, time of first surveillance esophago-gastro-duodenoscopy (EGD) after surgery, and interval EGD follow-ups. Also, there are few other concerns which will be discussed in this study.

Methods

We performed literature search in PubMed, Scopus, and Cochrane, for articles published by November 2020, using one or more of the key words including "One anastomosis gastric bypass," "OAGB," "Mini gastric bypass," "MGB," "Single-anastomosis gastric bypass," "Omega loop gastric bypass," "loop gastric bypass," or a combination of these keywords in the titles or abstracts. We excluded animal studies and non-English papers. We also focused on two IFSO consensuses (2017 and 2020) in OAGB/MGB and search in included articles for non-consensus items. Finally, the extracted data were summarized about the non-consensus items (Table 1).

Results

Procedure and Patient Selection

Moderate and Severe Esophagitis, Symptomatic GERD, and Barrett's Esophagus

Not only most surgeons believe that Barrett's esophagus is a contraindication to OAGB/MGB [4–6], but they also do not recommend OAGB/MGB in severe GERD and esophagitis class C and D [4, 6], albeit Barrett's esophagus is a contraindication for many other bariatric surgical procedures except RYGB. Also it has been shown that preoperative symptomatic reflux is related with post-OAGB GERD outcomes [7]. On the other hand, complete remission of GERD was reported in 92% of cases after OAGB/MGB in long-term follow-up [8].

Cirrhosis of the Liver

Child Pugh C cirrhosis is considered a contraindication to OAGB/MGB in the IFSO consensus [4]. In the Delphi consensus statement, OAGB/MGB was considered an acceptable surgical option in suitable patients with Child Pugh A cirrhosis without portal hypertension [3]; however, couple of years later in the next IFSO consensus, Child A cirrhosis was classified as contraindication of OAGB/MGB [4]. The fear of liver failure after bariatric operations was reported decades before by Brolin et al.; they showed that gastric bypass can result in a 3% mortality in the presence of liver cirrhosis [9]. Recently Mahawar et al. in a survey asked the surgeons about contraindications of OAGB/MGB, and liver cirrhosis (regardless of child class) was one of the criteria mentioned by the responders [5]. In our practice, most of the patients with cirrhosis were diagnosed intraoperatively. Child A and B patients without ascites and no severe signs of portal hypertension (confirmed by biopsies after surgery) were operated with OAGB and a BPL less than 200 cm and did not develop any complications.

Patients with Low Body Mass Index

There is now satisfactory evidence to consider OAGB/MGB as a safe and effective surgical metabolic option for diabetic patients with BMI ≤ 35 kg/m^2. In a systematic review, Parmar et al. reported cumulative results of OAGB/MGB procedures on 376 patients with a mean BMI of 29.16 kg/m^2. The median limb length was 120 cm. This review identified acceptable results in weight loss and resolution of comorbidities with low early and late complications. The mean BMI came down to 23.76 kg/m^2 at 12 months. Type 2 diabetes mellitus (T2DM) was completely resolved in 75.46%. Mortality was 0%. Mean leak rate was 0.26%. Marginal ulceration, hypoalbuminemia, and anemia were observed in 6.3%, 0.2%, and 4.7% respectively which were managed conservatively [10]. Kular et al. observed high remission rate of T2DM among 128 patients with class I obesity after 7 years [11]. Similarly, Kim et al. found 70% resolution of hyperglycemia in non-obese T2DM patients (BMI 25–30 kg/m^2) [12].

The available evidence suggests that OAGB/MGB is at least as favorable as, if not superior to, SG and RYGB in terms of metabolic effectiveness. Randomized studies comparing metabolic effectiveness of OAGB/MGB with SG or RYGB in this group of patients with longer term follow-up are needed. Superior effectiveness of OAGB/MGB in T2DM improvement over SG and RYGB also is reported [13].

Patients with Super Obesity

The role of OAGB/MGB in the BMI ≥ 50 kg/m^2 group has to be established in large studies with longer follow-ups. In a systematic review, Parmar et al. reported cumulative results of OAGB/MGB procedures on 318 patients with a mean BMI of 57.4 kg/m^2. The median limb length was 280 cm. Mortality was 0.31% with seven complications. The leak rate was 0%. Mean percentage excess weight loss (%EWL) of 67.7%, 71.6%, and 90.75% was observed at 12, 24, and 60 months, respectively. One of the advantages of OAGB/MGB is that the long gastric pouch can help form a tension-free

Table 1 The summarized non-consensus items and recommendations

Items	Recommendations
A) Procedure and patient selection	
Moderate and severe esophagitis, symptomatic GERD, and Barrett's esophagus	OAGB/MGB is an appropriate bariatric/metabolic procedure for patients with GERD (excluding severe esophagitis grade C and D and Barrett's esophagus).
Cirrhosis of the liver	OAGB/MGB is contraindicated in patients with Child's C liver cirrhosis. Child A and B patients without ascites and no severe signs of portal hypertension could be operated with OAGB with a shorter BPL (less than 200cm).
Low body mass index (BMI)	OAGB/MGB is a safe and effective surgical metabolic option for patients with BMI ≤ 35 kg/m^2.
Super obesity	OAGB/MGB is safe and effective in super-obese (BMI ≥ 50 kg/m^2) patients.
Adolescents and elderly patients	OAGB/MGB could be considered an appropriate procedure for the elderly (over 60 years old) patients if the general conditions are appropriate.
Smoking	OAGB/MGB is not recommend in active smokers. Smoking must be stopped at least 6 weeks before surgery. Lifelong PPIs are recommended in patients who recommence smoking after OAGB/MGB and advise of the ulcer risk.
B) Intraoperative	
Gastric pouch	The gastric pouch should be created as long as possible. Between 15 and 18-cm long, it is desirable. Narrow pouch over 36-38FR of calibration gastric tube First stapler-firing place for pouch confection (at the crow's foot)
Gastrojejunal anastomosis	GJ can be done in hand-sewn or linear-staple technique. GJ should be done with absorbable suture. The ideal width of the GJ should be 3-5cm. GJ is preferred on its posterior wall.
Whole small bowel count	Total bowel length should be measured to define the percentage for the length of the BPL. For a safe and adequate OAGB-MGB whenever possible without adding risk to the patient
Anti-reflux stitch	Anti-reflux suture is an optional step in OAGB/MGB.
Hiatal hernia repair	Selective HH repair in large and giant size is recommended.
Petersen defect	It is not necessary closure of Petersen's space during OAGB/MGB.
Biliopancreatic limb (BPL)	Majority of surgeons recommended 30-40% of total bowel length as BPL.
C) Postoperative	
Management of GERD	The most agreed conversional surgery is RYGB.
Management of leak	Options: Simple closure and drainage/conversion to RYGB In stable patients with more than 3 cm abscess: endoscopic stent or radiologic intervention In stable patients with less than 3 cm abscess or in patients without abscess: medical treatment and frequent reassessment
Malnutrition	Protein-calorie malnutrition patients may need a staged approach involving enteral/parenteral feeding, as appropriate, followed by either reversal to original anatomy, gastro-gastrostomy, or shortening of the limb.
Nutritional supplementations	Routine multivitamin supplement containing zinc and copper, vitamin D and calcium supplement, and iron and vitamin B12 supplement for the rest of their life with higher dose in comparison to RYGB.
Postoperative endoscopy	Postoperative EGD in patients symptomatic with reflux for early detection of any pathologic finding, such as esophagitis, gastritis, marginal ulcer, Barrett's esophagus, and malignant transformations. Need more long-term data.
Proton-pump inhibitor prophylaxis	Routinely use of prophylaxis with PPI for at least 3-6 months is recommended.
Ursodeoxycholic acid for gallstone prophylaxis	Patients should be advised routine ursodeoxycholic acid for gallstone prophylaxis for 6 months.
Weight loss failure	First, patients should undergo a medico-nutritional assessment by a multidisciplinary team and followed for at least 6 months and better continue to 24 months. To improve the restriction: gastric pouch resizing, gastric banding, or endoscopic treatment are explored.
Marginal ulcer	MU will usually respond to treatment with PPIs and sucralfate suspension for at least 3-6 months. Screen for HP and eradicate as appropriate and ensure MU healing by a check endoscopy after 3-6 months. Rare cases may require revision of the GJ anastomosis or change to RYGB. Perforated ulcers can be managed by laparoscopic closure with an omentoplasty and drainage. Conversion to RYGB has been suggested also for non-healing ulcers.

