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ORIGINAL CONTRIBUTIONS

Mini Gastric Bypass-One Anastomosis Gastric Bypass (MGB-OAGB)-IFSO Position Statement

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Preamble

The International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) has played an integral role in educating both the metabolic surgical and the medical community at large about the role of innovative and new surgical and/or endoscopic interventions in treating adiposity-based chronic diseases.

The mini gastric bypass is also known as the one anastomosis gastric bypass. The IFSO has agreed that the standard nomenclature should be the mini gastric bypass-one anastomosis gastric bypass (MGB-OAGB). The IFSO commissioned a task force (Appendix 1) to determine if MGB-OAGB is an effective and safe procedure and if it should be considered a surgical option for the treatment of obesity and metabolic diseases.

The following position statement is issued by the IFSO MGB-OAGB task force and approved by the IFSO Scientific Committee and Executive Board. This statement is based on current clinical knowledge, expert opinion, and published peer-reviewed scientific evidence. It will be reviewed in 2 years.

Keywords MGB OAGB IFSO Position statement Systematic Review

Background

In weight loss surgery, the concept of a "loop" gastric bypass consisting of one anastomosis was first introduced by Mason in 1967 [1]. In Mason's configuration, the gastric pouch was wide and short, and had a horizontal shape, exposing the esophageal mucosa to caustic bile reflux coming from the jejunal loop. Because it was a reflux-inducing procedure, this bypass concept was quickly abandoned. In 1997, Rutledge introduced a different version of one anastomosis gastric bypass and named it "mini gastric bypass" (MGB) because the procedure initially was described through a "mini-laparotomy", in analogy with "mini-laparotomy cholecystectomy".

MGB consisted of a lesser curvature-based long-sleeved gastric pouch starting 2–3 cm below the level of the crow's foot and extending proximally slightly to the left of the angle of His. An antecolic 3–5-cm-wide anastomosis was then constructed between the pouch and the jejunum, about 180–220 cm distal to Treitz' ligament. In the super obese, the distance to Treitz' ligament would be about 250 cm, in the elderly or vegetarians 180–200 cm and in type II diabetics without major obesity about 150 cm [2].

In 2002, Carbajo and Caballero (Spain) proposed a technical variation to prevent gastroesophageal (GE) bile reflux. They called their technique one anastomosis gastric bypass (OAGB) or in Spanish bypass gastrico de una anastomosis (BAGUA). According to this technique, OAGB had a latero-lateral anastomosis between the loop of jejunum and the pouch, and the distance to Treitz' ligament averaged 250–350 cm [3].

Since then, other names such as "single anastomosis gastric bypass" (SAGB) or "omega loop gastric bypass" (OLGB) have been proposed to define the same technique [4, 5]. In 2013, the confusion created by the various names led a group of surgeons to use the name mini gastric bypass-one anastomosis gastric bypass (MGB-OAGB) to define this surgery [6].

Despite an increase in the utilisation of MGB-OAGB, particularly in Europe and the Asia Pacific regions [7], there remains concern that the MGB-OAGB could create bilio-

On behalf of the IFSO appointed task force reviewing the literature on MGB-OAGB

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enteric reflux, and may increase the risk of esophageal and gastric cancer.

The task force undertook a systematic review to summarise the current evidence on the efficacy and safety of these procedures with the aim of providing the most up-to-date information to guide practice.

Methods

Literature Search

We performed a comprehensive literature search to identify studies reporting any experience or outcomes with the MGB-OAGB. The search was done in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. We searched MEDLINE (1946 to November 2017), EMBASE (1974 to November 2017), PubMed (until November 2017) and the Cochrane Library (until November 2017). Search terms were broad, to encompass all mini gastric bypass procedures (MGB). These include terms specifying the bariatric procedure (*gastric bypass*, *mini gastric bypass*, *one anastomosis gastric bypass*, *bariatric surgery*), single anastomosis (*single anastomosis*, *loop anastomosis*, *one anastomosis*, *omega loop*, *mini*). A full list of search terms is presented in Appendix Table 4. Manual searching of reference lists from reviews, as well as references from selected primary studies, was performed to identify any additional studies.

Inclusion Criteria

Studies were selected that reported on outcomes after single anastomosis gastric bypass procedures. All study designs were accepted. We summarised data for studies with greater than 15 participants, and with greater than 1-year follow-up; however, studies of all sizes and follow-up time frames were collected. Only full text articles were included.

Data Extraction

Information extracted from eligible studies included basic study data (year, country, design, study size), demographic data, surgical technique, follow-up, weight loss, evolution of co-morbidities and complications.

Results

Literature Search

Using the search strategy described, we identified 3936 studies. After 877 duplicates were removed, we screened titles and abstracts for 3059 records. Full text articles for 255 eligible studies were screened, and 168 articles were subsequently excluded. Hence, 87 full length publications were identified for inclusion.

Of these studies, 78 focused on outcomes of OAGB. Only 52 of these studies had reasonable follow-up and study numbers, with 26 having less than 1 year follow-up [8–22] or ≤ 15 OAGB patients [23–33]. A further nine studies focused on complications following OAGB (Fig. 1).

Overall Summary

A total of 52 reasonable quality ($n > 15$, follow-up > 1 year) studies were identified. Of these, there were 16,546 patients (excluding 2 studies with significant overlap in patient cohort), with a median of 94.5 (IQR 34.5–203, range 16–2678) patients per study. The average study body mass index (BMI) ranged from 25.3 to 67 kg/m^2, with a mean study BMI of 44.6 ± 6.4 kg/m^2.

Over a range of follow-up times, the average excess weight loss was 74.8 ± 12.0%. In studies that reported diabetes remission, there was observed resolution of diabetes in 2495 of 2855 diabetic patients (87.4%).

Outcomes from MGB-OAGB

There are currently 4 randomised controlled trials, 34 single-arm cohort studies and 14 multiple-arm comparison cohort studies on MGB-OAGB, which are summarised in Table 1. Sixteen studies reported on just primary MGB-OAGB procedures, 6 on revision operations, 15 analysed a mix of both and 15 did not state whether they were primary or revision operations.

MGB-OAGB as a Primary Procedure

In total, there are 191 patients who have been enrolled in 4 RCT and a further 8724 patients reported up in retrospective and prospective cohort studies. This number is likely to be an overestimation due to shared patients in multiple series.

Weight Loss

In the four randomised controlled trials, weight loss was reported at 12 months (EWL 66.9 ± 23.7% [35] and EWL 66.9 ± 10.9% [37]), 2 years (EWL 64.4 ± 8.8% [34]) and 5 years (TBWL 22.8 ± 5.9% [36]). Of note, in the Lee trial comparing MGB-OAGB to SG at 5 years, the mean starting BMI was substantially lower than the other trials at 30.2 ± 2.2 and the EWL achieved was over 100% with a mean finishing BMI of

