



# 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

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## Abstract

**Background** One-anastomosis gastric bypass (OAGB-MGB) is currently the third performed primary bariatric surgical procedure worldwide. However, the procedure is hampered by numerous controversies and there is considerable variability in surgical technique, patient selection, and pre- and postoperative care among the surgeons performing this procedure. This paper reports the results of a modified Delphi consensus study organized by the International Federation for Surgery of Obesity and Metabolic Disorders (IFSO).

**Methods** Fifty-two internationally recognized bariatric experts from 28 countries convened for voting on 90 consensus statements over two rounds to identify those on which consensus could be reached. Inter-voter agreement of  $\geq 70\%$  was considered consensus, with voting participation  $\geq 80\%$  considered a robust vote.

**Results** At least 70% consensus was achieved for 65 of the 90 questions (72.2% of the items), 61 during the first round of voting and an additional four in the second round. Where consensus was reached on a binary agree/disagree or yes/no item, there was agreement with the statement presented in 53 of 56 instances (94.6%). Where consensus was reached on a statement where options favorable versus unfavorable to OAGB-MGB were provided, including statements in which OAGB-MGB was compared to another procedure, the response option favorable to OAGB-MGB was selected in 13 of 23 instances (56.5%).

**Conclusion** Although there is general agreement that the OAGB-MGB is an effective and usually safe option for the management of patients with obesity or severe obesity, numerous areas of non-consensus remain in its use. Further empirical data are needed.

**Keywords** Obesity · One-anastomosis gastric bypass · Mini-gastric bypass · Delphi · Consensus statement

## Introduction

Since Rutledge presented his first series of 1274 cases of a novel bariatric surgical procedure he called mini-gastric bypass (MGB) in 1997 [1], through its modification into a procedure called the one-anastomosis gastric bypass (OAGB) in 2002 by Carbajo [2], and approval by IFSO as a standalone bariatric/metabolic procedure in 2018 [3], to the present day, its popularity has been progressively increasing [4–10]. Also, in several recent studies, OAGB has been found to outperform such procedures as Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG), in terms of both weight loss and resolution of concomitant metabolic disorders like type 2 diabetes (T2D) [11–18], albeit it potentially can increase the risk of certain surgical complications [18]. However, even with the progressive increasing in surgeons performing the procedure, there is a considerable variation in

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its perioperative practices [19] such that, in 2018, Mahawar et al. published a consensus statement based upon the results of a modified Delphi survey of 101 OAGB-MGB experts worldwide [20]. In that web-based consensus building exercise, 55 statements were evaluated and a consensus was reached on 48 over two rounds of voting.

The current consensus study was an expansion of the previous one to 90 questions, gathering experts from around the world to validate, discuss, and vote on both previously asked and new statements, thereby addressing issues and practices pertaining to the OAGB-MGB across five areas: fundamentals; indications and patient selection; technical standardization; complications and controversies; and post-operative care, including conversions from and to OAGB-MGB. The general objectives were to validate the results of the previous exercise as well as to expand into areas not previously covered. A modified Delphi survey technique was adopted to allow for anonymous voting and, thereby, potentially reduce voter bias caused by peer pressure. The Delphi technique and numerous variants of this process are recognized methods to achieve consensus and identify areas of non-consensus among experts across a wide variety of health and non-health related fields [21].

## Methods

A modified Delphi consensus building exercise was conducted under the auspices of the International Federation for Surgery of Obesity and Metabolic Disorders (IFSO) in Hamburg, Germany, from July 18th to 19th, 2019, in accordance with the guidelines published by Keeney et al. [21].