gastrojejunostomy compared to that in case of RYGB [14]. It is known that RYGB is more difficult in technique and carries more than 3 times the risk of major complication than OAGB/MGB [15]. Different authors have used different biliopancreatic limb in the super-obese patients varying from 200 to 400 cm [16].

Based on our review and the systematic review by Parmar et al. [14], we can recommend that in patients with BMI > 50 kg/m^2, the BPL of at least 200 cm can be considered. If the surgeon decides to have BPL ≥ 200 cm, then they should ideally measure the whole SB length. Patients with super obesity (SO) and super-super obesity (SSO) represent a totally different medical and metabolic status than morbidly obese. SG alone and standard RYGB have their own set of disadvantages for this group of patients. It is mandatory to know the whole length of the small bowel and can apply 60% BPL and

40% CL [17] under strict postoperative monitoring. Long-term results with OAGB/MGB will help us decide on the BPL length. Current limited literature shows OAGB/MGB is safe and effective in patients who are super-obese.

Adolescents and Elderly Patients

Many reported series of OAGB did not mention any age limitations [18–20]. Carbajo et al. reported good results after OAGB in morbid obese children and adolescents between 13 and 19 years old [21]. Another study showed safety and efficacy of OAGB in patients more than 65 years old [8]. Other papers did not include patients less than 18 or more than 65 years of age [22, 23]. The IFSO consensus statement on OAGB/MGB considered it an appropriate procedure for the elderly (over 60 years old) patients [4].

Smoking

Most of experts do not recommend OAGB/MGB in active smokers, as in all other bariatric surgeries with gastrointestinal anastomosis [4, 24], because smoking has a significant correlation with marginal ulcer [6, 25–28]. Smoking must be stopped at least 6 weeks before surgery and must not to be started after OAGB/MGB [3, 29]. Also, lifelong proton-pump inhibitors (PPIs) are recommended in patients who recommence smoking after OAGB/MGB [4, 6].

Intraoperative

Gastric Pouch

It is important to highlight certain points for creating the gastric tube. First is the size of bougie; many papers used 36F gastric tube as a calibration measure for construction of the pouch [30, 31]; however, bougie size ranging from 32F to 50F have been also reported [18]. Second is the entrance to lesser sac; many authors prefer 1-2 cm distal to the crow's foot to enter the lesser sac and firing the first stapler [20], although other reports vary from the lowest part of the incisura angularis of the stomach to up to 5 cm proximal of the pylorus [19], and above the crow's foot [32], which can make the pouch not much long to prevent bile reflux. Third is the pouch length; the size of bougie (36-38F) and the first stapler-firing place for pouch confection (at the crow's foot) were included in IFSO consensus [4]. The ideal length of pouch is still a debated topic. The pouch lengths reported are 18 cm [33, 34], 12-18cm [35], extended below the liver edge [19], and more than 15 cm [36] by different studies. The gastric pouch should be created as long as possible and preferable to be at least 15cm. Shorter gastric pouch may predispose to postoperative reflux and its complications.

Gastrojejunal Anastomosis

Most papers used linear cutting staplers in addition to continuous running absorbable sutures for gastrojejunal anastomosis. The length of anastomosis varies between 25 mm [30], 45mm [19, 34, 37], and 60 mm [20] in different papers [1]. It seems the type of suture material is about surgeon's preference; however, absorbable sutures must be used. Vicryl 2-0 [20], V-Loc 2-0 [30], and PDS 2-0 [19, 34, 37] are used by different papers. Hand-sewn anastomosis is also reported [36]. Majority of the papers made the anastomosis on the posterior wall of a gastric tube [31]; however, anastomosis on the anterior wall of pouch is also reported [19].

Whole Small Bowel Count

An ongoing debate with the OAGB/MGB is the length of the BPL. A BPL of 200 cm or longer may increase the risk of malabsorption and protein-calorie malnutrition and should preferably be done after measuring total small bowel length [4]. Carbajo used to measure whole small bowel and used mid-portion for GJ anastomosis [8]. They recommend that the BPL length must be tailored in relation with the features of the patient. Another study recommended using between 60 and 40%, but it can be different due to various status and model of obesity [17]. In another study by Soong et al., they concluded routine measurement of the whole small bowel length to keep the common channel at least 400-cm long. This may reduce the incidence of malnutrition after OAGB/MGB with tailored limb bypass, without compromising efficacy in weight loss and diabetes resolution [38].

On the other hand, measuring the whole small intestine and choosing the appropriate length are not free of risks. Counting whole small intestine leads to additional operative time and increased chance of unrecognized bowel injury due to intestinal manipulation (particularly in high BMI patients) [39].

Another problem is the absence of a precise measurement method for the small intestine and diversity between different surgeons [39].