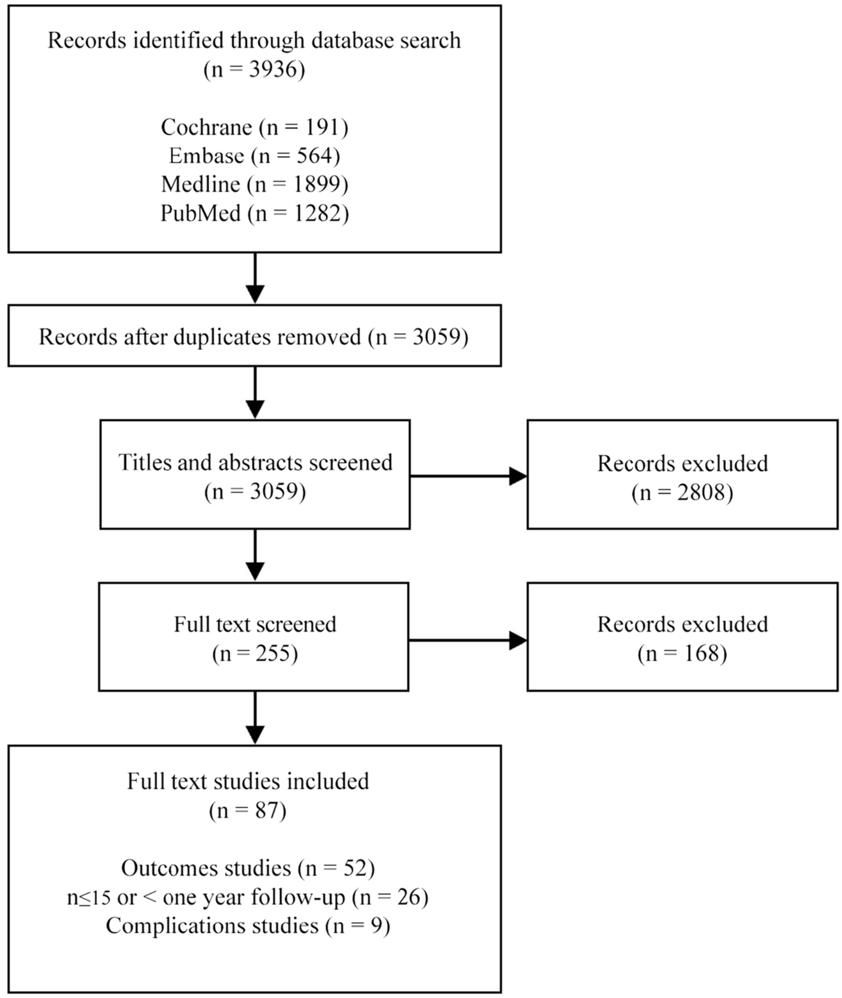

Fig. 1 PRISMA flowchart

23.3 ± 2.2 kg/m^2. These results were not significantly different to comparator operations.

In the prospective cohort studies, weight loss at 12 months was EWL 80.5% (*n* = 2410; follow-up not reported) [38], EWL 70.1 ± 8.4% (*n* = 838; 94.8% follow-up) [51] and EWL 70 ± 20% (*n* = 89; 100% follow-up) [52]; 23 months 68.4% (*n* = 126; 45.2% follow-up) [20]; 3 years EWL 81.5 ± 5.0% (*n* = 570; 89.4% follow-up) [51]; 5 years EWL 72.9% (*n* = 1163; 56% follow-up) [44] and 77.0 ± 5.1 (*n* = 254; 79.1% follow-up). Two other prospective studies were not included as they failed to differentiate primary or secondary procedures and did not accurately report weight loss as the focus of these papers was health change rather than weight loss [53, 55]. Weight loss reported in the retrospective cohort studies was similar (Table 1).

Change in T2DM Management

Diabetes or metabolic syndrome was reported upon as a co-morbidity of interest in all 4 RCT. In the Lee trial comparing MGB-OAGB to RYGB, there was 100% resolution of the metabolic syndrome at 2 years [34]. No other treatment for T2DM was required at 12 months for 50% of participants with T2DM in-trial (*n* = 2) [35] and 84% (*n* = 49) [37]. At 5 years, 60% of participants with T2DM at baseline had a HbA1c < 6.5% without medications in the low BMI trial focusing on change in diabetes [36]. Again, these results were not significantly different to the comparator populations.

There are six prospective cohort studies that addressed change in diabetes status following MGB-OAGB. The change in T2DM management was reported in various ways, but all reported major improvement (Table 1).

Complications

There was one early death in-trial reported in the four RCT (3.3% death rate for that trial [36]; 0.05% for pooled data). A further 15 deaths were reported in the prospective and retrospective cohort studies giving a crude death rate overall of 0.17%. This is likely to be an underestimation due to shared patients between reports.

Table 1 Study data

Study details	n = (comp group)	Primary or revision	Maximum time point (n = or % follow-up)	Male gender	Start BMI (kg/m^2)	Weight loss achieved	T2DM resolution	Early complications [a]requiring reoperation	Long-term complications [a]requiring reoperation
Randomised controlled trials									
Lee 2005 [34] Taiwan RCT	40 (40 RYGB)	Primary	2 years (100%)	13 (33%)	44.8 ± 8.8	BMI 28.3 ± 3.5, %EWL 64.4 ± 8.8	100% resolution of metabolic syndrome	1 minor leak and wound infection, 1 bleed, 1 NG sutured in[a]	2 bleeding ulcer, 1 ileus
Darabi 2013 [35] Iran RCT	20 (20 gastric plication)	Primary	12 months (100%)	3 (15%)	49.5 ± 8.0	BMI 33.4 ± 7.6, %EWL 66.9 ± 23.7	1/2 (50%)	No major complications	2 marginal ulcers, nutritional deficiencies reported
Lee, 2014 [36] Taiwan RCT	30 (30 SG)	Primary	5 years (24 (80%))	8 (27%)	30.2 ± 2.2	BMI 23.3 ± 2.0, % weight loss 22.8 ± 5.9	18 (60%) HbA1c ≤6.5% without medica-tions [5 years]	NR 1 death (3.33%): AMI	1 marginal ulcer, 1 biliary reflux[a]
Seetharamaiah 2017 [37] India RCT	101 (100 SG)	Primary	12 months (NR)	39 (39%)	44.3 ± 7.9	%EWL 66.9 ± 10.9	84%	3 bleeds, 2 marginal ulcers*, 2 GERD, 3 nausea and vomiting, 4 wound infection	
Primary operations or not reported									
Rutledge 2005 [38] USA Prospective Cohort	2410	NR	74.4 months (Mean 38.7 months) (NR)	361 (15%)	46 ± 7	Weight loss 59 kg, %EWL 80, BMI 29 [1 year]; Weight loss maintained within 10 kg max in > 95% of patients [5 years]	83% improved T2DM	142 (5.9%) requiring reoperation (reason not specified), 1.08% leaks[a], 0.08% wound hernias, 0.12% wound infections 2 deaths (0.08%): AMI, perforated colon	5.6% dyspepsia/ulcers (3 requiring reoperation[a]), 4.9% anaemia, 31 (1.1%) excessive weight loss/-malnutrition[a] 4 late deaths (0.16%): 1 narcotic overdose, 1 alcoholic liver disease, 2 unknown
Noun 2007 [20] Lebanon Prospective cohort	126	Primary	23 months (57 (45.2%))	46 (37%)	44 ± 7	BMI 31.4 ± 3.2, %EWL 68.4	85% complete resolution of comorbidi-ties (T2DM not specified)	1 intraabdominal sepsis[a], 3 wound infection, 2 major atelectasis	3 (2.3%) marginal ulcers, 5 (3.9%) incisional hernia
Noun 2007 [39] Lebanon Retrospective cohort	30	Primary	12 months (15 (50%))	11 (37%)	41.8 ± 4.5	BMI 30.8 ± 3.1, %EWL 67.6	100%	2 (6.6%) obstruction gastrojejunostomy	1 anastomotic ulcer (Mx with PPI)
Peraglie, 2008 [40] USA Retrospective cohort	16	Primary	2 years (2 (12.5%))	2 (14%)	62.4 (60–73)	%EWL 57 [12 months], 65 [24 months]	NR	1 intraoperative liver laceration and enterotomy (managed laparoscopically)	
[b]Lee 2008 [41] Taiwan Retrospective cohort	644	NR	4 years (253 (39%) [2 years], 39 (6%) [4 years])	175 (27%)	43.1 ± 6.0	(BMI > 40) %EWL 79.1 ± 23.5, (BMI 40–50) 73.1 ± 15.6, (BMI > 50) 67.2 ± 12.5 [2 years]	Improvement shown, parameters reported	23 (4.3%) minor complications, 13 (2.0%) major complications (not specified) 1 death (0.016%)	
Lee 2008 [42] Taiwan	201	NR	5 years (NR)	58 (29%)	40.7 ± 7.5	%TBWL 32.8	87% (of 201)	51 (6.2%) minor complications, 18 (2.2%) major complications (of	

