



The First Consensus Statement on One Anastomosis/Mini Gastric Bypass (OAGB/MGB) Using a Modified Delphi Approach

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Abstract

Background An increasing number of surgeons worldwide are now performing one anastomosis/mini gastric bypass (OAGB/MGB). Lack of a published consensus amongst experts may be hindering progress and affecting outcomes. This paper reports results from the first modified Delphi consensus building exercise on this procedure.

Methods A committee of 16 recognised opinion-makers in bariatric surgery with special interest in OAGB/MGB was constituted. The committee invited 101 OAGB/MGB experts from 39 countries to vote on 55 statements in areas of controversy or variation associated with this procedure. An agreement amongst $\geq 70.0\%$ of the experts was considered to indicate a consensus.

Results A consensus was achieved for 48 of the 55 proposed statements after two rounds of voting. There was no consensus for seven statements. Remarkably, 100.0% of the experts felt that OAGB/MGB was an “acceptable mainstream surgical option” and 96.0% felt that it could no longer be regarded as a new or experimental procedure. Approximately 96.0 and 91.0% of the experts felt that OAGB/MGB did not increase the risk of gastric and oesophageal cancers, respectively. Approximately 94.0% of the experts felt that the construction of the gastric pouch should start in the horizontal portion of the lesser curvature. There was a consensus of 82, 84, and 85% for routinely supplementing iron, vitamin B₁₂, and vitamin D, respectively.

Conclusion OAGB/MGB experts achieved consensus on a number of aspects concerning this procedure but several areas of disagreements persist emphasising the need for more studies in the future.

Keywords Mini gastric bypass · One anastomosis gastric bypass · Single anastomosis gastric bypass · Omega loop gastric bypass · Loop gastric bypass · Gastric bypass · Consensus statement · Delphi approach

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Abbreviations

OAGB/MGB	One Anastomosis (Mini) Gastric Bypass
IFSO	International Federation for the Surgery of Obesity and Metabolic Disorders
RYGB	Roux-en-Y Gastric Bypass
GERD	Gastro-Esophageal Reflux Disease

Introduction

One anastomosis/mini gastric bypass (OAGB/MGB) is being performed by an increasing number of surgeons worldwide with several thousand cases [1–4] now documented in the published scientific literature. At the same time, there is considerable variation amongst surgeons with regard to a number of peri-operative practices [5]. This survey of 210 OAGB/MGB surgeons from 39 countries with a cumulative experience of 68,442 procedures revealed considerable variations in practice. For example, surgeons described no less than 55 different absolute and 59 relative contraindications to this procedure in their practice. Rather more worryingly, a large number of surgeons did not routinely recommend iron, vitamin D, and vitamin B₁₂ supplementation after this procedure. Given that these supplementations are now routine and supported by various nutritional guidelines [6, 7] after Roux-en-Y gastric bypass (RYGB), one fails to understand the rationale behind these practices with a procedure that is associated with a higher incidence of severe protein-calorie malnutrition [8]. There were further significant variations with regard to the length of the bilio-pancreatic limb used with only 35.0% of the surgeons using a fixed length. There was also lack of consistency regarding approach to patients with hiatus hernia.

This variation in practice is probably because there is a relative lack of studies on various peri-operative practices concerning this procedure. The unfortunate controversy surrounding this procedure [9] has probably further hindered its widespread adoption and detailed scientific investigation. Developing a systematic evidence base for all of the different aspects of this procedure will not be easy and likely to take some time. While we wait for that to happen, a consensus amongst experts can be useful to guide newer surgeons. At the same time, surgeons need to be aware that expert opinion can only be regarded as level 1V evidence and needs to be confirmed in future studies. There is currently no published consensus amongst experts concerning various aspects of OAGB/MGB.

Modified Delphi protocol is a recognised strategy for consensus building amongst experts [10]. This technique has been used widely in various walks of life including biomedical disciplines as well as bariatric surgery [11]. It allows experts to share and modify their opinion anonymously and removes the possibility of some loud voices determining the group thinking. It further allows experts to change their views without any loss of face that can happen in open face-to-face

setting. The aim of this exercise was to develop consensus amongst OAGB/MGB experts on a range of practices and principles concerning this procedure following a modified Delphi protocol.

Methods

We constituted a committee of 16 recognised opinion-makers in bariatric surgery with a special interest in this procedure to oversee the consensus building exercise (Table 1). The committee invited 101 expert OAGB/MGB surgeons from around the world (Table 2) to take part in the consensus building exercise. The experts had to meet following criteria for inclusion.