Anti-reflux Stitch

Anti-reflux suture which makes an attachment between the afferent loop of the jejunum and gastric pouch and/or gastric remnant [30, 40, 41] was first described by Carbajo [8, 42] for prevention of tension on anastomotic site and bile reflux. It also may prevent gastric pouch rotation, decreased bleeding, leakage [38], and incidence of marginal ulceration [43]. Bowel injury/perforation may be a complication of anti-reflux suture [30] and most of experts believe that anti-reflux suture is not a necessary step in OAGB/MGB [3]. It can be an optional step, but needs more studies to evaluate its efficacy on prevention of GERD.

Hiatal Hernia Repair

Although there is no any consensus around hiatal hernia (HH) repair during OAGB/MGB, it has been shown that the presence and size of HH are correlated with postop GERD symptoms, especially in moderate and large HH [44]. Hence, selective HH repair in large and giant size is recommended by some authors [8, 45, 46]. Deitel et al. suggested HH repair in presence of a large gastric fundus in HH [24]. It is also recommended to repair any HH during conversional Roux-en-Y gastric bypass after OAGB/MGB due to GERD symptoms [7]. "His angle" dissection and posterior crural closure and also Toupet's fundoplication with gastric remnant are recommended in such scenario [7, 45].

Petersen Defect

In two recent consensus around OAGB/MGB [3, 4], most of surgeons agreed to non-closure of Petersen's space during OAGB/MGB, due to large defect and less chance for bowel incarceration compared to RYGB [47]. The incidence of internal herniation [40] is estimated about 1 in 500 cases [48]. Although there are few reports about IH after OAGB/MGB [23, 47, 49, 50], most of surgeons do not repair this space routinely [6, 8, 26, 38]. A survey by Mahawar et al. showed that only 18% of surgeons close Petersen's defect during OAGB/MGB [5]; however, it seems that closure can prevent IH, pouch kinking, and twisting and also pouch migration to the thoracic cavity [51].

Biliopancreatic Limb

Currently there is no consensus on the biliopancreatic limb (BPL) that should be bypassed during performance of the OAGB/MGB. Reported lengths of BPL varied widely from 100 to 400 cm, so the best way to choose optimal PBL length in OAGB/MGB is still debated. Fixed BPL may not be appropriate for morbidly obese patients with widely varied BMI, so BPL can be tailored according to BMI [16, 34, 52–57].

Noun et al. increased limb length by 10 cm for each increase in BMI above 40 [52]. Lee et al. [53], Jammu et al. [54], and similarly Kermansaravi et al. used 180 cm, 200 cm, and 220 cm BPL in BMI of 35–39, 40–50, and above 50, respectively, with a 10-cm reduction in its length in every 5-year age above 45 years old [34]. In another study by Boyle et al., they found that BPL of 150 cm delivers weight loss outcomes similar to that seen with a BPL of 200 cm [55]. In Mahmoudieh et al. study, 180-cm intestinal bypassed length had similar results for patients with a BMI level of 40–45 and 45–50 kg/m^2 [56].

Consensus was not achieved for ideal percentage length for BPL, when measurement of whole small bowel length was performed. In the last IFSO OAGB/MGB consensus, majority of surgeon recommended 30-40% of total bowel length as BPL [4].

Komaei et al. concluded, tailoring BPL length by bypassing about 40% of the whole small bowel length was superior to the fixed 200 cm BPL as it was associated with less nutritional deficiencies while providing similar weight loss results [57]. Carbajo selected the mid-portion of whole small bowel lengths. For increasing BMIs, they added 10–50 cm of bypassed small bowel but always maintained at least ~250–300 cm of common channel for the last ~1000 patients in their series [8].

Postoperative Factors

Management of GERD

Incidence of GERD symptoms after OAGB/MGB has been reported as high as up to 30% in one study [58]. It can be due to acid or bile reflux (BR) which first time was described by Kular et al. [59]. Most of experts believe that BR should be medically treated initially [4]. In persistent and medically resistant BR after 3-6 months [23] and stabilized presence of bile in the esophagus in EGD evaluation, conversional surgery is indicated [60].

The most agreed conversional surgery is RYGB [3], which can be a standard RYGB with shortening the pouch [6, 25, 40, 55, 60] or dividing the biliopancreatic loop without pouch resizing [7]. Braun's jejunojejunostomy (enteroenterostomy) has been reported in few studies [23, 25, 61–64].

Management of Leak

Endoscopic stent placement for early and acute leaks in stable patients has been reported by Younis et al. in 9 patients (5 patients fully recovered without surgical intervention, 2 patients converted to RYGB, one patient underwent urgent laparotomy, and unfortunately one patient died due to respiratory failure) [64]. It is obvious that patients who are unwell, hemodynamically unstable, with frank peritonitis should undergo emergent surgical intervention. In series of Beaupel et al., 17 patients with leakage after OAGB were enrolled. The most frequent site of leak was GJ anastomosis, and 16 patients underwent either laparotomy or laparoscopy without any mortality [65, 66]. An algorithm for leaks after OAGB has been reported [67]. Patients with sepsis and/or diffuse peritonitis in imaging need emergent laparoscopic intervention (irrigation and T tube or conversion to RYGB). Patients with abscess more than 3 cm were managed with percutaneous drainage or endoscopic intervention. Small abscesses (less than 3 cm) were managed with medical therapy. In cases of drainage of GI content from intraoperatively placed abdominal drain without sepsis or abscess, medical treatment usually is enough. If any of the conservative managements are failed, laparoscopic intervention is mandatory [67].

When surgical intervention is necessary, there are some options. Simple closure and drainage are feasible and pose patient to shorter operative time in underlying sepsis. However, conversion to RYGB was reported by other authors. Pigtail placement can be explored in stable patients.

Malnutrition

Malnutrition especially protein-calorie malnutrition after OAGB/MGB is a rare but dreaded complication with few data available [1]. Extreme weight loss, which can lead to malnutrition after OAGB/MGB, has been reported in multiple studies ranging from 0.2 to 2% [8, 25, 39, 61, 66]. There are two case reports about young women (29 and 37 years old) who died after OAGB/MGB due to liver failure and malnutrition (but in both cases, the small bowel was not measured and the necropsies showed that the CL was about only 1 m, so technical failure was the reason of death) [67, 68]. Its mechanism is multifactorial, and more weight reduction effect is due to its longer BPL length making this procedure more malabsorptive than RYGB. But the main surgical maneuver in order to avoid malnutrition is to know the total small bowel length and adjust both BPL and CL to the features of patient and maintain a reasonable CL capable of maintaining long-term weight loss without malnutrition [17]. Also, marginal ulcer is often associated with biliary reflux, which both in turn can aggravate malnutrition with reduced food intakes. Recent studies in rodents and humans have demonstrated that the OAGB/MGB itself was associated with fewer intestinal adaptation with increased protein-calorie malabsorption as compared to RYGB [25, 39, 61, 66].