Table 1 (continued)

Study details	n = (comp group)	Primary or revision	Maximum time point (n = or % follow-up)	Male gender	Start BMI (kg/m^2)	Weight loss achieved	T2DM resolution	Early complications [a]requiring reoperation	Long-term complications [a]requiring reoperation
Retrospective cohort								whole population (n = 820)). (Complications not specified) 1 death (0.12%)	
Piazza 2011 [43] Italy Retrospective cohort	197	Primary	3 years (36 [5 months], 89 [1 year], 66 [2 years], 5 [3 years])	50 (25%)	52.9	34.2 ± 3.4 [6 months], 39.4 ± 4.2 [12 months], 30.3 ± 3.6 [24 months], 28.3 ± 2.6 [36 months]	NR	2 PE, 6 melaena 1 death (0.51%): pulmonary sepsis	3 anastomotic ulcers (Rx PPI)
Lee 2012 [44] Taiwan Prospective cohort, comparator	1163 (494 RYGB)	Primary	5 years (56%)	313 (27%)	41.1 ± 6.1	BMI 27.7 ± 5.8, %EWL 72.9 ± 19.3	137/154 (89%)	78 (6.7%) minor complications (not specified) 15 (1.3%) leak, 1 (0.1%) bowel obstruction, 2 (0.2%) bleed, 1 (0.1%) respiratory failure, 1 (0.1%) renal failure, 1 (0.1%) anastomotic stricture 2 deaths (0.17%)	Revision rate 2.8% (n = 33) (10 inadequate weight loss, 4 intolerance, 10 malnutrition, 1 bowel obstruction, 7 marginal ulcer, 1 structure)
Lee 2013 [45] Taiwan Retrospective cohort, comparator	33 (17 LAGB, 12 SG)	NR	12 months (NR)	Whole cohort: 23 (37%)	41.7 ± 7.3	Mean weight loss 37.1%	28/33 (85%)	NR	NR
Lee 2013 [46] Taiwan Prospective cohort, comparator	35 (41 LAGB, 76 SG)	NR	NR	9 (26%)	40.3 ± 7.6	BMI 27.3 ± 4.5	NR	NR	NR
Carbajo 2014 [47] Spain Retrospective cohort	79	Primary	12 months (NR)	18 (23%)	Pre-diabetic 43.73 ± 7.32, diabetic 43.19 ± 6.21	%EBMIL 80.2	Mean decrease in BGL and HbA1c	NR	NR
Kim 2014 [48] South Korea Retrospective cohort	107	Primary	3 years (51 (47.7%))	54 (50%)	25.3 ± 3.2	BMI 22.4 ± 4.1	HbAc, fasting BGL and other parameters reported	5 major complications, including 1 leak requiring conversion to RYGB	2 conversion to RYGB for stenosis (n = 1) and perforation (n = 1). 22 marginal ulcers, 12 anaemia
[b]Kular 2014 [49] India Retrospective cohort	1054	Primary	6 years (86.4%)	342 (32%)	43.2 ± 7.4	BMI 26.2 ± 3.7, %EWL 85	93%	4 (0.3%) wound infection, 42 (3.9%) nausea/vomiting 2 (0.1%) leaks*, 4 (0.3%) bleed, 2 (0.1%) umbilical hernia obstruction[a], 2 (0.1%) intraabdominal abscess, 4 (0.3%) DKA	5 (0.6%) marginal ulcer, 68 (7.6%) anaemia, 18 (2.0%) biliary reflux, 1 (0.1%) gallstone pancreatitis[a], 1 (0.1%) port site hernia[a], 1 (0.1%) excessive weight loss*, 1 (0.1%) hypoalbuminaemia[a]
Musella 2014a [50] Italy Retrospective cohort, comparator	80 (175 SG, 120 LAGB, 145 balloon)	NR	3 years (84.2%)	41 (51.3%)	Mean 50.8 (41–67)	BMI 27.5 (mean), %EWL 79.5	20/25 (80%)	1 (1.2%) minor (not specified)	3 (3.7%) minor (not specified)
Musella 2014 [51] Italy Prospective cohort	974	NR	795/838 (94.8%) [1 year], 510/570 (89.4%) [3 years], 201/254 (79.1%) [5 years] 156 (16%) dropout	475 (48.8-%)	48 ± 4.6	BMI 31.9 ± 4.9, %EWL 70.1 ± 8.4 [1 year], BMI 27.5 ± 2.1, %EWL 81.5 ± 5.0 [3 years], BMI 28.0 ± 2.3,	189/224 (84.4%)	10 leaks[a], 34 bleeds[a], 2 gastric perforations[a], 3 jejunal perforation[a], 2 PE, 1 stroke, 1 respiratory distress—requiring 20 reoperations[a] 2 (0.2%) deaths (1 PE, 1 "related to MGB procedure")	4 gastric pouch enlargement, 1 trocar hernia[a], 1 excess weight loss[a], 2 weight regain[a], 14 anastomotic ulcers[a], 8 biliary gastritis, 44 anaemia

Table 1 (continued)

Study details	n = (comp group)	Primary or revision	Maximum time point (n = or % follow-up)	Male gender	Start BMI (kg/m^2)	Weight loss achieved	T2DM resolution	Early complications [a]requiring reoperation	Long-term complications [a]requiring reoperation
						%EWL 77 ± 5.1 [5 years]			
Yang 2014 [52] Taiwan Prospective cohort, comparator	89 (47 RYGB, 32 SG, 10 LAGB)	NR	12 months (100%)	21 (24%)	41.7 ± 5.6	%EWL 70 ± 20	HbA1c 6.5 ± 1.4 to 5.3 ± 0.5 ($p < 0.001$)	NR	NR
[b]Garcia-Caballero, 2014 [53] Spain Prospective cohort	83	NR	12 months (NR)	NR	Range: 92-159 kg, BMI >30	Mean BMI 23–33	NR	NR	NR
Luger 2015 [54] Austria Retrospective cohort	50	NR	12 months (35 (70%))	12 (24%)	45.4 ± 6.6	BMI 29.1 ± 3.8, TWBL 36%	NR	NR	NR
Milone 2015 [55] Italy Prospective cohort, comparator	74 (86 SG)	NR	12 months (NR)	28 (38%)	47.3 ± 3.9	%BMI loss ~ 35	75%	NR	NR
Kular 2016 [56] India Retrospective cohort	128	Primary	7 years (84%)	46 (36%)	33.4 ± 3.3	BMI 24.9 ± 2.4, %EWL 78.5	53 (58%)	4 (3.1%) minor—2 (1.6%) wound infection, 2 (1.6%) nausea and vomiting 2 (1.6%) major—1 (0.8%) bleeding with shock[a], 1 (0.8%) diabetic ketoacidosis	12 (9.4%)—2 (1.6%) ulcers, 5 (3.9%) anaemia, 1 (0.8%) low albumin, 1 (0.8%) bile reflux, 3 (2.3%) excess weight loss
Peraglie 2016 [57] USA Retrospective cohort	88	Primary	6 years (42%)	33 (38%)	Mean 43 (33–61)	%EWL 72	84%	4 (4.5%)—2 bleeds, 1 reintubation, 1 readmission	
Al-Shurafa 2016 [58] Saudi Arabia Retrospective cohort, comparator	58 (9 RYGB, 12 SG, 1 LAGB)	NR	12 months (NR)	Whole cohort: 36 (54%)	stratified into categories (see text)	%EWL 68	NR	1 (1.3%) readmission	NR
Jammu 2016 [59] India Retrospective Cohort, Comparator	473 (339 LSG, 295 RYGB)	NR	7 years (0.52)	140 (30%)	Mean 56.6 (40–73)	%EWL 92.2	94%		62 (13.1%) hypoalbuminemia, 23 (4.9%) anaemia, 3 (0.6%) GORD, 2 (0.4%) bile reflux, 3 (0.6%) marginal ulcer, 28 (5.9%) dumping
Kansou 2016 [60] France Retrospective cohort, comparator	136 (136 SG)	Primary	12 months (study selection based on follow-up)	9 (6.6%)	42.8 ± 5.0	%TWL 38.2 ± 8.4, BMI change 16.5 ± 4.6, %EWL 79.3 ± 17.8	93%	7 (5.1%) leaks, 2 (1.4%) bleed, 6 (4.4%) Clavien Dindo ≥ 3	10 (7.6%) marginal ulcer, 23 (16.9%) stenosis Both significantly more than SG
Kruschitz, 2016 [61] Austria Retrospective cohort, comparator	25 (25 RYGB)	NR	12 months (16 (64%))	22 (88%)	45.3 ± 5.3	%BMI loss 37.9 ± 6.5, %EWL 127 ± 31	N/A (no diabetic patients)	NR	NR
Musella 2016 [62] Europe (multi-centre)	175 (138 SG)	NR	12 months (206 (63.7%))	58 (60%)	48.3 ± 9.2	BMI 33.1 ± 6.6	82/96 (85.4%)	8 (4.5%) total—2 (1.1%) PE, 5 (3.6%) intraabdominal bleed, 1 (0.5%) other	