Over the spring and early summer of 2019, a committee of four internationally recognized bariatric surgery experts (ACR, JMC, KM, WB), with a special interest in the OAGB-MGB, and a scientific consultant specializing in Delphi studies, created a list of 94 questions/statements and invited other international experts to join them for a 2-day conference consensus in Hamburg, Germany, at which the expert committee oversaw all proceedings. All members of the expert committee also were eligible to vote. The final expert panel of voters consisted of 52 individuals. To be eligible as a voting member, all experts had to satisfy one or both of the following criteria: be nominated by either a member of the OAGB-MGB consensus committee or an IFSO Chapter president, based on their previous expertise in OAGB-MGB, or confirm their own status as either an expert in OAGB-MGB or in bariatric surgery with international standing as a research investigator in bariatric surgery with publications in peer-reviewed scientific journals. All voting members also had to physically attend the consensus meeting in Hamburg.

On group discussion, four of the 94 questions ultimately were discarded due to inadequate clarity. The 90 remaining questions were divided into five modules (fundamentals of OAGB-MGB; indications and selection of patients for OAGB-MGB; technical standardization; complications and controversies in diagnosis, treatment, and prevention; and post-operative management and revisions). Of this, 66 questions had binary responses (yes/no, agree/disagree, etc.), while 24 had  $\geq 3$  response options. In accordance with Keeney et al. [21], an a priori decision was made to define consensus as  $\geq 70\%$  agreement among all voters. Robust statements were considered those for which at least 80% of the 52 experts ( $n = 42$ ) voted.

Voting was conducted electronically using hand-held keypads linked to the voting software TurningPoint (Turning Technologies), with statements/questions displayed on a large screen in PowerPoint (Microsoft). Prior to voting in each round, voters were given the option of asking questions for clarity. Voting commenced only after all questions on clarity were answered and the moderator announced the start of voting. The voters were given 30 s to vote for each question/statement. Only statements/questions for which consensus was not reached were again asked and voted in a round 2. Prior to round 2 voting, the results of round 1 were displayed.

## Results

Fifty-two international experts attended the consensus meeting, including 11 (21.15% of the sample) from the Asia Pacific Chapter (APC) of IFSO, 15 (28.85%) from the European Chapter (EC), nine (17.31%) from the Latin American Chapter (LAC), 10 (19.23%) from the Middle East and North African Chapter (MENAC), and seven (13.46%) from the North American Chapter (NAC). Attendees hailed from 28 countries, four countries from the IFSO APC (Australia, China, India, Singapore), ten from IFSO EC (Austria, Belgium, France, Germany, Israel, Italy, Portugal, Spain, Switzerland, UK), six from IFSO LAC (Argentina, Brazil, Chile, Ecuador, Guatemala, Mexico), seven from the IFSO MENAC (Egypt, Jordan, Kuwait, Lebanon, Qatar, Saudi Arabia, United Arab Emirates), and one from North America (USA). The numbers of attendees from the various countries were seven from the USA; five from India; four from Australia; three each from Brazil and the UK; two each from Egypt, France, Germany, Italy, Lebanon, the United Arab Emirates, and Mexico; and one each from the remaining 16 countries.

Robust voting ( $\geq 80\%$  of eligible voters) was achieved for 88 of the 90 statement/questions. At least 70% consensus was achieved for 65 of the 90 items (72.2%), 61 during the first round of voting, and an additional four in the second round. The percentage of consensus ranged from a low of 48% for

one multiple response statement to a high of 100% for two items. Among items for which consensus was reached, the range of consensus was from 70 to 100%.

The results for each individual module are summarized in Tables 1, 2, 3, 4, and 5. Consensus was reached for 12 of 14 items (85.7%) in fundamentals of the OAGB-MGB, 11 of 17 (64.7%) in indications and patient selection, 21 of 29 (72.4%) in technical standardization, nine of 11 (81.8%) in complications and controversies, and 12 of 19 (63.2%) in post-operative management and revisions.