According to a large survey, the highest rate (0.6%) of revisional surgery after OAGB/MGB for severe protein-calorie malnutrition occurred when the surgeon used BPL length 250 cm while the minimum (0%) was found when BPL length was 150 cm [69]. According with the IFSO consensus statement [4], no consensus reached an agreement to measure the total small bowel (only 62% agreement) in order to prevent malabsorption. A BPL about 150 cm should be considered a profile similar than RYGB (73% agreement). In a study by Keleidari et al. [66] among 846 cases of OAGB/MGB, 12 (1.4%) underwent reversal to normal anatomy due to severe and refractory hypoalbuminemia after a mean of 12.1 months. Interestingly all of them were women with %EWL of 107.7 ± 20.8%. They concluded common channel more than 250 cm cannot prevent hypoalbuminemia, but does not refer the essential correlation between BPL and CL. They recommended in patients with severe and refractory hypoalbuminemia, reversal to normal anatomy is an easy and safe treatment option when all nutritional supports (i.e., oral and TPN) have been attempted. Similarly, Genser et al. [39] reversed 26 of 2934 patients with LOAGB (0.8%) to normal anatomy from 2005 to 2015, after mean 20.9 ± 13.4 months. A total of 91.7% of their patients were female and the mean age in their study was 47.3 ± 10.8 years. They reported the mean primary BPL length in 12 patients before reversing them to normal anatomy and found that 66% of them had 120 ± 63.9 cm discrepancy to standard 200 cm. A great number of reported cases with malnutrition could have been avoided if the total small bowel length would have been measured, so surgeons that are interested in OAGB/MGB should be conscious that this surgical step can be helpful.

Authors practice the follow-up after OAGB/MGB by checking the albumin and LFT every 3 months for the first year, every 6 months for the second year, and then annually. Because timing of diagnosis remains a crucial factor for deciding on better strategy, late diagnosis and intervention may lead to liver dysfunction and death. Although conversion to SG was not free from complications, when diagnosis is made early, conversion to RYGB or SG could solve the problem and prevent from weight regain. When the diagnosis is late and severe refractory malnutrition is present, conversion to normal anatomy or elongation of the CL should be considered in these high-risk patients after nutritional optimization.

Nutritional Supplementations

It is now widely recognized that bariatric surgery patients need regular prophylactic supplementation with a number of micronutrients to prevent clinical deficiency. Even though the consensus was achieved on IFSO first consensus on OAGB/MGB, patients should be advised routine multivitamin supplement containing zinc and copper, vitamin D and calcium supplement, and iron and vitamin B12 supplement for the rest of their life but the dosage of these supplements is still unclear for patients undergoing OAGB/MGB [3].

Since OAGB/MGB bypasses more small bowel as BPL, the requirement for such micronutrient supplementation is likely to be higher than patients undergoing RYGB [51, 70, 71]. We hypothesize that OAGB/MGB patients should be advised lifelong supplementation with (1) two multivitamin/mineral tablet, each containing at least 1.0 g of copper and 15 mg of zinc; (2) parenteral supplementation with 1 mg vitamin B12 every 3 months or oral supplementation with 1.5 mg vitamin B12 daily; (3) iron supplementation with at least 120 mg elemental iron daily; (4) calcium supplementation with 1500 mg elemental calcium; and (5) vitamin D 3000 international units daily. These doses are based on our experience with OAGB/MGB and the literature on RYGB extrapolated to higher requirements with OAGB [51, 71–75].

Postoperative Endoscopy

IFSO recommends preoperative esophago-gastroduodenoscopy (EGD) in all patients who are candidate for weight loss surgery, especially in patients who are scheduled

for gastric bypass whose gastric remnant will be un-accessible after surgery. Postoperative EGD also is recommended by IFSO, 1 year after OAGB/MGB and SG and then every 2-3 years to early detection of any pathologic finding, such as Barrett's esophagus and malignant transformations [76], as two cases of gastric cancer (one is gastric remnant and one in gastric pouch) [77, 78] and one case of esophageal cancer [79] after OAGB/MGB are reported until now. However, gastro-esophageal cancer after OAGB/MGB is exceedingly rare [80]. Follow-up EGD also can help in confirmation of bile reflux and marginal ulcer formation after OAGB/MGB [23, 27].

Proton-Pump Inhibitor Prophylaxis

In many reported series [1], data about postoperative PPI is lacking; however, lansoprazole 30 mg daily [36, 55] or other PPIs for 6 months [32] were reported. These reports are in line with results of Mahawar et al. survey, where most surgeons routinely use marginal ulcer prophylaxis with PPI for at least 6 months [5].

Ursodeoxycholic Acid for Gallstone Prophylaxis

Long-term routine care of these patients is very similar to that of RYGB patients. Most surgeons recommend routine ursodeoxycholic acid for the same duration for prophylaxis of gallstones during the period of rapid weight loss [24, 44, 81]. But consensus was not achieved (60% disagreed) on IFSO first consensus on OAGB/MGB that patients should be advised of routine ursodeoxycholic acid for gallstone prophylaxis for 6 months [3].

In another survey study by Mahawar et al., only 28.0% surgeons routinely use ursodeoxycholic acid prophylaxis for gallstones. Most of these surgeons recommend a duration of up to 6 months. Surgeons reported a wide variation in dosages in the range of 400–1200 mg daily [5].

Weight Loss Failure

OAGB/MGB has been proven to be an effective and durable procedure for weight loss and with a high resolution of co-morbidities [62, 82]. One of the main concerns bariatric surgeons harbored towards MGB-OAGB was its poorly defined long-term outcomes. There are few data concerning the management of the inadequate weight loss or weight regain after OAGB. In a study by Ansar et al., they found preoperative higher BMI, type 2 diabetes, pre-surgery volume eating habit, and weight reduction value in the first month after surgery and length of BPL were independently associated with unsuccessful weight loss at 1-year follow-up [37]. Insufficient weight loss was defined as insufficient percentage of excess weight loss (%EWL) 2 years after surgery (< 50%). Weight regain was defined as > 25% EWL regain compared to the lowest weight achieved after OAGB or when a patient met the criteria for bariatric surgery again. Prior to surgery, all patients should undergo a medico-nutritional assessment by a multidisciplinary team and followed for at least 6 months to ensure the absence of eating disorders. CT scan and endoscopy were performed for all patients. The gastric pouch was considered dilated when radiologic and endoscopic criteria were met: Gastric pouch was considered dilated when the width was > 4 cm measured on CT scan after ingestion of radio-opaque product. Patients may experience inadequate weight loss or weight regain due to gastric pouch dilation after OAGB. Dilated gastric pouch resizing (GPR) associated with correction of eating behavior was suggested as an option in the management of these patients [6, 83]. In the recent systematic review, it is reported that the revisional OAGB procedures lose less weight compared to primary OAGB cases [84]. To improve the restriction, other alternative solutions could be considered such as addition of gastric banding or endoscopic treatment. Addition of adjustable gastric banding over prior RYGB was reported by several teams with controversial conclusions [85, 86].