1. Nomination by either a member of the OAGB/MGB Consensus Building Committee or President of a national bariatric society affiliated to International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO)
2. Self-confirmation of OAGB/MGB expert status
3. Working knowledge of English language
4. Participation in both rounds of voting as per the modified Delphi protocol

The committee drafted 55 statements for experts to vote on. The members of the committee also voted as experts. No attempt was made to examine individual responses. An agreement amongst $\geq 70.0\%$ of the experts was used to define consensus. This cut-off has been used in previous consensus papers published in the field of bariatric surgery [12]. Experts were encouraged to provide justification for their choices. The committee invited a second round of votes from experts on statements with $\leq 75.0\%$ consensus after the first round. The cumulative results of the first-round exercise were shared with experts prior to the second-round voting. The exercise was concluded after two rounds as the committee felt a saturation point had been reached.

Results

A total of 101 experts from 39 countries voted on 55 statements proposed by the consensus building committee. With 9 experts, India had the highest number of OAGB/MGB experts in the world followed by the United Kingdom (8), France (8), Mexico (8), and Italy (7).

Table 3 summarises detailed results of first- and second-round votes on each of the 55 statements. A consensus of $> 75.0\%$ was reached for 38 statements and a consensus of 70.0–75.0% was reached for another 7 statements, after the

Table 1 Members of OAGB/MGB Consensus Building Committee (in alphabetical order)

Name	Country
Miguel Carbajo	Spain
Jean-Marc Chevallier	France
Mohammad Khalid Mirza	Kingdom of Saudi Arabia
Maurizio De Luca	Italy
Jacques Himpens	Belgium
Ali Khammas	United Arab Emirates
Lilian Kow	Australia
Kuldeepak Singh Kular	India
Mufazzal Lakdawala	India
Wei-Jei Lee	Taiwan
Kamal Mahawar	United Kingdom
Mario Musella	Italy
Gerhard Prager	Austria
Scott Alan Shikora	United States of America
Peter Small	United Kingdom
Rudolf Weiner	Germany

first round. There was no consensus on 10 statements after the first round.

The committee decided to vote on statements with $\leq 75.0\%$ consensus in the second round. After the second round, a consensus of $> 70.0\%$ was achieved for all but 7 statements.

Expert Disagreement with the Committee Statements

Out of the 48 statements where consensus was achieved, experts agreed with 46 of the statements proposed by the committee. Two statements where a consensus of disagreement was reached have been clearly identified in Table 3. These are as follows.

- (i) One anastomosis/mini gastric bypass (OAGB/MGB) is not a malabsorptive bariatric procedure (disagreed by 82.0% of the experts).
- (ii) The standard length of the bilio-pancreatic limb should be 150 cm for all patients (disagreed by 82.0% of the experts).

Change in Position in Second Round

For each of the 17 statements that went for second-round voting, the majority (irrespective of whether it was to agree or disagree) increased indicating the willingness of experts to move towards a consensus. After the second round, there was a consensus on 48 statements as opposed to 45 statements where a consensus was achieved after the first round. Three statements where there was no consensus after the first round

but a consensus was achieved after the second round are as follows.

- (i) OAGB/MGB is an acceptable surgical option for suitable patients with large hiatus hernia (> 4.0 cm) (75.25% agreed).
- (ii) OAGB/MGB is an acceptable surgical option in suitable patients with Child-Pugh class A cirrhosis of the liver without portal hypertension (75.25% agreed).
- (iii) Surgeons should avoid going too close to the angle of His to avoid leaks in this area (77.23% agreed).

No Consensus Achieved

Even after two rounds of voting, there was no consensus on 7 statements. These have been clearly identified in Table 3 and are as follows.

- (i) One anastomosis/mini gastric bypass (OAGB/MGB) largely works similar to an RYGB in its mechanism of action (65.35% disagreed).
- (ii) OAGB/MGB is an acceptable surgical option for suitable patients with severe gastro-oesophageal reflux disease (GERD) requiring daily medication (69.31% agreed).
- (iii) OAGB/MGB is the preferred surgical option for suitable patients with severe psychiatric disorders because of the ease of reversibility (54.46% agreed).
- (iv) OAGB/MGB is not recommended for patients with Barrett's oesophagus (66.34% agreed).
- (v) Routine crural approximation is unnecessary for patients with a hiatus hernia (63.37% agreed).
- (vi) Patients should be advised routine prophylaxis for gallstones with ursodeoxycholic acid for at least 6 months (64.36% disagreed).
- (vii) Patients developing symptomatic GERD unresponsive to maximal medical therapy after OAGB/MGB can be offered surgical correction in the form of a Braun's anastomosis between afferent and efferent limbs (66.34% disagreed).