Where consensus was reached on a binary agree/disagree or yes/no item, there was agreement with the statement presented in 53 of 56 instances (94.6%). Where consensus was reached on a statement where options favorable versus unfavorable to OAGB-MGB were provided, including statements in which the OAGB-MGB was compared to another procedure (e.g., “For patients with severe and intractable reflux after a sleeve gastrectomy, which option do you prefer—RYGB or OAGB-MGB?”), the response option favorable to the OAGB-MGB was selected in 13 of 23 instances (56.5%).

Two statements achieved 100% consensus: “OAGB-MGB can be recommended for super-obese (BMI over 50 kg/m<sup>2</sup>) patients”, with which 47 of 47 voters agreed, and “Internal hernia is rare after OAGB-MGB but can happen, and always should be considered to avoid delays in management,” with

which 50 of 50 voters agreed. Conversely, two statements just reached consensus with 70% of voters in agreement: “If the surgeon considers doing staple line reinforcement, the use of buttress material also is a suitable option,” with 35 of 50 voters agreeing, and “Leaks from the gastric pouch or anastomosis can be managed by conversion to Roux-en-Y configuration without dismantling the original gastroenterostomy, along with drainage and suturing, if appropriate,” again with 35 of 50 voters agreeing.

Four statements required two rounds to achieve consensus. For two of these, consensus was achieved after grouping response options. For the statement “Surgeons should aim to construct a long and narrow pouch over what size of calibration gastric tube?,” the round 1 response options of 36 Fr and 38 Fr were grouped into 36–38 Fr and then selected by 90% of voters. “The ideal width of the gastroenterostomy should be...,” the round 1 response options 3 cm, 4 cm, and 5 cm were grouped to 3–5 cm, which was selected by 85% of voters. The other two items for which consensus was achieved in the second round were “If the surgeon considers doing staple line reinforcement, barbed sutures are a suitable option,” for which the percentage consensus rose from 69 to 80%, and “Revisional surgery with conversion to RYGB should just be considered for patients with no meaningful improvement in dyspeptic symptoms over at least 6 months

**Table 1** Module 1—fundamentals of OAGB-MGB

Statement/Question	# votes	Response	% consensus
MGB and OAGB should be considered in the same class of bariatric/metabolic procedures.	48	Agree	98%
OAGB-MGB produces weight loss that is:	51	> SG	96%
OAGB-MGB mechanisms are based on intestinal stimulation.	42	Agree	88%
OAGB-MGB should be recognized as a mainstream, standalone option for REVISIONAL surgery in bariatric/metabolic procedures.	48	Agree	85%
Surgeons should be advised to undergo training and mentoring before adopting this procedure in their practice.	49	Agree	84%
OAGB-MGB should keep the same “NIH based international guidelines” selection criteria of any regular bariatric/metabolic procedure.	49	Agree	84%
OAGB-MGB can be recommended as metabolic surgery for patients with BMI from 30 to 34.9 kg/m <sup>2</sup> and type 2 diabetes.	47	Agree	83%
OAGB-MGB mechanisms are based on intestinal hypo-absorption.	42	Agree	80%
Multidisciplinary teams should receive special training and mentoring before starting with OAGB-MGB regular practice.	49	Agree	78%
OAGB-MGB produces weight loss that is:	51	> RYGB	78%
Roux-en-Y gastric bypass (RYGB) and OAGB-MGB work based on different physiologic mechanisms and principles, regarding restriction and hypo-absorption.	48	Agree	75%
The frequency of early dumping syndrome in OAGB-MGB is:	48	< RYGB	73%
Do you think that the frequency of late dumping syndrome in OAGB-MGB is comparable to RYGB, < RYGB or > RYGB?		No consensus Comp. to RYGB—36% < RYGB—64%	
Do you think that the frequency of hypoglycemia in OAGB-MGB is comparable to RYGB, < RYGB or > RYGB?		No consensus Comparable to RYGB—31% Less than RYGB—67% More than RYGB—2%	