Faul et al. believed that there is a causal link between history of gastric banding and weight loss failure. Among their patients with weight loss failure, 40% had a history of gastric banding. A reason behind that is revisional surgery could be difficult due to adhesions compromising the preparation of an adequate small and narrow gastric pouch leaving a large part of cardia on the posterior side [83]. They observed satisfactory mid-term secondary weight loss in well-selected patients.

Marginal Ulcer

There were concerns that OAGB/MGB is associated with high rate of marginal ulcer (MU) and its complication. MU after OAGB/MGB has been reported in several studies ranging from 0.5 to 5% which seems similar to that with RYGB [8, 27, 43, 51, 87]. In a systematic review by Parmar et al., they found mean MU rate of 2.7% in about 12,000 OAGB/MGB patients [87]. In a survey study by Mahawar et al., they reported overall MU rate of 2.24% after OAGB/MGB with no mortality associated with MU [43]. Carbajo et al. reported lower rate of 0.5% [8]. The risk factors of MU after OAGB/MGB are known as helicobacter pylori (HP), ingestion of NSAIDs, and alcohol and tobacco consumption. In a study by Clapp et al., they concluded that the risk of anastomotic ulcer was increased with increased BMI, need for PTC, and history of DVT/PE [27].

MUs in majority of the large series were successfully managed conservatively [27, 43, 51, 88]. Our review showed variable practice among surgeons. MU will usually respond to treatment with PPIs and sucralfate suspension. PPIs will usually need to be continued for at least 3 months. Smoking, use

of steroids, and NSAIDs must be avoided. Screen for HP and eradicate as appropriate and ensure MU healing by a check endoscopy after 3 months [51, 88]. In case of smokers, PPI should be continued for long term.

Ulcers may become refractory to medical management. Hemorrhage will often respond to PPIs and endoscopic modalities but in rare cases may require surgery with over sewing of the ulcer or revision of the gastrojejunal anastomosis. Perforated ulcers can be managed by laparoscopic closure with an omentoplasty and drainage or by laparoscopic conversion to RYGB [89]. Conversion to RYGB has been suggested also for non-healing ulcers [27, 51, 52, 59, 88].

Data in this field is limited and there is a need to standardize prophylaxis, diagnosis, treatment, and management of complications of these ulcers after OAGB/MGB.

Discussion

OAGB/MGB is now a well-known and established bariatric and metabolic surgical procedure with good efficacy and acceptable complications [1], but there are some debates around its some aspects, despite two recent consensuses around OAGB/MGB [3, 4].

Most of the surgeons do not recommend OAGB/MGB in Barrett's esophagus, esophagitis class C&D, severe GERD symptoms, Child C cirrhosis [4–7], and active smokers [4, 24] but it is an acceptable option in both low BMI [10–12] and SO patients [14–16]. Also it can be a safe procedure in both young and old ages [4, 18–20].

In technical aspects, creation of a long pouch with at least 12-18 cm length [33–35] on a calibration tube [18, 30, 31] is recommended. As fixed BPL may not be appropriate for all different BMI, adjusting the BP limb according to BMI [16, 34, 52–57] or using 30-40% of total bowel length [4] is suggested. However, BPL longer than 200cm can have risk of anemia and malnutrition.

The size of gastrojejunostomy can vary from 25 to 60mm [19, 20, 30, 34, 37] in posterior [31] or anterior wall of the gastric pouch [19]. There is an ongoing debate about whole small bowel length measurement but it seems not necessary in all cases. [8, 38]. Anti-reflux suture is not believed a necessary step in OAGB/MGB [3], but it is recommended to repair any hiatal hernia greater than small size, during OAGB/MGB [8, 44–46]. Based on recent reports about Petersen's hernia after OAGB/MGB [23, 47, 49, 50], the defect closure may be essential.

Postop care is a very important aspect in any bariatric procedure such as OAGB/MGB. Protein-calorie malnutrition is a rare [8, 25, 39, 61, 66] but dangerous [67, 68] condition after OAGB/MGB that should be prevented by close follow-ups after surgery and should be treated promptly after diagnosis. Close adherence to postoperative nutritional supplements should be mandated.

Management of some complications such as persistent BR and leakage [23, 60, 65] and resistant MU [27, 51, 52, 59, 88] generally needs surgical intervention.

We have attempted to summarize the non-consensus points and recommendations in Table 1.

Conclusion

There is enough evidence to include OAGB/MGB as an accepted standard bariatric and metabolic surgical method including IFSO position statement. However, certain aspects as discussed above need long-term data more research.

Declarations

Ethics Approval Statement Ethics approval is not needed for this article.

Consent of Patients This is not needed for such article.

Conflict of Interest The authors declare no competing interests.

References

1. De Luca M, Tie T, Ooi G, et al. Mini gastric bypass-one anastomosis gastric bypass (MGB-OAGB)-IFSO position statement. Obes Surg. 2018;28(5):1188–206.
2. Carbajo M, Garcia-Caballero M, Toledano M, et al. One-anastomosis gastric bypass by laparoscopy: results of the first 209 patients. Obes Surg. 2005;15(3):398–404.
3. Mahawar KK, Himpens J, Shikora SA, et al. The First consensus statement on one anastomosis/mini gastric bypass (OAGB/MGB) using a modified Delphi approach. Obes Surg. 2018;28(2):303–12.
4. Ramos AC, Chevallier JM, Mahawar K, et al. IFSO (International Federation for Surgery of Obesity and Metabolic Disorders) consensus conference statement on one-anastomosis gastric bypass (OAGB-MGB): results of a modified Delphi study. Obes Surg. 2020;30(5):1625–34.
5. Mahawar KK, Kular KS, Parmar C, et al. Perioperative practices concerning one anastomosis (mini) gastric bypass: a survey of 210 surgeons. Obes Surg. 2018;28(1):204–11.
6. Chevallier JM, Arman GA, Guenzi M, et al. One thousand single anastomosis (omega loop) gastric bypasses to treat morbid obesity in a 7-year period: outcomes show few complications and good efficacy. Obes Surg. 2015;25(6):951–8.
7. Kassir R, Petrucciani N, Debs T, et al. Conversion of one anastomosis gastric bypass (OAGB) to Roux-en-Y gastric bypass (RYGB) for biliary reflux resistant to medical treatment: lessons learned from a retrospective series of 2780 consecutive patients undergoing OAGB. Obes Surg. 2020;30(6):2093–8.
8. Carbajo MA, Luque-de-León E, Jiménez JM, et al. Laparoscopic one-anastomosis gastric bypass: technique, results, and long-term follow-up in 1200 patients. Obes Surg. 2017;27(5):1153–67.