Discussion

One anastomosis/mini gastric bypass is an attractive primary as well as revisional bariatric procedure [1]. At the same time, there are multiple areas of controversy and variation. There is insufficient evidence at the present time to allow us to draw a robust conclusion on these aspects of this procedure. Though expert opinion is graded as the lowest level of scientific evidence, it is often the only available evidence to inform clinical

Table 2 One anastomosis/mini gastric bypass experts (in alphabetical order)

Serial number	Name	Institution	Country
1.	Richard Abittan	Richard Abittan Bariatric Center, Casablanca	Morocco
2.	Mohamed M Abouzeid	Ain Shams University	Egypt
3.	Sami Salem Ahmed	Istishari Hospital, Amman	Jordan
4.	Recep Aktimur	Istanbul Aydin University	Turkey
5.	Ali Alhamdani	Whittington Hospital	United Kingdom
6.	Haider A Alshurafa	Prince Sultan Military Medical City	Saudi Arabia
7.	Mustafa Allouch	Nini Hospital, Tripoli	Lebanon
8.	Priscila Antozzi	Centro de Cirugias Especiales Dres Antozzi	Argentina
9.	Arturo Valdés Alvarez	Christus Muguerza Saltillo	Mexico
10.	Basil J Ammori	Salford Royal Hospital	United Kingdom
11.	Jan Apers	Franciscus Gasthuis, Rotterdam	Netherlands
12.	Alberto Arango	Kennedy Hospital	Colombia
13.	Raymond Arnoux	Polyclinique de Bordeaux Tondu	France
14.	Sarfaraz Baig	Belle Vue Clinic, Kolkata	India
15.	Ramana Balasubramanian	Medica Gamma Hospital, Kolkata	India
16.	Mohit Bhandari	Mohak Bariatrics and Robotics, Indore	India
17.	Jean Biagini	St. Joseph Hospital	Lebanon
18.	Marie-Cécile Blanchet	Clinique de la Sauvegarde, Lyon	France
19.	Mehrdad Bohlooli	Jam Hospital, Tehran	Iran
20.	Michael Van den Bosche	Spire Southampton Hospital	United Kingdom
21.	William Braun	Weight and Metabolic Solutions Australia	Australia
22.	Matthieu Bruzzi	Hôpital Européen Georges-Pompidou	France
23.	Francisco J Campos	Secretaría de Salud CDMX	Mexico
24.	Miguel A Carbajo	Center of Excellence for the Study and Treatment of Obesity and Diabetes	Spain
25.	William Carr	Sunderland Royal Hospital	United Kingdom
26.	Suleyman Cetinkunar	Adana Numune Training and Research Hospital	Turkey
27.	Jean-Marc Chevallier	Université Paris 5	France
28.	Michal Čierny	Břeclav Hospital	Czech Republic
29.	Jérôme Dargent	Polyclinique Lyon-Nord	France
30.	Maurizio De Luca	Montebelluna Treviso Hospital	Italy
31.	Shamsi Elhasani	Princess Royal University Hospital, Kent	United Kingdom
32.	Marloes Emous	Medical Center Leeuwarden	Netherlands
33.	Jorge Esmeral	CIMA Hospital	Costa Rica
34.	Marcelo Fage	Grupo Bariatrico Oeste	Argentina
35.	Mohamad Hayssam Elfawal	Makassed General Hospital	Lebanon
36.	Olivier Fercocq	Clinique du Ter	France
37.	Miguel Flores de la Torre	Equipo Multidisciplinario “Adios a Las Obesidad”	Mexico
38.	Marc AMRM Focquet	KOMC AZ St. Elisabeth Ziekenhuis, Zottegem	Belgium
39.	Vincent Frering	Clinique Sauvegarde	France
40.	Frank Garcia	Ucom Grupo Integral, CA	Venezuela
41.	Francesco Greco	Istituto Ospedaliero Fondazione Poliambulanza Brescia	Italy
42.	Javit Kuri Guinto	Hospital Privado Santa Lucia	Mexico
43.	Yasser Hamza	Alexandria Faculty of Medicine	Egypt
44.	David E Hargroder	Mercy Hospital Carthage	United States of America
45.	Jacques Himpens	St. Pierre University Hospital, Brussels	Belgium
46.	George Hopkins	Royal Brisbane and Women’s Hospital	Australia
47.	Gurvinder S Jammu	Jammu Hospital, Jalandhar, Punjab	India