Table 1 (continued)

Study details	n = (comp group)	Primary or revision	Maximum time point (n = or % follow-up)	Male gender	Start BMI (kg/m^2)	Weight loss achieved	T2DM resolution	Early complications [a]requiring reoperation	Long-term complications [a]requiring reoperation
Retrospective cohort, comparator									
Karimi 2017 [63] Iran Retrospective cohort Mixed primary and revision operations	196	Primary	12 months (87%)	30 (15%)	44.5 (IQR 40.95, 48.90)	% EBMIL 88.0 (IQR 76.9, 101.0)	NR	11 (6%) constipation, 3 (2%) diarrhoea, 1 (0.5%) dumping	
Carbajo 2005 [64] Spain Retrospective cohort	209	Mixed	18 months (NR)	37 (18%)	48 (39–86)	EBW 66 (36–220), %EWL 80 (65–100) [18 months]	NR	2 bleed, 2 necrosis of excluded stomach	1 PE, 1 pneumonia
Wang 2005 [65] Taiwan Retrospective cohort	423	Mixed	3 years (31 (7.3%))	87 (21%)	44.2 ± 7	BMI 28.8, %EWL 70.5	100%	18 (4.3%) minor, 7 (1.7%) major—2 anastomotic bleed, 1 duodenal ulcer with bleeding, 3 leak with abscess, 1 ileus 2 deaths (0.47%)—1 leak in patient with previous VBG, 1 sudden death	34 (8%) marginal ulcer, 41 (9.7%) anaemia
Chakhtoura 2008 [66] France Retrospective cohort	100	Mixed	12 months (33 (33%))	23 (23%)	46.9 ± 7.4	BMI 31.9 ± 5.7, %EWL 63 ± 14	NR	3 SBO[a], 1 splenic bleed[a], 1 iatrogenic SB injury[a], 1 perianastomotic abscess, 1 UGI bleed[a], 9 significant diarrhoea	1 anastomotic stricture[a], 1 anastomotic ulcer 2 biliary reflux (Mx prokinetic medications)
Noun 2012 [67] Lebanon Retrospective cohort	1000	Mixed	5 years (75 (70%))	336 (34%)	Primary: 42.5 ± 6.39, Revisional 41.25 ± 8.34	BMI 28.4 ± 3.8, %EWL 68.6 ± 21.9	NR	7 leaks, 2 stenosed gastrojejunostomy, 20 bleed, 1 trocar site incarceration, 3 major atelectasis, 1 DVT 6 patients reoperated[a]	33 (4.2%) incisional hernias, 6 stomal ulcers, 4 biliary reflux, 4 excessive weight loss
Disse 2014 [68] France Prospective cohort, comparator	20 (61 RYGB)	MIxed	Mean 21.4 months (outcomes reported at 12 months)	6 (30%)	Mean 40.1 (41.3–45)	%EBL 89	63%	1 anastomotic ulcer, 1 port site bleed	2 anastomotic ulcers[a]
Bruzzi, 2015 [69] France Prospective cohort	175	Mixed	5 years (72%)	26 (21%)	47 ± 8	BMI 31 ± 6, %EBMIL 71.5 ± 26.5	23/28 (82%)	1 (0.8%) perianastomotic abscess, 1 (0.8%) peritonitis, 1 (0.8%) bleed, 3 (2.4%) port site hernia, 1 (0.8%) anastomotic stricture, 1 (0.8%) marginal ulcer, 1 (0.8%) DVT, 1 (0.8%) minor wound infection	2 (1.6%) peritonitis due to ulcer perforation, 2 (1.6%) biliary reflux, 1 (0.8%) bowel obstruction, 1 (0.8%) incisional hernia, 2 (1.6%) marginal ulcer, 2 (1.6%) excessive weight loss
Chevallier, 2015 [70] France Prospective cohort	1000	MIxed	5 years (126 (72%))	288 (29%)	Median 45.7 (IQR 9)	%EBMIL 71.6 ± 27	86%	6 leaks, 5 port site hernia, 2 intraabdominal sepsis, 2 bleed, 1 anastomotic stricture 2 deaths (0.2%): PE and AMI 15 (7.5%)	2 ulcer perforations with peritonitis, 7 biliary reflux* (convert to RYGB), 5 bowel obstructions 15 (7.5%)
Guenzi, 2015 [71] France Retrospective cohort	81	Mixed	3 years (NR)	NR	47.1 ± 8.5	Diabetic 61.9 ± 32.2, non-diabetic 54.4 ± 34.1	88%	1 bleed (1.2%)[a], 1 leak (1.2%)[a]	2 reoperations[a] (1 ulcer, 1 abscess)
Parmar 2016 [72] UK Retrospective cohort	125	Mixed	12 months (65 (52%))	39 (31%)	Mean 48.1 (34.5–73.8)	%EWL mean 79.5 (44.9–138.3)	8/33 (24%)	1 (0.8%) wound infection, 1 (0.8%) PR bleed, 1 (0.8%) port site bleed, 1 (0.8%) early SBO[a]	3 (2.4%) marginal ulcers[a], 1 (0.8%) perforated marginal ulcer[a], 1 (0.8%) non-specific abdominal pain
Madhok 2016 [73] UK	19 (56 SG)	Mixed	2 years (6 (31.6%))	10 (53%)	67 (60–84)	96 kg (47–117); %EWL 66 (52–83); %TWL 44 (31–56)	4/6 [2 years]		1 (5.3%) marginal ulcer, 1 (5.3%) significant GORD[a] (converted to RYGB)

Table 1 (continued)