**Table 2** Module 2—indications and selection of patients for OAGB-MGB

Item/question	# votes	Response	% consensus
OAGB-MGB can be recommended for super-obese (BMI over 50 kg/m <sup>2</sup> ) patients.	47	Agree	100%
OAGB-MGB is an appropriate procedure for adults (45–59 years old) with recommendation for bariatric/metabolic surgery.	51	Agree	98%
OAGB-MGB is an appropriate operation for patients, regardless of gender.	47	Agree	98%
OAGB-MGB is contraindicated in patients with Child's C liver cirrhosis.	48	Agree	96%
OAGB-MGB is an appropriate procedure for the elderly (over 60 years old) recommended for bariatric/metabolic surgery.	51	Agree	94%
OAGB-MGB is an appropriate procedure for young adults (25–44 years old) recommended for bariatric/metabolic surgery.	50	Agree	88%
OAGB-MGB is contraindicated in patients suffering from Crohn's disease or other severe inflammatory bowel disease.	50	Agree	88%
Patients undergoing OAGB-MGB do not need to have preoperative esophageal pH and manometry studies, unless suffering from severe GERD, based on the surgeon's judgment.	46	Agree	87%
OAGB-MGB is an appropriate general denomination for all variants of this class of single-loop reconstruction "gastric bypass-type" procedures involving a long and narrow gastric pouch with gastrojejunostomy.	49	Agree	84%
OAGB-MGB is contraindicated in patients with diagnosis of Barrett's esophagus.	50	Agree	78%
Patients undergoing OAGB-MGB must undergo routine preoperative endoscopy.	50	Agree	78%
OAGB-MGB is an appropriate procedure for adolescents recommended for bariatric/metabolic surgery.	No consensus Agree—51% Disagree—49%		
OAGB-MGB is an appropriate procedure for youths (15–24 years old) recommended for bariatric/metabolic surgery.	No consensus Agree—60% Disagree—40%		
OAGB-MGB is an appropriate bariatric/metabolic procedure for patients with GERD (excluding severe esophagitis grade C and D and Barrett's esophagus).	No consensus Agree—68% Disagree—32%		
OAGB-MGB is an appropriate bariatric/metabolic procedure for patients with a type II hiatal hernia.	No consensus Agree—65% Disagree—35%		
OAGB-MGB is contraindicated in patients with Child's A liver cirrhosis.	No consensus Agree—33% Disagree—67%		

treatment," for which the percentage of consensus rose from 66 to 86%.

## Discussion

Delphi studies are, by their nature, not designed to measure truth, but the degree of consensus among different opinions, due to which their results are considered level IV evidence. Their value lies in their ability to explore questions and issues for which empirical data either do not exist, are inadequate, or would be impractical to obtain. In this consensus conference, 52 expert surgeons addressed the main points regarding preoperative management and patient selection, technical standardization, and postoperative care of OAGB-MGB, looking to establish gold standard practices for the technique.

Increasing empirical evidence supports the effectiveness of OAGB-MGB as a bariatric/metabolic surgical option to help individuals with obesity and severe obesity to lose weight and achieve quality of life improvements and even resolution of numerous obesity-linked disorders like diabetes and hypertension [2, 5, 6, 9, 11–18, 22–27]. The procedure remains controversial; however, most notably because of the dearth of level I evidence supporting its efficacy compared with other procedures [3]. In addition, the OAGB-MGB has, since its inception, harbored concerns regarding the at least theoretically increased risk of gastric and esophageal cancer due to bile reflux [28]. There also are questions regarding the indications and contraindications of this procedure and the documented risk of malabsorption as an important side effect, potentially leading to severe and even fatal consequences [29–31]. Lastly, like many other surgical procedures, there is considerable