Table 2 (continued)

Serial number	Name	Institution	Country
48.	Anne Juuti	Helsinki University Central Hospital	Finland
49.	Ewoud H Jutte	Medisch Centrum Leeuwarden	Netherlands
50.	Mohammad Kermansaravi	Iran University of Medical Sciences	Iran
51.	Ali Khammas	Rashid Hospital	United Arab Emirates
52.	Thomas Köstler	Spital Limmattal, Zürich	Switzerland
53.	Lilian Kow	Adelaide Bariatric Centre	Australia
54.	Jon Kristinsson	Oslo University Hospital, Aker	Norway
55.	Kuldeepak Singh Kular	Kular College and Hospitals Pvt. Ltd.	India
56.	Mufazzal Lakdawala	Digestive Health Institute, Mumbai	India
57.	Ming-Hsien Lee	China Medical University Hospital, Taiwan	Taiwan
58.	Wei-Jei Lee	Min-Sheng General Hospital	Taiwan
59.	Tomasz Lewandowski	Centre of General, Bariatric and Oncological Surgery "Pro Medica" Elk,	Poland
60.	Ricardo Belda Lozano	Hospital Torrecárdenas	Spain
61.	Roger Charles Luciani	Centre Hospitalier Mutualiste Les Portes du Sud	France
62.	Kamal Mahawar	Sunderland Royal Hospital	United Kingdom
63.	Tarek Mahdy	Mansoura Faculty of Medicine	United Arab Emirates
64.	Diana Gabriela Maldonado Pintado	Angeles Pedregal Hospital, Mexico City	Mexico
65.	Emilio Manno	Bariatric and Metabolic Unit Cardarelli Hospital, Naples	Italy
66.	Rami Micker	Clínica del Country	Colombia
67.	Mohammad Khalid Mirza	King Fahad University Hospital	Saudi Arabia
68.	Fernando Montufar	Clínica de Cirugia Bariátrica en Guatemala	Guatemala
69.	Mario Musella	Advanced Biomedical Sciences Department Federico II University - Naples	Italy
70.	Mahendra Narwaria	Asian Bariatrics Pvt. Ltd., Ahmedabad	India
71.	Salvador Navarrete Aulestia	Clínica Santa Sofia	Venezuela
72.	Brigitte Obermayer	Göttlicher Heiland Krankenhaus, Wien	Austria
73.	Taryel Omarov	Azerbaijan Medical University	Azerbaijan
74.	Oral B Ospanov	Astana Medical University	Kazakhstan
75.	M Mahir Ozmen	Liv Hospital Ankara	Turkey
76.	Chetan Parmar	Whittington Hospital, London	United Kingdom
77.	Raul Vazquez Pelcastre	High Specialty Regional Hospital of Yucatan Peninsula	Mexico
78.	Luigi Piazza	SICOB	Italy
79.	Arun Prasad	Apollo Hospital. New Delhi	India
80.	Gerhard Prager	Medical University of Vienna	Austria
81.	Marco Raffaelli	Università Cattolica del Sacro Cuore	Italy
82.	Asnat Raziell	Assuta Medical Center	Israel
83.	Karl Peter Rheinwald	St. Franziskus Hospital, Cologne	Germany
84.	Rui Ribeiro	Clinica de Santo António, Lisboa	Portugal
85.	Nasser Sakran	Emek Medical Center, Afula	Israel
86.	Vladimir Samoylov	Road Hospital Station Voronezh-1 JSC	Russia
87.	Kong-Han Ser	Min-Sheng General Hospital	Taiwan
88.	George Skroubis	University of Patras	Greece
89.	Peter K Small	Sunderland Royal Hospital	United Kingdom
90.	Jose Sergio Verboonen Sotelo	Obesity Goodbye Center	Mexico
91.	Scott A Shikora	Brigham and Women's Hospital	United States of America
92.	Antonio Susa	Istituto Clinico San Rocco, Brescia	Italy
93.	Osama Taha	Bariatric Center, Cairo	Egypt

Table 2 (continued)