Study details	n = (comp group)	Primary or revision	Maximum time point (n = or % follow-up)	Male gender	Start BMI (kg/m^2)	Weight loss achieved	T2DM resolution	Early complications [a]requiring reoperation	Long-term complications [a]requiring reoperation
Retrospective cohort, comparator									
Carbajo 2017 [74] Spain Retrospective cohort	1200	Mixed	12 years (29 (50%))	456 (38%)	Mean 46 (range 34–220)	BMI 29.95, %EBMIL 76.30, %EWL 70% [12 years]	169/180 (94%)	16 (1.3%)[a]—9 intraabdominal bleed[a], 3 leaks[a], 2 early SBO[a]	12 (0.8%)—6 gastroenteric stenosis[a], 6 marginal ulcers
Carbajo 2017 [75] Spain Prospective cohort	150	Mixed	2 years (100%)	41 (27%)	42.82 ± 6.43	BMI 24.7 ± 4.4, %EWL 71.9 ± 13.4	NR	NR	NR
Lessing, 2017 [76] Israel Retrospective cohort	407	Mixed	12 months (NR)	153 (38%)	41.7 ± 5.8	%EWL 85.1 ± 32, %TWL 33.6 ± 7.8	NR	Primary OAGB—10 (3.2%): 1 (0.3%) leak[a], 3 (0.9%) obstruction, 6 (1.9%) bleeds, total 1 (0.3%) early re-op Revision OAGB—8 (8.2%): 6 (6.1%) leaks[a], 2 (2.0%) bleeds[a], total 4 (4.1%) early re-op	Primary OAGB—7 (2.1%): 2 (0.6%) dysphagia, 1 (0.3%) cholecystitis, 4 (1.2%) obstruction[a], total 4 (1.2%) late re-op Revision OAGB—1 (1.0%): 1 (1.0%) obstruction[a], total 1 (1.0%) late re-op
Musella 2017 [77] Italy Retrospective cohort	2678	Mixed	10 years (31 (44.9%))	793 (30%)	45.4 ± 3.6		NR	14 (0.52%) intraoperative complication (e.g. loop ischaemia, injury to adjacent organs, anastomotic dehiscence) 84 (3.1%) early complication—43 (1.6%) bleed, 13 leaks, 2 thermal injuries, 6 SB perforation, 4 abdo hernia, 5 anastomotic stricture, 1 gastroparesis, 3 infection, 1 bowel obstruction, 3 pulmonary. Total 49 (1.8%) reoperations 3 death (0.1%)	69 (10.1%) late complications—8 marginal ulcers, 28 GERD, 3 anastomotic strictures, 1 internal hernia, 1 gastric leak, 11 weight regain, 12 anaemia. Total 28 (4.1%) reoperations
1 (1.0%Taha 2017 [78] Egypt Retrospective cohort	1520	Mixed	3 years (680 (44.7%))	567 (37%)	46.8 ± 6.6	BMI 27.5 ± 3.4, %EWL 80.2 ± 5.9	397/472 (84.1%)	50 (3.3%)—7 (0.5%) PE, 13 (0.9%) respiratory distress, 1 (0.1%) leak, 17 (1.1%) abdominal bleeding, 9 (0.6%) GI bleeding, 2 (0.1%) jejunal perforation, 1 (0.1%) DVT 1 death (0.07%): PE	92 (6.1%)—3 (0.2%) gastric pouch enlargement, 3 (0.2%) marginal ulcer, 3 (0.2%) excessive weight loss[a], 47 (3.1%) iron deficiency anaemia, 18 (1.2%) weight gain, 18 (1.2%) intractable reflux[a]
Revision operations									
Wang 2004 [79] Taiwan Retrospective cohort	29	Revision	12 months (NR)	5 (17%)	Mean 41.7 (range 30–70.8)	BMI 32.1 (range 26.4–42.7)	NR	1 bleed, 1 wound infection, 1 SBO[a] 1 death (3.4%): leak in patient with previous VBG	NR
Moszkowicz 2013 [80] France Retrospective cohort	21	Revision	2 years (5 (23.8%))	8 (40%)	44 ± 7.7	BMI 35.7, %EBMIL 51.6	NR	2 (not specified)	
Bruzzi 2016 [81] France Retrospective cohort	33	Revision	5 years (30 (91%))	4 (13%)	45.5 ± 7	BMI 32 ± 5, %EBMIL 66 ± 22	6/7 (85%)	2 (6.6%)—1 perianastomotic abscess, 1 port-site hernia	2 (6.6%)—intractable biliary reflux[a] (convert to RYGB)
Salama 2016 [82] Egypt	39 (21 RYGB)	Revision	12 months (NR)	Whole cohort:	Whole cohort: 39.8 (26.5)	BMI 30.2 ± 5.4	NR	1 (2.6%) leak[a]	

Table 1 (continued)

Study details	n = (comp group)	Primary or revision	Maximum time point (n = or % follow-up)	Male gender	Start BMI (kg/m^2)	Weight loss achieved	T2DM resolution	Early complications [a]requiring reoperation	Long-term complications [a]requiring reoperation
Prospective cohort, comparator				12 (20%)					
Ghosh 2017 [83] Australia Retrospective cohort	74	Revision	12 months (46%)	7 (9%)	46.0 ± 8.9	BMI 33.2 ± 7.34, %EWL 67 ± 19.6	NR	16 (21.6%)—1 (1.4%) port site infection, 5 (6.8%) readmission for poor oral intake, 4 (5.4%) stricture, 2 (2.7%) ulceration, 1 (1.4%) contained leak, 2 (2.7%) SBO requiring conversion to RYGB, 1 (1.4%) respiratory failure	6 (8.1%) conversion to RYGB (1 abdominal pain, 4 GERD, 1 torted bowel loop)
Chansaenroj 2017 [84] Taiwan Retrospective cohort, comparator	26 (9 RYGB, 17 SG)	Revision	2 years (16 (61.5%))	10 (62%)	39.3 ± 8.9	%WL 31.9, BMI 26.6, %EWL 76.7 ± 24.1	NR	5 (19.2%)—2 leaks, 2 small bowel ileus, 1 major bleed	

NR not reported, *IGB* intragastric balloon, *SG* sleeve gastrectomy, *RYGB* Roux-en-Y gastric bypass, *DJB-SG* duodeno-jejunal bypass with sleeve gastrectomy, *MGB* mini/omega loop gastric bypass, *GERD* gastro-esophageal reflux disease, *SBO* small bowel obstruction, *DVT* deep vein thrombosis

[a] Requiring reoperation (but not all required reoperation)

[b] Significant overlap of patients with another included study

Early complications were experienced by 17/191 (8.9%) patients in the RCT cohort with 3 patients requiring a return to theatre (1.5%). This is likely to be an underestimation as minor complications were not reported by Darabi [35] and no complications other than the death were reported by Lee [36]. The early complication rate reported in the retrospective and prospective cohort studies was again similar (Table 1). Early complications included anastomotic leak, wound infection, haemorrhage, anastomotic stricture and organ perforation (Table 2).

There were no late deaths in the RCT cohort, and four in the cohort studies. Late complications included marginal ulcers, bowel obstruction, malnutrition and gastroesophageal reflux including biliary reflux.

MGB-OAGB as a Secondary Procedure

There is one prospective cohort comparator study, one retrospective cohort comparator study and four retrospective studies specifically addressing the use of MGB-OAGB as a revisional procedure with a total of 222 patients enrolled in these 6 studies.

Weight loss overall at each time-point appears to be lower than in the primary procedures, although one retrospective cohort study with a follow up rate of 91% (n = 30) did achieve EWL 66 ± 22% at 5 years [81].

Change in T2DM management was only reported in one retrospective cohort study (n = 30). There were seven patients with T2DM at baseline and at 5 years six patients required no treatment other than surgery for their T2DM giving an 85% resolution rate [81].

One early death has been reported with an in-trial death rate of 3.4% [79] and an overall death rate in these studies of 0.45%. No late deaths have been reported.