**Table 3** Module 3—technical standardization

Item/question	# votes	Response	% consensus
Surgeons should keep a minimum length of 0.5–1 cm of stomach close to the esophageal margin (dog-ear) avoiding stapling too close to the GE junction.	48	Agree	98%
Routine dissection of the hiatus and crural approximation is unnecessary unless there is an identified hiatal hernia.	48	Agree	96%
Gastroenterostomy can be done in hand sewn or linear-staple technique.	48	Agree	96%
A biliopancreatic limb of 200 cm or longer may increase the risk of malabsorption and protein-calorie malnutrition.	46	Agree	96%
Gastroenterostomies should be done with what type of suture?	48	Absorbable	94%
Hiatal hernia, no matter what size, is a contraindication to OAGB-MGB.	47	Disagree	91%
A biliopancreatic limb of 200 cm or longer may increase the risk of malabsorption and protein-calorie malnutrition and should only be done after measuring total bowel length.	47	Agree	91%
Surgeons should aim to construct a long and narrow pouch over what size of calibration gastric tube?	38 <sup>a</sup>	36–38 Fr	90%
If the surgeon considers doing staple line reinforcement the suture material should be...	49	Absorbable	86%
Any gentle leak test (methylene blue, ICG, air or endoscopic test) should be provided for gastroenterostomy patency verification.	47	Agree	85%
The ideal width of the gastroenterostomy should be...	46	3–5 cm	85%
Esophagitis grade A or B is a contraindication to OAGB-MGB.	48	Disagree	81%
If the surgeon considers doing staple line reinforcement, barbed sutures are a suitable option.	45	Agree	80%
Measurement of the total bowel length can be used to define the percentage for the length of the biliopancreatic limb.	48	Agree	79%
Where should OAGB-MGB stapling in the lesser curve for pouch construction be started?	48	Option C <sup>b</sup>	77%
Staple line bleeding can be reduced by restoring blood pressure to normal intra and postoperatively and closely examining and addressing the bleeding points with clips or sutures.	48	Agree	77%
A patient's BMI can be used to define the length of the biliopancreatic limb.	47	Agree	77%
Barbed absorbable suture can be considered a suitable option for doing the gastroenterostomy anastomosis.	47	Agree	77%
Choosing a fixed length from the angle of Treitz can be considered a proper way to define biliopancreatic length.	46	Agree	76%
The mesocolic-mesenteric (Petersen's) space should be closed to decrease the postoperative risk of internal hernia.	49	Disagree	71%
If the surgeon considers doing staple line reinforcement, the use of buttress material also is a suitable option.	50	Agree	70%
The minimal recommended length of the gastric pouch should be...		No consensus Roughly 15 cm—46% As long as possible—54%	
Total bowel length should always be measured for a safe and adequate OAGB-MGB.		No consensus Agree—41% Disagree—59%	
Total bowel length should be measured for a safe and adequate OAGB-MGB whenever possible without adding risk to the patient.		No consensus Agree—62% Disagree—38%	
Esophagitis grade C or D is a contraindication to OAGB-MGB.		No consensus Agree—67% Disagree—33%	
The best way to choose the length of the biliopancreatic limb should be based on... <sup>c</sup>		No consensus A fixed length from the Treitz's angle—27% Patient's BMI—33% % Of the total bowel length—41%	
When measurement of the total small bowel length is performed, the ideal percentage length for the biliopancreatic limb, as a percentage, should be...		No consensus < 30%—17% 30–40%—68% > 40%—15%	
To avoid gastric pouch rotation, the gastroenterostomy should be done on its posterior wall or over the staple line, but not on the anterior wall of the gastric pouch		No consensus Agree—55% Disagree—45%	
Which is your preferred place in the pouch to do the gastroenterostomy—the anterior wall, posterior wall or staple line?		No consensus Anterior wall—23% Posterior wall—59% Staple line—18%	

<sup>a</sup> Fewer than 80% of the experts voted

<sup>b</sup> Response options: A. Close to the 3rd branch on the lesser curve; B. Above the incisura angularis; C. At the crow's foot; D. On the antrum between the incisura angularis and pylorus below the crow's foot; E. In the same place as the regular RYGB