Serial number	Name	Institution	Country
94.	Om Tantia	ILS Hospital, Salt Lake, Kolkata	India
95.	Murat Ustun	Istanbul Bariatric Center	Turkey
96.	Villy Våge	Helse Bergen	Norway
97.	Ramon Vilallonga	Centro Médico Teknon	Spain
98.	Rudolf Weiner	Clinic Obesity Surgery, Sana-Klinikum Offenbach	Germany
99.	Monica Vera Zalles	Centro Medico Foianini	Bolivia
100.	José Ayala Zavaleta	Hospital Regional de Alta Especialidad de Oaxaca	Mexico
101.	Khalil Zayadin	Amman Surgical Hospital	Jordan

practice. A consensus amongst experts using a robust methodology can help drive up clinical standards. At the same time, it is important to make a distinction between a clinical guideline which is necessarily a synthesis of available evidence and a consensus statement which is an attempt to get experts to agree on the correct choice, often in areas with no clear scientific evidence.

A recent attempt at understanding objections to OAGB/MGB [13] revealed that approximately 51.0 and 45.0% of surgeons who do not perform this procedure cite an increased risk of gastric and oesophageal cancer respectively as one of the contributory factors. It is especially interesting because not a single case of a gastric pouch or oesophageal cancer has yet been reported in published scientific literature after this procedure. Critics would, of course, argue that since it is a newer procedure and the vast majority have only been performed over the last decade, we need to see longer follow-up studies to be absolutely certain. At the same time, one has to recognise that it will probably never be practicable to design an adequate study with either of these cancers as an endpoint. The opinion of experts hence matters in such situations and can often settle protracted debates. In our consensus building exercise, 96.0 and 91.0% of the experts felt that OAGB/MGB does not increase the risk of gastric cancers and oesophageal cancers, respectively. This issue has been investigated in some detail in the past [9], and the conclusion was that there is lack of convincing data from human studies to label bile as a carcinogen for either gastric or oesophageal cancers but authors acknowledge that this is a controversial topic.

Young age, symptoms of GERD, hiatus hernia, and vegetarian food habits are often used as relative or absolute contraindications by OAGB/MGB surgeons [5]. There was a consensus of 95.0% amongst experts that OAGB/MGB is an acceptable surgical option for suitable young adults in this exercise. Similarly, though there is a definite incidence and prevalence of GERD after OAGB/MGB, the exact number is currently a matter of debate, and studies specifically conducting a detailed risk versus benefit evaluation of such patient selection strategies in comparison with other procedures such as RYGB are currently lacking.

Notwithstanding the relative scarcity of such studies, there was a consensus amongst experts in this study that OAGB/MGB is an acceptable option for suitable patients with a hiatus hernia, including even those with a large hiatus hernia of > 4.0 cm. Similarly, though there was no consensus on patients with severe GERD requiring daily medication, there was 86.0% consensus that OAGB/MGB was “an acceptable surgical option for suitable patients with mild to moderate GERD”. There was a further 79.0% consensus that OAGB/MGB was an acceptable surgical option for vegetarian patients.

As expected, 94.0% of the experts felt that construction of the pouch should start in the horizontal portion of the lesser curvature of the gastric pouch [14]. Remarkably, however, 81.0% of the experts felt that the routine use of the anti-reflux technique as popularised by Carbajo et al. [15] was not strictly necessary. Once again, comparative studies evaluating the role of this technique are lacking and must be regarded as an important area for future investigation. Similarly, 82.0% of the experts felt that the routine closure of Petersen’s space was unnecessary probably reflecting the previously stated position of many experts [16] but with an increasing number of reports of Petersen’s hernia after this procedure [17], it remains to be seen if this will change in the future.

RYGB is traditionally classified as a combined restrictive and malabsorptive procedure. But we now know that malabsorption contributes only approximately 11.0% to total calorie deficit in the early period after RYGB and possibly even lower in the long term [18]. Such studies do not exist for OAGB/MGB but it is nevertheless interesting that 82.0% of the experts disagreed with the statement “one anastomosis/mini gastric bypass (OAGB/MGB) is not a malabsorptive bariatric procedure”. Similarly, 82.0% of the experts disagreed with the statement, “The standard length of the bilio-pancreatic limb should be 150 cm for all patients”. Future studies need to address the contribution of malabsorption to total calorie deficit after OAGB/MGB and efficacy of a standard bilio-pancreatic limb of 150 cm. Majority of the experts agreed that it was acceptable to use a bilio-pancreatic limb of up to 200 cm with this procedure in various clinical settings with “careful monitoring”.