9. Brolin RE, Bradley LJ, Taliwal RV. Unsuspected cirrhosis discovered during elective obesity operations. Arch Surg (Chicago, Ill : 1960). 1998;133(1):84–8.
10. Parmar CD, Zakeri R, Mahawar K. A systematic review of one anastomosis/mini gastric bypass as a metabolic operation for patients with body mass index </= 35 kg/m(2). Obes Surg. 2020;30(2):725–35.
11. Kular KS, Manchanda N, Cheema GK. Seven years of mini-gastric bypass in type II diabetes patients with a body mass index <35 kg/m(2). Obes Surg. 2016;26(7):1457–62.
12. Kim Z, Hur KY. Laparoscopic mini-gastric bypass for type 2 diabetes: the preliminary report. World J Surg. 2011;35(3):631–6.
13. Ruiz-Tovar J, Carbajo MA, Jimenez JM, et al. Long-term follow-up after sleeve gastrectomy versus Roux-en-Y gastric bypass versus one-anastomosis gastric bypass: a prospective randomized comparative study of weight loss and remission of comorbidities. Surg Endosc. 2019;33(2):401–10.
14. Parmar CD, Bryant C, Luque-de-Leon E, et al. One anastomosis gastric bypass in morbidly obese patients with BMI >/= 50 kg/m(2): a systematic review comparing it with Roux-En-Y gastric bypass and sleeve gastrectomy. Obes Surg. 2019;29(9):3039–46.
15. Lee WJ, Lin YH. Single-anastomosis gastric bypass (SAGB): appraisal of clinical evidence. Obes Surg. 2014;24(10):1749–56.
16. Lee WJ, Wang W, Lee YC, et al. Laparoscopic mini-gastric bypass: experience with tailored bypass limb according to body weight. Obes Surg. 2008;18(3):294–9.
17. Ruiz-Tovar J, Carbajo MA, Jimenez JM, et al. Are there ideal small bowel limb lengths for one-anastomosis gastric bypass (OAGB) to obtain optimal weight loss and remission of comorbidities with minimal nutritional deficiencies? World J Surg. 2020;44(3):855–62.
18. Lo HC. The learning curve of one anastomosis gastric bypass and its impact as a preceding procedure to Roux-en Y gastric bypass: initial experience of one hundred and five consecutive cases. BMC Surg. 2020;20(1):37.
19. Ruiz-Mar G, Ruelas-Ayala A, Ornelas-Onate LA, et al. The one anastomosis gastric bypass technique: results after one year of follow-up. Arquivos brasileiros de cirurgia digestiva : ABCD = Brazilian archives of digestive surgery. 2019;32(4):e1476.
20. Scavone G, Caltabiano DC, Gulino F, et al. Laparoscopic mini/one anastomosis gastric bypass: anatomic features, imaging, efficacy and postoperative complications. Updat Surg. 2020;72(2):493–502.
21. Carbajo MA, Gonzalez-Ramirez G, Jimenez JM, et al. A 5-year follow-up in children and adolescents undergoing one-anastomosis gastric bypass (OAGB) at a European IFSO Excellence Center (EAC-BS). Obes Surg. 2019;29(9):2739–44.
22. Ahuja A, Tantia O, Goyal G, et al. MGB-OAGB: effect of biliopancreatic limb length on nutritional deficiency, weight loss, and comorbidity resolution. Obes Surg. 2018;28(11):3439–45.
23. Apers J, Wijkmans R, Totte E, et al. Implementation of mini gastric bypass in the Netherlands: early and midterm results from a high-volume unit. Surg Endosc. 2018;32(9):3949–55.
24. Deitel M, Rutledge R. Mini-gastric bypass: prevention and management of complications in performance and follow-up. Int J Surg (London, England). 2019;71:119–23.
25. Musella M, Susa A, Manno E, et al. Complications following the mini/one anastomosis gastric bypass (MGB/OAGB): a multi-institutional survey on 2678 patients with a mid-term (5 years) follow-up. Obes Surg. 2017;27(11):2956–67.
26. Neuberg M, Blanchet MC, Gignoux B, et al. Long-term outcomes after one-anastomosis gastric bypass (OAGB) in morbidly obese patients. Obes Surg. 2020;30(4):1379–84.
27. Clapp B, Hahn J, Dodoo C, et al. Evaluation of the rate of marginal ulcer formation after bariatric surgery using the MBSAQIP database. Surg Endosc. 2019;33(6):1890–7.
28. Mahawar KK, Kumar P, Carr WR, et al. Current status of mini-gastric bypass. J Minim Access Surg. 2016;12(4):305–10.
29. Mahawar KK, Parmar C, Carr WR, et al. Preoperative interventions for patients being considered for bariatric surgery: separating the fact from fiction. Obes Surg. 2015;25(8):1527–33.
30. Ruiz-Tovar J, Llavero C. Metabolic effect of the hepatic branch of the vagal nerve in one-anastomosis gastric bypass (OAGB). World J Surg. 2020;44(6):1939–44.
31. Jedamzik J, Eilenberg M, Felsenreich DM, et al. Impact of limb length on nutritional status in one-anastomosis gastric bypass: 3-year results. Surgery for Obesity and Related Diseases : official journal of the American Society for Bariatric Surgery. 2020;16(4):476–84.
32. Bruzzi M, Rau C, Voron T, et al. Single anastomosis or mini-gastric bypass: long-term results and quality of life after a 5-year follow-up. Surgery for Obesity and Related Diseases : official journal of the American Society for Bariatric Surgery. 2015;11(2):321–6.
33. Shenouda MM, Harb SE, Mikhail SAA, et al. Bile gastritis following laparoscopic single anastomosis gastric bypass: pilot study to assess significance of bilirubin level in gastric aspirate. Obes Surg. 2018;28(2):389–95.
34. Kermansaravi M, Pishgahroudsari M, Kabir A, et al. Weight loss after one-anastomosis/mini-gastric bypass-the impact of biliopancreatic limb: a retrospective cohort study. Journal of Research in Medical Sciences : the official journal of Isfahan University of Medical Sciences. 2020;25:5.
35. Bhandari M, Nautiyal HK, Kosta S, et al. Comparison of one-anastomosis gastric bypass and Roux-en-Y gastric bypass for treatment of obesity: a 5-year study. Surgery for Obesity and Related Diseases : official journal of the American Society for Bariatric Surgery. 2019;15(12):2038–44.
36. Hussain A, El-Hasani S. Short- and mid-term outcomes of 527 one anastomosis gastric bypass/mini-gastric bypass (OAGB/MGB) operations: retrospective study. Obes Surg. 2019;29(1):262–7.
37. Ansar H, Zamaninour N, Pazouki A, et al. Weight loss after one anastomosis gastric bypass-mini gastric bypass (OAGB-MGB): patient-related perioperative predictive factors. Obes Surg. 2020;30(4):1316–23.
38. Soong TC, Almalki OM, Lee WJ, et al. Measuring the small bowel length may decrease the incidence of malnutrition after laparoscopic one-anastomosis gastric bypass with tailored bypass limb. Surgery for Obesity and Related Diseases : official journal of the American Society for Bariatric Surgery. 2019;15(10):1712–8.
39. Genser L, Soprani A, Tabbara M, et al. Laparoscopic reversal of mini-gastric bypass to original anatomy for severe postoperative malnutrition. Langenbeck's Arch Surg. 2017;402(8):1263–70.
40. Saarinen T, Pietiläinen KH, Loimaala A, et al. Bile reflux is a common finding in the gastric pouch after one anastomosis gastric bypass. Obes Surg. 2020;30(3):875–81.
41. Navarrete S, Leyba JL, Ll SN, et al. Results of the comparative study of 200 cases: one anastomosis gastric bypass vs Roux-en-Y gastric bypass. Obes Surg. 2018;28(9):2597–602.
42. Carbajo MA, Fong-Hirales A, Luque-de-León E, et al. Weight loss and improvement of lipid profiles in morbidly obese patients after laparoscopic one-anastomosis gastric bypass: 2-year follow-up. Surg Endosc. 2017;31(1):416–21.
43. Mahawar KK, Reed AN, Graham YNH. Marginal ulcers after one anastomosis (mini) gastric bypass: a survey of surgeons. Clin Obes. 2017;7(3):151–6.
44. Kermansaravi M, Kabir A, Mousavimaleki A, et al. Association between hiatal hernia and gastroesophageal reflux symptoms after one-anastomosis/mini gastric bypass. Surgery for Obesity and Related Diseases : official journal of the American Society for Bariatric Surgery. 2020;16(7):863–7.
45. Chiappetta S, Stier C, Scheffel O, et al. Mini/one anastomosis gastric bypass versus Roux-en-Y gastric bypass as a second step