<sup>c</sup> Response options: A. A fixed length from the Treitz's angle; B. The patient's BMI; C. A percentage of total bowel length



**Table 4** Module 4—complications and controversies in diagnosis, treatment, and prevention

Item/questions	# votes	Response	% consensus
Internal hernia is rare after OAGB-MGB but can happen and always should be considered to avoid delays in management.	50	Agree	100%
Alkaline reflux should initially be managed medically, rather than surgically.	48	Agree	96%
Protein-calorie malnutrition patients may need a staged approach involving enteral/parenteral feeding, as appropriate, followed by either reversal or shortening of the limb or conversion to a Roux-en-Y configuration.	46	Agree	96%
Patients needing resection of their gastroenterostomy due to persistent ulcer or stricture should undergo conversion to a Roux-en-Y configuration.	50	Agree	88%
Patients with severe protein-calorie malnutrition after OAGB-MGB are under risk of serious consequences and should ideally be managed in high-volume or center-of-excellence in bariatric/metabolic surgery.	50	Agree	86%
Revisional surgery with conversion to RYGB should just be considered for patients with dyspeptic symptoms from alkaline gastritis and no meaningful improvement over $\geq 6$ months treatment.	49	Agree	86%
Marginal ulcers after OAGB-MGB and their complications (like stricture, bleeding, or perforation) should be treated like marginal ulcers after RYGB.	47	Agree	85%
Patients in good nutritional status reporting symptoms of uncontrolled GERD despite optimal medical treatment can be offered conversion to a Roux-en-Y configuration without dismantling the original gastroenterostomy.	50	Agree	82%
Leaks from the gastric pouch or anastomosis can be managed by conversion to Roux-en-Y configuration without dismantling the original gastroenterostomy, along with drainage and suturing, if appropriate.	50	Agree	70%
Considering this conversion to a Roux-en-Y configuration, how long should the Roux limb be?		No consensus < 60 cm—24% 60–80 cm—59% > 80 cm—27%	
Bile reflux should be diagnosed by esophageal impedance-pH monitoring.		No consensus Agree—50% Disagree—50%	

variability among surgeons as to how the procedure should be performed [19].

In 2017, Mahawar et al. published the results of the first consensus study on the OAGB-MGB, in which a modified Delphi approach was used to present 55 statements to 101 international experts [20]. The study was hampered by low response rates, as low as 55%, with fewer than 80% voting on 20 of the 55 statements. The current survey, again using a modified Delphi approach, was conducted both to expand upon the previously reported study, in terms of topic areas, and to enhance response rates.

One topic area, which was expanded in the present study, was the comparisons of the OAGB-MGB against other procedures, primarily comparing the OAGB-MGB against the RYGB and SG. Consistent with the results of a recent meta-analysis [16], 76% of voters agreed that the OAGB-MGB produces a greater degree of weight loss than the RYGB, despite the lack of RCTs documenting this. Also consistent

with the results of a recent meta-analysis [15], 96% of voters agreed that the OAGB-MGB generated greater weight loss than sleeve gastrectomy.

Further comparing the OAGB-MGB and the RYGB, there was consensus that the OAGB-MGB and the RYGB achieve their results based on different physiologic mechanisms and principles. On the other hand, voters also agreed that, with shorter biliopancreatic limb (BPL) lengths (< 1.5 m), the OAGB-MGB has a profile similar to the RYGB. Pertaining to when to choose one procedure over the other, the RYGB was favored for patients with severe and intractable reflux after a sleeve gastrectomy, while the OAGB-MGB was considered an acceptable option post sleeve gastrectomy in patients requiring further weight loss or metabolic benefits. No consensus was reached on which procedure was better, the OAGB-MGB or the RYGB, for patients with morbid obesity and symptomatic GERD. Comparing the two procedures with respect to complications, a large majority agreed that OAGB-