Table 3 Consensus statement voting results

Serial no.	Statements	First-round, experts' agreeing % (n = 101)	Second-round, experts' agreeing % (n = 101)	Final outcome
1.	One anastomosis/mini gastric bypass (OAGB/MGB) largely works similar to a Roux-en-Y gastric bypass (RYGB) in its mechanism of action.	Disagree 52.48% (n = 53)	Disagree 65.35% (n = 66)	No consensus
2.	One anastomosis/mini gastric bypass (OAGB/MGB) is not a malabsorptive bariatric procedure (experts disagreed).	Disagree 82.18% (n = 83)	NA	Consensus
3.	OAGB/MGB is an acceptable mainstream surgical option for suitable patients seeking bariatric or metabolic surgery.	Agree 100.0% (n = 101)	NA	Consensus
4.	Surgeons performing OAGB/MGB do not need to take approval from institutional review boards.	Agree 75.25% (n = 76)	NA	Consensus
5.	OAGB/MGB can no longer be regarded as a new or experimental procedure.	Agree 96.04% (n = 97)	NA	Consensus
6.	OAGB/MGB is an acceptable surgical option for suitable young adults.	Agree 95.05% (n = 96)	NA	Consensus
7.	OAGB/MGB is an acceptable surgical option for suitable elderly patients (> 70.0 years of age).	Agree 70.3% (n = 71)	Agree 85.15% (n = 86)	Consensus
8.	OAGB/MGB is an acceptable surgical option for suitable patients with severe gastro-oesophageal reflux disease (GERD) requiring daily medication.	Agree 63.37% (n = 64)	Agree 69.31% (n = 70)	No consensus
9.	OAGB/MGB is the preferred surgical option for suitable patients with severe psychiatric disorders because of the ease of reversibility.	Agree 50.5% (n = 51)	Agree 54.46% (n = 55)	No consensus
10.	OAGB/MGB is an acceptable surgical option for suitable patients with mild to moderate GERD.	Agree 86.14% (n = 87)	NA	Consensus
11.	OAGB/MGB is an acceptable surgical option for suitable patients with large hiatus hernia (> 4.0 cm).	Agree 66.34% (n = 67)	Agree 75.25% (n = 76)	Consensus
12.	OAGB/MGB is an acceptable surgical option for suitable patients with mild to moderate hiatus hernia (\leq 4.0 cm).	Agree 89.11% (n = 90)	NA	Consensus
13.	OAGB/MGB is not recommended for patients with Barrett's oesophagus.	Agree 60.4% (n = 61)	Agree 66.34% (n = 67)	No consensus
14.	OAGB/MGB is not recommended for patients with Crohn's disease.	Agree 79.21% (n = 80)	NA	Consensus
15.	Smokers should be advised to cease smoking prior to OAGB/MGB as there is a higher risk of marginal ulcer and other complications in smokers.	Agree 98.02% (n = 99)	NA	Consensus
16.	OAGB/MGB is an acceptable surgical option in vegetarian patients.	Agree 79.21% (n = 80)	NA	Consensus
17.	OAGB/MGB is an acceptable surgical option in suitable patients with Child-Pugh class A cirrhosis of the liver without portal hypertension.	Agree 67.33% (n = 68)	Agree 75.25% (n = 76)	Consensus
18.	All OAGB/MGB patients should undergo a routine preoperative upper gastro-intestinal endoscopy.	Agree 75.25% (n = 76)	NA	Consensus
19.	All OAGB/MGB patients should undergo a routine preoperative ultrasound scan of the abdomen.	Agree 73.27% (n = 74)	NA	Consensus
20.	All OAGB/MGB patients should undergo a preoperative screening, followed by eradication if needed, for <i>Helicobacter pylori</i> .	Agree 83.17% (n = 84)	NA	Consensus
21.	Construction of OAGB/MGB pouch should start in the horizontal portion of the lesser curvature of the stomach to make it as long as possible.	Agree 94.06% (n = 95)	NA	Consensus
22.	Routine use of staple-line reinforcement is unnecessary.	Agree 86.14% (n = 87)	NA	Consensus
23.	Routine use of anti-reflux sutures or technique is unnecessary.	Agree 73.27% (n = 74)	Agree 81.19% (n = 82)	Consensus
24.	Surgeons may choose to use an oro-gastric tube to size the pouch.	Agree 95.05% (n = 96)	NA	Consensus
25.	Surgeons should avoid going too close to the angle of His to avoid leaks in this area.	Agree 66.34% (n = 67)	Agree 77.23% (n = 78)	Consensus
26.	The routine crural approximation is unnecessary for patients with a hiatus hernia.	Agree 55.45% (n = 56)	Agree 63.37% (n = 64)	No consensus