procedure after sleeve gastrectomy-a retrospective cohort study. Obes Surg. 2019;29(3):819–27.
46. Rheinwalt KP, Plamper A, Ruckbeil MV, et al. One anastomosis gastric bypass-mini-gastric bypass (OAGB-MGB) versus Roux-en-Y gastric bypass (RYGB)-a mid-term cohort study with 612 patients. Obes Surg. 2020;30(4):1230–40.
47. Kermansaravi M, Kazazi M, Pazouki A. Petersen's space internal hernia after laparoscopic one anastomosis (mini) gastric bypass. Case reports in surgery. 2018;2018:9576120.
48. Camacho Fernandez-Pacheco B, Lopez-Tomassetti Fernandez E, Hernandez Hernandez JR. Surgery and considerations for the repair of Petersen's space hernia after mini gastric bypass. J Minim Access Surg. 2018;14(1):58–60.
49. Abbas A, Kermansaravi M, Eghbali F, et al. Another Petersen's space hernia after one anastomosis gastric bypass: a video case report. Obes Surg. 2019;29(11):3776–7.
50. AlZarooni N, Abou Hussein B, Al Marzouqi O, et al. Gastric remnant perforation caused by Peterson's hernia following one anastomosis gastric bypass: a rare complication. Obes Surg. 2020;30(8):3229–32.
51. Mahawar KK, Parmar C, Graham Y. One anastomosis gastric bypass: key technical features, and prevention and management of procedure-specific complications. Minerva Chir. 2019;74(2):126–36.
52. Noun R, Skaff J, Riachi E, et al. One thousand consecutive mini-gastric bypass: short- and long-term outcome. Obes Surg. 2012;22(5):697–703.
53. Lee WJ, Ser KH, Lee YC, et al. Laparoscopic Roux-en-Y vs. mini-gastric bypass for the treatment of morbid obesity: a 10-year experience. Obes Surg. 2012;22(12):1827–34.
54. Jammu GS, Sharma R. A 7-year clinical audit of 1107 cases comparing sleeve gastrectomy, Roux-En-Y gastric bypass, and mini-gastric bypass, to determine an effective and safe bariatric and metabolic procedure. Obes Surg. 2016;26(5):926–32.
55. Boyle M, Mahawar K. One anastomosis gastric bypass performed with a 150-cm biliopancreatic limb delivers weight loss outcomes similar to those with a 200-cm biliopancreatic limb at 18 -24 months. Obes Surg. 2020;30(4):1258–64.
56. Mahmoudieh M, Keleidari B, Afshin N, et al. The early results of the laparoscopic mini-gastric bypass/one anastomosis gastric bypass on patients with different body mass index. J Obes. 2020;7572153:2020.
57. Komaei I, Sarra F, Lazzara C, et al. One anastomosis gastric bypass-mini gastric bypass with tailored biliopancreatic limb length formula relative to small bowel length: preliminary results. Obes Surg. 2019;29(9):3062–70.
58. Kermansaravi M, Mahawar KK, Jazi AHD, et al. Revisional surgery after one anastomosis/mini gastric bypass: a narrative review. Journal of Research in Medical Sciences. 2020;25(1):62.
59. Kular KS, Manchanda N, Rutledge R. A 6-year experience with 1, 054 mini-gastric bypasses-first study from Indian subcontinent. Obes Surg. 2014;24(9):1430–5.
60. Bolckmans R, Arman G, Himpens J. Efficiency and risks of laparoscopic conversion of omega anastomosis gastric bypass to Roux-en-Y gastric bypass. Surg Endosc. 2019;33(8):2572–82.
61. Lee WJ, Lee YC, Ser KH, et al. Revisional surgery for laparoscopic minigastric bypass. Surgery for Obesity and Related Diseases : official journal of the American Society for Bariatric Surgery. 2011;7(4):486–91.
62. Taha O, Abdelaal M, Abozeid M, et al. Outcomes of omega loop gastric bypass, 6-years experience of 1520 cases. Obes Surg. 2017;27(8):1952–60.
63. Johnson WH, Fernanadez AZ, Farrell TM, et al. Surgical revision of loop ("mini") gastric bypass procedure: multicenter review of complications and conversions to Roux-en-Y gastric bypass. Surgery for Obesity and Related Diseases : official journal of the American Society for Bariatric Surgery. 2007;3(1):37–41.
64. Younis F, Shnell M, Gluck N, et al. Endoscopic treatment of early leaks and strictures after laparoscopic one anastomosis gastric bypass. BMC Surg. 2020;20(1):33.
65. Beaupel N, Bruzzi M, Voron T, et al. Management of acute intra-abdominal sepsis caused by leakage after one anastomosis gastric bypass. Surgery for Obesity and Related Diseases : official journal of the American Society for Bariatric Surgery. 2017;13(8):1297–305.
66. Keleidari B, Mahmoudieh M, Shahabi S, et al. Reversing one-anastomosis gastric bypass surgery due to severe and refractory hypoalbuminemia. World J Surg. 2020;44(4):1200–8.
67. Liagre A, Queralto M, Juglard G, et al. Multidisciplinary management of leaks after one-anastomosis gastric bypass in a single-center series of 2780 consecutive patients. Obes Surg. 2019;29(5):1452–61.
68. Kermansaravi M, Abdolhosseini MR, Kabir A, et al. Severe hypoalbuminemia and steatohepatitis leading to death in a young vegetarian female, 8 months after mini gastric bypass: a case report. Int J Surg Case Rep. 2017;31:17–9.
69. Mahawar KK, Parmar C, Carr WRJ, et al. Impact of biliopancreatic limb length on severe protein-calorie malnutrition requiring revisional surgery after one anastomosis (mini) gastric bypass. J Minim Access Surg. 2018;14(1):37–43.
70. O'Kane M PJ, Aasheim E, Barth J, et al. BOMSS Guidelines on perioperative and postoperative biochemical monitoring and micronutrient replacement for patients undergoing bariatric surgery. Adopted by BOMSS Council September 2014 [Internet].. uk/wp-content/uploads/2014/09/BOMSS-guidelines-Finalversion1Oct14.pdf [cited 2020, Aug 16].
71. Madhok BM, Mahawar KK, Hadfield JN, et al. Haematological indices and haematinic levels after mini gastric bypass: a matched comparison with Roux-en-Y gastric bypass. Clin Obes. 2018;8(1):43–9.
72. Kumar P, Hamza N, Madhok B, et al. Copper deficiency after gastric bypass for morbid obesity: a systematic review. Obes Surg. 2016;26(6):1335–42.
73. Mahawar KK, Bhasker AG, Bindal V, et al. Zinc deficiency after gastric bypass for morbid obesity: a systematic review. Obes Surg. 2017;27(2):522–9.
74. Mahawar KK, Reid A, Graham Y, et al. Oral vitamin B12 supplementation after Roux-en-Y gastric bypass: a systematic review. Obes Surg. 2018;28(7):1916–23.
75. Mechanick JI, Apovian C, Brethauer S, et al. Clinical practice guidelines for the perioperative nutrition, metabolic, and nonsurgical support of patients undergoing bariatric procedures - 2019 Update: Cosponsored by American Association of Clinical Endocrinologists/American College of Endocrinology, The Obesity Society, American Society for Metabolic and Bariatric Surgery, Obesity Medicine Association, and American Society of Anesthesiologists. Obesity (Silver Spring, Md). 2020;28(4):O1–o58.
76. Brown WA. Johari Halim Shah Y, Balalis G, Bashir A, Ramos A, Kow L, et al. IFSO position statement on the role of esophagogastro-duodenal endoscopy prior to and after bariatric and metabolic surgery procedures. Obes Surg. 2020;30(8):3135–53.
77. Wu CC, Lee WJ, Ser KH, et al. Gastric cancer after mini-gastric bypass surgery: a case report and literature review. Asian J Endosc Surg. 2013;6(4):303–6.
78. Runkel M, Pauthner M, Runkel N. The first case report of a carcinoma of the gastric cardia (AEG II) after OAGB-MGB. Obes Surg. 2020;30(2):753–4.
79. Aggarwal S, Bhambri A. Singla V. Sharma A. Adenocarcinoma of oesophagus involving gastro-oesophageal junction following mini-