**Table 5** Module 5—post-operative management and revisions

Item/question	# votes	Response	% consensus
Patients undergoing OAGB-MGB should be informed about the requirement for lifelong annual follow-up screening for anemia, secondary hyperparathyroidism, and other nutritional deficiencies with suitably trained healthcare professionals.	47	Agree	98%
Weight loss and metabolic outcomes achieved with OAGB-MGB can be linked to the length of the bypassed small bowel.	44	Agree	93%
OAGB-MGB is an appropriate revisional option after sleeve gastrectomy for further weight loss or metabolic benefit.	45	Agree	91%
OAGB-MGB is an appropriate revisional option after gastric bands for further weight loss or metabolic benefit.	46	Agree	87%
OAGB-MGB should not be considered a carcinogenic procedure.	44	Agree	86%
OAGB-MGB patients are likely to need more iron and calcium than RYGB patients.	48	Agree	85%
Lifelong PPI prophylaxis should be considered in high-risk peptic diseases groups like those who continue to smoke or chronically use NSAIDs and following the successful treatment of a marginal ulcer.	45	Agree	82%
Patients should be recommended vitamin–mineral supplementation as suggested for those undergoing RYGB until more focused data emerges regarding OAGB-MGB-specific recommendations.	43	Agree	79%
OAGB-MGB should not be recommended for patients who actively smoke.	45	Agree	78%
For patients with severe and intractable reflux after a sleeve gastrectomy, which option do you prefer—RYGB or OAGB-MGB?	45	RYGB	76%
Patients undergoing OAGB-MGB should be informed about the requirement for lifelong follow-up endoscopic screening with a suitably trained healthcare professional.	47	Agree	74%
With shorter biliopancreatic limb lengths (< 1.5 m), OAGB-MGB has a profile similar to RYGB, but the longer the biliopancreatic limb length, the more similar it will be to the biliopancreatic diversion class of bariatric/metabolic procedures.	45	Agree	73%
Patients should be advised about the need for routine 6-month post-operative prophylaxis against gallstones with ursodeoxycholic acid.	No consensus	Agree—57%	Disagree—43%
Postoperative continuous use PPI prophylaxis should be recommended for how many months?	No consensus	1–3 months—30%	4–6 months—57%
		7–12 months—11%	> 12 months—2%
Among asymptomatic OAGB-MGB patients with a normal preoperative endoscopy, when should the first endoscopic surveillance be done after the surgery?	No consensus	1 year—30%	2 years—7%
		≥ 3 years—48%	Never—15%
Considering asymptomatic OAGB-MGB patients with normal pre- and post-operative endoscopy, at what intervals should endoscopy be done?	No consensus	Within 1 year—4%	At 2 years—6%
		≥ 3 years—66%	Never—24%
Protein-calorie malabsorption might not be necessary for the therapeutic effect of OAGB-MGB.	No consensus	Agree—67%	Disagree—33%
OAGB-MGB is an appropriate option after a sleeve gastrectomy for the management of intractable reflux.	No consensus	Agree—37%	

**Table 5** (continued)

Item/question	# votes	Response	% consensus
Which procedure offers better treatment for patients with morbid obesity and symptomatic GERD—RYGB, OAGB-MGB, or either one?		Disagree—63%	
		No consensus	
		RYGB—63%	
		OAGB-MGB—26%	
		They are similar—11%	

MGB patients are likely to need more iron and calcium supplementation than RYGB patients. This is consistent with the results of the earlier consensus statement, in which there was consensus that OAGB-MGB patients should take a multivitamin containing zinc and copper, in addition to iron, calcium, vitamin B<sub>12</sub>, and vitamin D supplements for the remainder of their lives [20]. In our survey, no consensus was reached comparing the two procedures for the frequency of late dumping syndrome or hypoglycemia, though early dumping syndrome was considered less frequent with the OAGB-MGB.