Table 3 (continued)

Serial no.	Statements	First-round, experts' agreeing % (n = 101)	Second-round, experts' agreeing % (n = 101)	Final outcome
27.	If an oro-gastric tube is used, it is acceptable to use tubes of sizes ranging from 32 to 40 Fr.	Agree 95.05% (n = 96)	NA	Consensus
28.	Routine division of the greater omentum is unnecessary.	Agree 81.19% (n = 82)	NA	Consensus
29.	The standard length of the bilio-pancreatic limb should be 150 cm for all patients (experts disagreed).	Disagree 82.18% (n = 83)	NA	Consensus
30.	It is not necessary to measure the total small bowel length.	Agree 70.3% (n = 71)	Agree 79.21% (n = 80)	Consensus
31.	It is acceptable to routinely use a standard bilio-pancreatic limb length of up to 200 cm with careful monitoring.	Agree 78.22% (n = 79)	NA	Consensus
32.	It is acceptable to use a bilio-pancreatic limb of up to 200 cm for superobese patients with careful monitoring.	Agree 76.24% (n = 77)	NA	Consensus
33.	It is acceptable to use a bilio-pancreatic limb of up to 200 cm for patients seeking revisions from previous gastric bands or sleeves, with careful monitoring.	Agree 75.25% (n = 76)	NA	Consensus
34.	Routine closure of Petersen's space is unnecessary.	Agree 82.18% (n = 83)	NA	Consensus
35.	An intraoperative leak test is recommended.	Agree 93.07% (n = 94)	NA	Consensus
36.	Routine placement of surgical drains is unnecessary.	Agree 72.28% (n = 73)	Agree 78.22% (n = 79)	Consensus
37.	Routine postoperative use of nasogastric tubes is unnecessary.	Agree 92.08% (n = 93)	Consensus	Consensus
38.	Routine postoperative contrast study to check for leaks prior to allowing oral intake is unnecessary.	Agree 75.00% (n = 75)	Agree 85.15% (n = 86.0%)	Consensus
39.	Patients should be advised marginal ulcer prophylaxis using a proton pump inhibitor for at least a duration of 6 months.	Agree 71.29% (72.0%)	Agree 88.12% (n = 89)	Consensus
40.	Patients should be advised a routine multivitamin supplement containing suitable amounts of zinc and copper, daily for the rest of their life.	Agree 88.12% (n = 89)	NA	Consensus
41.	Patients should be advised routine iron supplements for the rest of their life.	Agree 72.28% (n = 73)	Agree 82.18% (n = 83)	Consensus
42.	Patients should be advised routine vitamin D and calcium supplements for the rest of their life.	Agree 85.15% (n = 86)	NA	Consensus
43.	Patients should be advised routine vitamin B ₁₂ supplements for the rest of their life.	Agree 71.29% (n = 72)	Agree 84.16% (n = 85)	Consensus
44.	Patients should be advised routine prophylaxis for gallstones with ursodeoxycholic acid for at least 6 months.	Disagree 55.45% (n = 56)	Disagree 64.36% (n = 65)	No consensus
45.	Patients should be advised annual screening for anaemia and secondary hyperparathyroidism for the rest of their life.	Agree 94.06% (n = 95)	NA	Consensus
46.	Patients should be advised annual bariatric follow-up for the rest of their life.	Agree 95.05% (n = 96)	NA	Consensus
47.	Some patients experience GERD after OAGB/MGB.	Agree 89.11% (n = 90)	NA	Consensus
48.	Patients developing symptomatic GERD unresponsive to maximal medical therapy after OAGB/MGB can be offered surgical correction in the form of a conversion to RYGB.	Agree 91.09% (n = 92)	NA	Consensus
49.	Patients developing symptomatic GERD unresponsive to maximal medical therapy after OAGB/MGB can be offered surgical correction in the form of a Braun's anastomosis between afferent and efferent limbs.	Disagree 55.45% (n = 56)	Disagree 66.34% (n = 67)	No consensus
50.	Some patients develop protein-calorie malnutrition after OAGB/MGB.	Agree 90.10% (n = 91)	NA	Consensus
51.	Patients developing protein-calorie malnutrition after OAGB/MGB can be offered a reversal of the procedure if appropriate.	Agree 89.11% (n = 90)	NA	Consensus