Early complication rates range from 2.6 to 21.6%. The wide variation probably reflects differences in reporting. Early complications include anastomotic leak, haemorrhage, anastomotic stricture and organ perforation.

Late complication rates are only reported in two studies (6.6% [81] and 8.1% [83]). They include gastroesophageal reflux disease (bile reflux not specifically reported) and bowel obstruction.

Operative Technique for MGB-OAGB

Operative technique (Table 3) varied among groups in various domains—pouch and bougie size, gastrojejunostomy anastomosis technique, limb length.

Pouch and Bougie Size The description of the starting point for gastric stapling varied; however, most groups started at the level or just below the Crow's foot on the lesser curve. The majority of studies used a 36 French bougie; however, the bougie size varied from a 1 cm diameter nasogastric tube to a 42 French bougie.

Table 2 Studies focusing on complications

Study details	n =	Age	Gender	BMI	Study aims	Summary of findings
Chen 2016 [85] Taiwan Retrospective cohort	42 post-MGB-OAGB (of 49 gastric bypasses requiring revisional sleeve gastrectomy)	30.0 (20–55) for all patients	8 (16.3%)	25.3 ± 5.6 (all patients)	Present early results of conversion of gastric bypass (both RYGB and MGB) complications to sleeve gastrectomy	The reasons for revision to sleeve gastrectomy were malnutrition (58%—mostly anaemia and protein malnutrition), intolerance (18%—including 3 marginal ulcers and 3 bile reflux) and other (14%—including gastrojejunostomy strictures). Rate of perioperative minor complications was 6.1% and the rate of major complications was 8.1% (3 leakages and 1 internal bleeding). Conversion to sleeve was significantly associated with improved haemoglobin and albumin (1 year) and increased total cholesterol (3 years).
Chen 2012 [86] Taiwan Prospective cohort	120	30.9 ± 10.5	34 (28.3%)	41.4 ± 7.2	Investigate anaemia and diet behaviour	The overall proportion of anaemia rose from 4.1% at baseline to 26.6% post-MGB. The prevalence of anaemia in females was higher at baseline and increased by a larger proportion post-MGB, compared to males
Chiu 2006 [87] Taiwan Retrospective cohort, comparator	610 (142 LAGB)	32.1 ± 9.3	146 (23.9%)	39.4 ± 7.9	Presents technique for preventing trocar-wound hernias in lap bariatric operations	Used surgical plug into trocar sites of 10 mm and 12 mm ports. Reports 2 patients with trocar wound hernias (0.33% prevalence), which developed at 3 and 5 months
Saarinen 2017 [88] Finland Prospective cohort	9	56 (41–65)	5 (55.56%)	42.1 (34.2–54.6)	Investigate bile reflux post-MGB with hepatobiliary scintigraphy	Mean %EWL at 12 months was 83.9 (49.5–128.3). 4 patients reached diabetes remission and 2 became insulin-independent. Transient bile reflux in the gastric tube but not the oesophagus was identified in 5 patients with hepatobiliary scintigraphy. 1 patient with positive scintigraphy required a reoperation due to malabsorption and non-ulcerative GERD. 2 with reflux symptoms had negative scintigraphy
Lee 2011 [89] Taiwan Prospective cohort	1322	31.6 ± 9.1	326 (24.7%)	40.2 ± 7.4	Assess revision surgery post-MGB	Of 1322 patients who had undergone MGB between Jan 2001 and Dec 2009, 23 (1.7%) underwent revision surgery during 9 years follow-up. Reasons—malnutrition (n = 9, 39.1%), inadequate weight loss (n = 8, 34.7%), intractable bile reflux (n = 3, 13.0%) and dissatisfaction (n = 3, 13.0%). Conversion to RYGB (n = 11, 47.8%), SG (n = 10, 43.5%), normal anatomy (n = 2, 8.6%). Two patients underwent additional revision: 1 duodenal switch, 1 BPD
Mahawar 2017 [90] UK Cross-sectional	86 surgeons reporting on 27,672 procedures	NR	NR	NR	Determine incidence of marginal ulcers after OAGB and practices regarding marginal ulcers	27,672 OAGB-MGB were reported with 622 marginal ulcers (2.24%). 82.4% of surgeons routinely used PPI. 57.6% 'always' diagnose with endoscopy and 48.1% 'always' monitor with endoscopy. Most perforated ulcers had laparoscopic repair ± omentoplasty ± drainage. Most bleeding ulcers had PPI ± blood transfusions ± endoscopy. 20 of 43 non-healing ulcers (46.5%) were revised to RYGB
Mishra 2016 [91] India Retrospective cohort, Comparator	47 (617 SG, 418 RYGB)	Not reported separately	Not reported separately	Not reported separately	Evaluate prevalence of gallstones and management after surgery in an Indian bariatric population	6 patients with cholelithiasis (12.8%) and 2 with symptomatic cholelithiasis (4.3%) after an overall population follow-up of 32.4 ± 7.2 months. No choledocholithiasis. Management not reported separately
Rutledge 2007 [92] USA	1069	39	15 (38.5%)	45 ± 7		The rate of hospitalisation in the year preceding MGB surgery was 17% compared to 11% in the year post-MGB.

Table 2 (continued)

Study details	*n* =	Age	Gender	BMI	Study aims	Summary of findings
Retrospective cohort					Compare hospitalisation episodes pre- and post-op for MGB vs RYGB	Pre-MGB reasons for admission: general medical problems (38%), obstetric/gynaecological issues (36%), orthopaedic (16%), gallbladder (9%) and renal stones (2%). Post-MGB reasons for admission: surgical complications (29%), gallbladder (20%), renal stones (14%), plastic surgery (11%), appendectomy (9%), gynaecological issues (9%) and orthopaedic (6%)
Salama 2017 [93] Egypt Prospective cohort	50	35.5 ± 9.39	18 (36%)	NR	Evaluate incidence of biliary reflux	Patients underwent upper gastrointestinal endoscopy and pH monitoring, 18 months after MGB. 3 (6%) with reflux oesophagitis—2 (4%) with Grade A acid reflux esophagitis. 1 case with biliary reflux oesophagitis

Gastrojejunostomy A linear stapler was used in most cases, varying in length from 30 to 60 mm. Only a partial length of the stapler was used in some cases, creating an anastomosis as small as 1.5 cm. Handsewn anastomoses were not commonly used (described in one study).

Limb Length The most common limb length used was 200 cm, reported by 27 studies. Nine studies reported forming limbs < 200 cm, five reported > 200 cm and five reported the "Rutledge" technique but no length. Ten studies tailored the limb length according to pre-operative body mass index (BMI).

Discussion

The current evidence suggests that MGB-OAGB provides effective weight loss that is durable to 5 years. Weight loss appears to be more effective in primary operations when compared to revisional procedures; however, small numbers limit our ability to completely assess this parameter.

MGB-OAGB appears to have a favourable effect on T2DM, although numbers in the reports are small, and durability of glycaemic effect has not been reported.

There is an acceptable early and late complication rate, and the rates of symptomatic bile reflux are lower than first feared. Complication rates appear to be higher in the revisional setting. There is a lack of long-term nutritional information and rates of bile reflux rely mainly on self-reporting. These are areas of concern and it is imperative that patients who undergo these procedures understand the need for on-going care from their bariatric team.

The ideal operative technique has not been defined. The most common description commences the pouch below the crows-foot with a stapled anastomosis and 200 cm common limb length; however, there is a great deal of variance in each of these elements. This may be an important issue to be addressed by an RCT in the future.

There is a paucity of RCT evidence, with the majority of evidence coming from retrospective cohort studies. There is a need for well-designed large prospective cohort studies as well as RCT in to the future to better define where MGB-OAGB should be placed in the current suite of bariatric procedures.