gastric bypass/one anastomosis gastric bypass. Journal of minimal access surgery: Dash NR; 2019.
80. Musella M, Berardi G, Bocchetti A, et al. Esophagogastric neoplasms following bariatric surgery: an updated systematic review. Obes Surg. 2019;29(8):2660–9.
81. Mahawar K. Care for patients who have undergone one anastomosis gastric bypass surgery. British journal of nursing (Mark Allen Publishing). 2019;28(3):157–60.
82. Musella M, Susa A, Greco F, et al. The laparoscopic mini-gastric bypass: the Italian experience: outcomes from 974 consecutive cases in a multicenter review. Surg Endosc. 2014;28(1):156–63.
83. Faul A, Chevallier JM, Poghosyan T. Dilated gastric pouch resizing for weight loss failure after one anastomosis gastric bypass. Obes Surg. 2019;29(10):3406–9.
84. Parmar CD, Gan J, Stier C, et al. One anastomosis/mini gastric bypass (OAGB-MGB) as revisional bariatric surgery after failed primary adjustable gastric band (LAGB) and sleeve gastrectomy (SG): a systematic review of 1075 patients. Int J Surg (London, England). 2020;81:32-38.
85. Schmidt HJ, Lee EW, Amianda EA, et al. Large series examining laparoscopic adjustable gastric banding as a salvage solution for failed gastric bypass. Surgery for Obesity and Related Diseases : official journal of the American Society for Bariatric Surgery. 2018;14(12):1869–75.
86. Brunaldi VO, Jirapinyo P, de Moura DTH, et al. Endoscopic Treatment of Weight Regain Following Roux-en-Y Gastric Bypass: a Systematic Review and Meta-analysis. Obes Surg. 2018;28(1):266–76.
87. Parmar CD, Mahawar KK. One Anastomosis (Mini) Gastric bypass is now an established bariatric procedure: a systematic review of 12, 807 patients. Obes Surg. 2018;28(9):2956–67.
88. Godina M, Nagliati C, Menegon P, et al. Emergency laparoscopic conversion from mini/one anastomosis gastric bypass to modified Roux-en-Y-gastric bypass due to acute bleeding from a recurrent marginal ulcer. Updat Surg. 2017;69(3):421–4.
89. Musella M, Berardi G, Vitiello AJSfO, Diseases R. Laparoscopic conversion from MGB/OAGB to RYGB for perforated marginal ulcer: video case report. 2020.