Table 3 (continued)

Serial no.	Statements	First-round, experts' agreeing % (n = 101)	Second-round, experts' agreeing % (n = 101)	Final outcome
52.	Patients developing protein-caloric malnutrition after OAGB/MGB can be offered shortening of the BP limb if appropriate.	Agree 86.14% (n = 87)	NA	Consensus
53.	OAGB/MGB does not increase the risk of gastric cancer.	Agree 96.04% (n = 97)	NA	Consensus
54.	OAGB/MGB does not increase the risk of Barrett's oesophagus.	Agree 84.16% (n = 85)	NA	Consensus
55.	OAGB/MGB does not increase the risk of oesophageal cancer.	Agree 91.09% (n = 92)	NA	Consensus

OAGB/MGB one anastomosis (mini) gastric bypass, IFSO International Federation for the Surgery of Obesity and Metabolic Disorders, RYGB Roux-en-Y gastric bypass, GERD gastro-oesophageal reflux disease

There is significant variation in practice concerning micronutrient supplementation with this procedure. In a recent survey of 210 surgeons [5], only half of the surgeons reported routine iron supplementation and 59.0 and 68.0% reported routine vitamin B₁₂ and vitamin D supplementation, respectively. There was a consensus of 82, 84 and 85% for routinely supplementing iron, vitamin B₁₂, and vitamin D, respectively. Approximately 88.0% of the experts agreed that "Patients should be advised a routine multivitamin supplement containing suitable amounts of zinc and copper, daily for the rest of their life".

Authors would like to caution against over-interpretation of the findings of this consensus building exercise. Though, we believe, this consensus building exercise will help individual OAGB/MGB surgeons make the correct choices for their patients, one has to acknowledge that we can only make grade D recommendations on the basis of expert opinion. At the same time, authors hope that inclusion of a large number of experts from different geographical areas would at least partially help overcome the weaknesses of individual expert opinion. Though we recognise that in areas of science with a poor evidence base, expert opinion is often the best available guide for clinical decision-making, experts can be wrong and it is hence necessary to validate expert opinion in scientific studies. This is further important because experts in this exercise were necessarily OAGB/MGB surgeons and likely to have a favourable approach towards the technique. Moreover, as previously stated, there is scarcity of level 1 data on this procedure.

The methodology adopted for consensus building can also be discussed. It has been argued that exercises conducted in an open room setting can be hijacked by more articulate and loud voices. This was the reason we adopted a modified Delphi protocol where experts were able to share their opinion anonymously and in areas of lack of agreement or consensus, experts were able to gauge the group thinking before voting again. It has been suggested that such an approach allows experts to vote independently as well as change their position without any loss of face [10]. At the same time, one could argue that anonymity might reduce the sense of direct personal responsibility, though the group would, of course, own collective responsibility for the results. This consensus document in conjunction with a position statement that IFSO is developing should hence help improve outcomes of patients undergoing OAGB/MGB.

Conclusion

This paper reports results from the first scientific consensus building exercise, involving 101 experts from 39 countries, on various aspects of OAGB/MGB, following a modified Delphi protocol. A consensus was achieved for 48 of the 55 statements proposed by a committee comprising of 16 recognised opinion-makers in bariatric surgery with special interest in

OAGB/MGB. There was no consensus for 7 statements. Remarkably, 100.0% of the experts felt that OAGB/MGB was an “acceptable mainstream surgical option” for suitable patients and 96.0% felt that it could no longer be regarded as a new or experimental procedure. Approximately 96.0 and 91.0% of the experts felt that OAGB/MGB did not increase the risk of gastric and oesophageal cancers, respectively. Approximately 94.0% of the experts felt that the construction of the gastric pouch should start in the horizontal portion of the lesser curvature to achieve the longest possible pouch and 81.0% felt that routine use of an anti-reflux technique or sutures was unnecessary.

Author Contribution KM conceived the idea for this exercise, moderated it, analysed the results, and wrote large sections of the manuscript. All other authors helped with determining the methodology of the exercise, provided feedback at every stage, took part in the voting, critically reviewed the manuscript, and provided leadership. All authors have seen the final draft and approve of it.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest. Jacques Himpens is a consultant with Medtronic and with Ethicon.

Statement of Human and Animal Rights Not applicable.

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