The term mini gastric bypass/one anastomosis gastric bypass (MGB-OAGB) has been used throughout this position statement as this has been the agreed nomenclature endorsed by the Executive Board of IFSO. Whilst the initial use of the word "mini" reflected the minimally invasive approach used for the procedure compared to a laparotomy, there is a risk that the term will be misinterpreted as meaning the surgery itself is a lesser procedure—both in terms of surgical risk and metabolic benefit. The current systematic review reinforces that the procedure is effective in terms of weight loss and metabolic benefit, but also carries surgical risk that is very similar to RYGB. Therefore, the

Table 3 Operative technique

Study details	Primary or revision	Operative time	LOS	Conversion rate	Pouch and bougie size	Gastro-jejunostomy	Limb length (cm)
Carbajo 2005 Spain *n* = 209	Primary and revision	93 (70–150) [mainly primary]	36 h (20–86)	2 (0.9%—uncontrollable bleeding)	Level of Crow's foot 1 cm NGT	Linear 30 mm stapler, introduced so anastomosis 1.5–2 cm diameter	200
Carbajo 2017 Spain *n* = 1200	Primary and revision	86 (45–180) min [primary]; 112 (95–230) min [primary with additional operations]; 180 (130–240) min [revision]	24 h (15–120), uncomplicated patients (97.4%); 9 (5–32) days, complicated patients (2.6%)	4 (0.3%—2 bleeding, 1 perforation, 1 inflammation)	13–15 cm length 36Fr	Linear 30 mm stapler, 75% inserted, anastomosis 2–2.5 cm	250–350 (BMI dependent)
Chakhtoura 2008 France *n* = 100	Primary and revision	129 ± 37 [primary and revision]	8.5 ± 2.2 days	0	Proximal to Crow's foot	Linear 45 mm stapler	200
Chevallier 2015 France *n* = 1000	Primary and revision	NR	NR	NR	Proximal to Crow's foot 32Fr	Linear 45 mm stapler	200
Darabi 2013 Iran *n* = 20	Primary	89 ± 12.8 min [primary]	5.2 ± 1.0 days	0	NR	NR	"Rutledge"
Disse 2014 France n = 20	Primary and revision	Mean 152 (75–210) [mainly primary]	4.2 days	NR	Angle of lesser curve	NR	"Rutledge"
Garcia-Caballero, 2014 Spain *n* = 83	NR	NR	NR	NR	12 cm 36Fr	NR	120–280 (BMI)
Ghosh 2017 Australia *n* = 74	Revision	72.7 ± 15.7 [revision from LAGB]	2.6 ± 1.2 days		Distal to Crow's foot 36Fr	NR	150
Guenzi 2015 France *n* = 81	Primary and revision	NR	NR	NR	34–36Fr	NR	200
Jammu 2016 India *n* = 473	NR	57.5 (42–75)	NR	NR	Distal to Crow's foot 38Fr	Linear 45 mm stapler	"Rutledge"
Kansou 2016 France *n* = 136	Primary	NR	NR	0	Angle of lesser curve 36Fr	NR	200
Karimi, 2017 Iran *n* = 196	Primary	NR	NR	NR	Rutledge	Longitudinal 45 mm blue cartridge on the posterior aspect of the pouch	"Rutledge"
Kim 2014 South Korea *n* = 107	Primary	87 ± 34 [primary]	4.5 ± 1.0 days	1	2 cm proximal to pylorus	Linear 45 mm staple	200
Kruschitz, 2016 Austria *n* = 25	NR	NR	NR	0	30-40 ml sleeve	NR	200
Kular 2014 India *n* = 1054	Primary	52 ± 18.5 [primary]	2.5 ± 1.3 days	0	Rutledge	Linear 45 mm stapler	200
Kular 2016 India *n* = 128	Primary	49.0 ± 13.2 [primary]	2.2 ± 1.0 days	NR	Rutledge	Linear 45 mm stapler	200
Lee 2008 Taiwan *n* = 644	NR	130	5 days	0	As per Wang et al (2004)	NR	150–350 (BMI)
Lee 2005 Taiwan	Primary	147.7 ± 46.7 [primary]	5.5 ± 1.4 days	1 (2.5% - hypertrophy of left hepatic lobe)	1.5 cm left of lesser curve of antrum	Linear stapler (size not specified)	"Rutledge"

Table 3 (continued)

Study details	Primary or revision	Operative time	LOS	Conversion rate	Pouch and bougie size	Gastro-jejunostomy	Limb length (cm)
n = 40							
Lee 2008 Taiwan *n* = 201	NR	116.3 ± 40.9	6.6 ± 5.8 days	NR	As per Wang et al (2004)	NR	100–300 (BMI)
Lee 2012 Taiwan *n* = 1163	Primary	115.3 ± 24.6 [primary]	3.7 ± 4.1 days	1 (0.1%)	Antrum 2 cm wide gastric tube	NR	200
Lee 2013 Taiwan *n* = 33	NR	NR	NR	NR	Stomach vertically transected alongside endoscope	NR	150 + 10 per BMI category increase
Lee 2014 Taiwan *n* = 30	Primary	NR	NR	NR	Rutledge	Linear stapler (size not specified)	120
Lessing 2017 Israel *n* = 407	Primary and revision	NR	2.2 ± 0.84 days	0	34Fr	Linear 60 mm stapler	200
Luger 2015 Austria *n* = 50	NR	NR	NR	NR	40-70 ml		200–220
Madhok 2016 UK *n* = 19	Primary and revision	92 (63–189) [mainly primary]	Median 2 days	0	Incisura 36Fr	Linear 45 mm stapler	200
Milone 2015 Italy *n* = 74	NR	NR	NR	NR	40–70 ml 38Fr	NR	200–220
Moszkowicz 2013 France *n* = 21	Revision	NR	NR	NR	Corner lesser curve 34Fr	Linear 45 mm stapler	200
Musella 2014 Italy *n* = 974	NR	95 ± 51.6	4.0 ± 1.7 ICU stay 57.6 ± 50.4 h for 56 (5.7%) of patients	12 (1.23% - 8 adhesions, 2 spleen injuries 1 jejunal loop tear, 1 Veress needle vascular damage)	36–42Fr	Linear 30-60 mm stapler	224.6 ± 23.2
Musella 2014 Italy *n* = 80	NR	115 ± 15.6	NR	NR	14–16 cm, at level of Crow's foot 38Fr	Linear 60 mm stapler	200
Musella 2016 Europe (multi-centre) *n* = 175	NR	NR	NR	NR	15 ± 2.5 cm	NR	190 ± 25.5
Musella 2017 Italy *n* = 2678	Primary and revision	86.56 ± 36.45 min [primary], 109.3 ± 24.81 min [revision]	4.16 ± 1.1 days	20 (0.7%)	14.2 ± 3.4 (below Crow's foot)	Musella 2014	217 ± 13.8 (165–260)
Noun 2007 Lebanon *n* = 30	Primary	135 ± 45	3 ± 0.25 days	1 (3.3%)	Rutledge (Divided at junction of fundus and antrum) 36Fr	Linear 30 mm stapler	200
Noun 2007 Lebanon *n* = 126	Primary	144 ± 15.2	3.3 ± 0.6 days	Mini-laparotomy. Incision increased by 3 cm in 8 (6.3%)	Crow's foot Diameter of the oesophagus	Handsewn gastroenterostomy (no size reported)	200
Noun 2007 Lebanon *n* = 33	Revision	184.7 [revision from VBG], 155.2 [revision from LAGB]	5.3 days [revision to VBG], 4.1 days [revision to LAGB]	Open operation	36Fr	Handsewn gastroenterostomy (no size reported)	200
Noun 2012 Lebanon *n* = 1000	Primary and revision	89 ± 12.8 min [primary]; 144 ± 15 min [revision]	1.85 ± 0.8 days [primary]; 2.35 ± 1.89 days [revision]	0	Level of Crow's foot	Linear 45 mm stapler	150 + 10 for each BMI point above 40
Parmar 2016 UK	Primary and revision	Mean 92.4 (45–150)	Mean 2.2 (2–17) days	NR	Incisura 36Fr	Linear 45 mm stapler	200