With respect to indications and contraindications, there was consensus that the OAGB-MGB was suitable for patients irrespective of gender and of all ages over 24; no consensus was reached for adolescents or young adults under 24 years of age. The OAGB-MGB was deemed suitable for patients with super-obesity (BMI  $\geq 50$  kg/m<sup>2</sup>) and for patients with moderate obesity (BMI 25–30 kg/m<sup>2</sup>) with diabetes. The choice of the OAGB-MGB was considered contraindicated for patients with Child's C liver disease, Crohn's or other inflammatory bowel diseases, grade C esophagitis, or Barrett's esophagus, but not in patients with grade A or B esophagitis. As in the earlier Delphi study, in which 96% consensus was reached [20], our experts agreed that the OAGB-MGB should not be offered to patients actively smoking. No consensus was reached with respect to its suitability among patients with Child's A or B liver disease, GERD (excluding severe grade C esophagitis or Barrett's disease), or a hiatal hernia.

Consensus was reached on most technical aspects of the OAGB-MGB. There was clear consensus that a biliopancreatic limb (BPL) length  $\leq 2.0$  m was desirable, that a BPL should only be over 2.0 m if the total small bowel length has been measured and the bowel found to be suitably long, and that a patient's BMI can be used to determine BPL length. There also was consensus that surgeons should keep a minimum length of 0.5–1 cm of stomach close to the esophageal margin to avoid stapling too close to the gastroesophageal junction. Furthermore, surgeons should aim to construct a long and narrow pouch over 36–38 Fr gastric calibration tubes and create a gastroenterostomy that is 3–5 cm wide. Absorbable sutures should be used and barbed absorbable sutures could also be considered as a suitable option. A leak test (e.g., with methylene blue or indocyanine green dye, or air) should be performed to verify that the gastroenterotomy is patent and there is no leakage.

Consistent with the previously published statement [20], 96% of our experts agreed with the statement that the OAGB-MGB is not known to increase cancer risk, depicting essential areas of consensus with respect to the technical aspects of an OAGB-MGB.

The currently presented Delphi study had both strengths and weaknesses. Among its strengths were the number and tremendous diversity of voters and questions, which covered five broad areas of interest. Another strength was that, of the 90 statements included, at least 80% of eligible voters voted on 88 (97.8%).

Its weaknesses are those inherent to the Delphi process itself, the results of which must only be interpreted as level IV evidence, given that they are based solely on opinions. There also was the inherent bias that exists when experts who routinely perform a given procedure are asked to rate the procedure's value. To offset this, we asked six American and one Swiss expert who do not routinely perform the OAGB-MGB procedure, but are well-published, internationally recognized experts in bariatric surgery to participate. Evidence against undo bias also was the observation that, of the 23 items that asked voters either to rate their preference of the OAGB-MGB over another procedure or to consider the OAGB-MGB either indicated or contraindicated in a given clinical scenario, the response unfavorable to the OAGB-MGB was selected, by consensus, almost half (43.4%) the time.

## Conclusion

This IFSO OAGB-MGB consensus statement expands upon the results of the previously published statement, particularly with respect to technical aspects of the procedure and comparisons against other procedures, especially the RYGB. As in the earlier study, there was consensus that the OAGB-MGB is effective across a broad range of obese patients and that concerns regarding an increased cancer risk are unfounded. There also was consensus that surgeons and multidisciplinary teams should receive special training prior to undertaking the OAGB-MGB in their bariatric/metabolic interventions portfolio, that adopting a biliopancreatic limb of 200 cm or less is safest, that patients require long-term vitamin and nutritional



supplementation and lifelong monitoring, and that severe complications are best handled at large-volume bariatric surgery centers. Considerable research remains required to address a number of issues, like controversies related to GERD and bile reflux.

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## Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflicts of interest.

**Ethics Statement** The current study was a survey of expert surgeons and hence did not involve patients or animal subjects.

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