Table 3 (continued)

Study details	Primary or revision	Operative time	LOS	Conversion rate	Pouch and bougie size	Gastro-jejunostomy	Limb length (cm)
n = 125							
Peraglie 2016 USA *n* = 88	Primary	70 (43–173)	1.2 (1–3) days	0	Level of Crow's foot 28Fr	Linear stapler (size not specified)	180 (most commonly, but varied according to BMI)
Piazza 2011 Italy *n* = 197	Primary	120 (range 90–170)	5 days	0	Proximal to antrum 36Fr	Linear 60 mm stapler	180–240 (BMI)
Rutledge 2005 USA *n* = 2410	NR	37.5	1 days	0.0017	Below Crow's foot 28Fr	NR	180
Salama 2016 Egypt *n* = 39	Revision	145.4 ± 29.2 [revision from VBG]	4.8 ± 2.2 days	NR	Incisura. 36Fr inserted. Stapled on previous staple line. If unable to insert, mesh removed. If still unable, stapled above mesh. If long enough, continued as MGB. If not, converted to RYGB	Linear stapler (size not specified)	180
Seetharamaiah 2017 India *n* = 101	Primary	64.8 ± 10.6 [primary]	3.2 ± 0.6 days	0	3 cm proximal to pylorus 36Fr	Linear 45 mm stapler	150–180
Taha 2017 Egypt *n* = 1520	Primary and revision	57 (procedure 35 ± 11.2, anaesthetic 22 ± 8.1) [mainly primary]	1.02 ± 2.3 days	0	Level of Crow's foot 36Fr	Linear stapler (size not specified)	150–300 (BMI)
Wang 2004 Taiwan *n* = 29	Revision	171.4 ± 15.3 (range 130–290) [revision]	6.4 ± 3.2 (range 2–28) days	0	60-80 ml (Just below crow's foot)	NR	200
Wang 2005 Taiwan *n* = 423	Primary and revision	130.8 [primary and revision]	5 days	0	60–80 ml 1–2 cm diameter	Linear 35 mm stapler	200
Blanc 2015 France *n* = 50	Primary and revision	Mean 60 (45–75) [mainly primary]	Mean 3 (3–5) days	8	37Fr	Handsewn gastrojejunostomy	200
Garcia-Caballero 2012 Spain *n* = 13	Primary	NR	NR	NR	Size of pouch dependent on BMI	NR	BMI dependent
Genser 2016 France *n* = 35	Primary and revision	NR	NR	NR	One and two stage procedures performed (LAGB removal) Angle of lesser curve, just proximal to Crow's foot 36Fr	Linear 45 mm stapler	200
Greco, Francesco 2014 Italy *n* = 68	Primary and revision	Mean 65 min [mainly primary]	NR	3 trocar or single incision for all cases	Level of incisura 40Fr	Linear 30 mm stapler	300 cm from ileocecal valve
Kim 2014 South Korea *n* = 12	Primary	NR	NR	NR	BMI < 25, distal lesser curve to gastric fundus. BMI > 25, distal lesser curve to gastric angle	Linear stapler	200
Greco 2017	Revision	NR	< 72 h	NR		Linear 30 mm stapler	

Table 3 (continued)

Study details	Primary or revision	Operative time	LOS	Conversion rate	Pouch and bougie size	Gastro-jejunostomy	Limb length (cm)
Italy n = 12					Ring at base of sleeve to create functional gastric pouch 40Fr		300 cm proximal to ileocecal valve
Himpens 2016 Belgium *n* = 14	NR	NR	NR	NR	S	NR	150
Yeh 2017 Taiwan *n* = 16	NR	NR	NR	NR	Approximately 2 cm wide from antrum	Linear stapler	120

taskforce recommends that in the future the procedure be referred to as "one anastomosis gastric bypass (OAGB)".

The need for more RCT's is paramount to our understanding of our interventions; however, the need for guidance for emerging procedures is the responsibility of organisations, such as IFSO. Professional societies must continue to extrapolate the existing data against the needs of the patients we serve and the availability of current technology on a micro and macro level. Though position statements are not without bias, they are meant to be temporal in nature. Continued reanalysis is necessary in order to remain relevant.

Recommendation of the IFSO MGB-OAGB Taskforce

Based on the existing data, we recommend the following:

1. OAGB should be the identifier for this procedure in future publications.
2. Whilst early results are promising in terms of weight and T2DM management, there is a lack of long-term evidence for durability of effect as well as long-term nutritional complications. Bile reflux is either under reported or does not seem to be a major issue, but remains a theoretical risk. Patients should be encouraged to remain in long-term multidisciplinary care.
3. Patients undergoing OAGB in the revisional setting have less weight loss and more complications than with primary procedures.
4. Surgeons performing this, as well as any other bariatric/metabolic procedure, are encouraged to participate in a national or international registry so that long-term data may be more effectively identified.
5. OAGB is a recognised bariatric/metabolic procedure and should not be considered investigational.

Compliance with Ethical Standards

Conflict Statement Dr. De Luca has nothing to disclose. Ms. Tie reports personal fees from Centre for Obesity Research and Education (CORE), grants from Apollo Endosurgery, grants from Novo Nordisc, outside the submitted work. Dr. Ooi reports personal fees from National Health and Medical Research Council, personal fees from Royal Australasian College of Surgeon, outside the submitted work. Dr. Himpens reports personal fees from Ethicon, personal fees from Medtronic, outside the submitted work. Dr. Higa has nothing to disclose. Dr. Carbajo reports he is the current President of the MGB-OAGB International Club. Dr. Mahawar reports he has been paid honoraria by Medtronic Inc. for mentoring consultant bariatric surgeons in the United Kingdom to help them start them start their One Anastomosis Gastric Bypass programme. Dr Shikora has nothing to disclose. Dr. Brown reports grants from Johnson and Johnson, grants from Medtronic, grants from GORE, personal fees from GORE, grants from Applied Medical, grants from Apollo Endosurgery, grants and personal fees from Novo Nordisc, personal fees from Merck Sharpe and Dohme, outside the submitted work.

Ethics Statement Ethical approval is not required for this type of study.

Informed Consent Informed consent is not required for this study.

Appendix 1—Members of the IFSO Appointed Task Force Reviewing the Literature on MGB-OAGB

Maurizio De Luca—Italy
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Tiffany Tie—Australia
Geraldine Ooi—Australia
Wendy Brown—Australia
Jacques Himpens—Belgium
Scott Shikora—USA
Rudolf Weiner—Germany
Miguel-A Carbajo—Spain
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Jean Marc Chevallier—France
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Luque-de-Leon—Spain
Aparna G Bhasker—India
Alberto Sartori—Italy
Mario Musella—Italy
KS Kular—India
Emanuele Soricelli—Italy
Ramon VilallongaVilallonga—Spain
Muffazal Lakdawala—India
Enrico Facchiano—Italy
Alessio Corradi—Germany

Appendix 2

Table 4 List of search terms used

Gastric bypass	Single anastomosis	Overall
Gastric bypass	One anastomosis	MGB
Bariatric surgery	Billroth II	OAGB
Stomach bypass	Single loop	GBP
(Roux-en-Y, RYGB, RNYGB, RYGBP)	Loop	SAGB
	Stomach intestinal pyloric Sparing surgery	
	Omega	

Databases: Medline, PubMed, Embase, Cochrane

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