MANUSCRIPT TITLE

Perioperative Practices Concerning Sleeve Gastrectomy – a Survey of 863 Surgeons with a Cumulative Experience of 520,230 Procedures

ABSTRACT

Background

Sleeve Gastrectomy (SG) is the most commonly performed bariatric procedure worldwide. There is currently no scientific study aimed at understanding variations in practices concerning this procedure. The aim of this study was to study the global variations in perioperative practices concerning SG.

Methods

A 37-item questionnaire-based survey was conducted to capture the perioperative practices of the global community of bariatric surgeons. Data were analysed using descriptive statistics.

Results

Response of 863 bariatric surgeons from 67 countries with a cumulative experience of 520,230 SGs were recorded. A total of 689 (80%) and 764 (89%) surgeons listed 13 absolute and relative contraindications, respectively. 65% (n = 559) surgeons perform routine preoperative endoscopy and 97% (n=835) routinely use intraoperative orogastric tube for sizing the resection. A wide variation is observed in the diameter of the tube used. 73% (n=627) surgeons start dividing the stomach at a distance of 3-5 cm from the pylorus, and 54% (n=467) routinely use staple line reinforcement. Majority (65%, n=565) of surgeons perform routine intraoperative leak test at the end of the procedure, while 25% (n=218) surgeons perform a routine contrast study in the early postoperative period. Lifelong

multivitamin/mineral, iron, vitamin D, calcium, and vitamin B12 supplementation is advocated by 66%, 29%, 40%, 38% and 44% surgeons, respectively.

Conclusion

There is a considerable variation in the perioperative practices concerning SG. Data can help in identifying areas for future consensus building and more focussed studies.

INTRODUCTION

Sleeve Gastrectomy (SG) is now the most commonly performed bariatric procedure in the world [1]. It was first performed by Hess in 1988 as a component of biliopancreatic diversion-duodenal switch (BPD-DS) procedure which was modified from Scopinaro's biliopancreatic diversion (BPD) and DeMeester's duodenal switch (DS) procedure [2-4]. With the evolution of laparoscopic surgery in the 1990s, Gagner performed the first laparoscopic SG as a part of BPD-DS in 1999 [5]. In the early part of the 21st century, it was popularized as a first-step intervention before BPD or gastric bypass in the super obese and high-risk group of patients [6-7]. Due to the unexpected good results in terms of weight loss and resolution of comorbidities, coupled with the simplicity of performing the procedure requiring intervention on only the stomach, SG gained status as a stand-alone bariatric procedure [8,9].

Despite SG being the most commonly performed procedure worldwide, there is a lack of agreement amongst surgeons regarding its contraindications, preoperative assessment, technical aspects of the procedure such as diameter of the orogastric tube to size the sleeve, distance from the pylorus at the beginning of gastric transection, staple line reinforcement, intraoperative leak test, and postoperative management [10-12].

Though there have been previous attempts to build consensus on various aspects of SG [10,11], these efforts have been hampered somewhat by lack of published scientific data on global variation in practices concerning this procedure. The objective of this study was to understand the variations in perioperative practices concerning SG through a survey of global community of bariatric surgeons on its contraindications, preoperative assessment, intraoperative technical details and postoperative management. It is expected that understanding variations in practice scientifically may pave way for focused studies to

identify best practice in the future. A better understanding of the global variations in practices might also improve the quality of future consensus building attempts on this procedure.

METHODS

This survey followed the principles of good practice in the conduct and reporting of survey research as recommended by the EQUATOR network guidelines [13]. A 37-item questionnaire-based survey (https://www.surveymonkey.co.uk/r/Mahawar) was conducted encompassing the global community of bariatric and metabolic surgeons. The 37 items in the questionnaire were formulated by the authors based on the existing controversies surrounding the management of patients who undergo SG. Eight bariatric surgeons from 5 continents shared responsibility of circulating the survey within the global bariatric community through emails, social media and personal interaction. The link to the survey was freely shared on social and scientific media (Facebook™, Researchgate™, Twitter™, Whatsapp™ and Linkedn™), and through personal network.

The survey was made live on 02/02/019 and closed for analysis on 29/03/2019. Questions enquired about the responder's experience with SG, contraindications, preoperative investigations, technical details and postoperative management. Full details of the questionnaire have been provided in **Table 1**.

Analysis was done using descriptive statistics as numbers (percentage) and bar graphs were used for representation where applicable.

RESULTS

Of the 942 surgeons who responded to the survey, 79 did not perform SG and their responses were omitted. The remaining 863 surgeons had performed 5,20,230 SGs till the time of completion of the survey and their responses were included.

Nationality of the respondents

A total of 67 countries were represented in the survey. **Table 2** provides the representation of the respondents in terms of nationality.

Experience of the respondents

Approximately, 12.5% (n=109) surgeons had performed between 1-50 SGs, 13% (n=113) had performed between 51-100 SGs, 38% (n=332) had performed 101-500 SGs while 30% (n=255) surgeons had performed more than 500 SGs at the time of completion of the survey. The mean experience per surgeon of the entire cohort was 603 procedures.

Absolute contraindications of SG

A total of 689 (80%) surgeons listed 13 absolute contraindications to SG, while 106 (12%) felt there was no absolute contraindication of SG. The list of absolute contraindications to SG chosen by the participants are enumerated in **Table 3**.

Relative contraindications of SG

A total of 764 (89%) surgeons listed 13 relative contraindications to SG, while 64 (7.4%) felt no relative contraindications of SG. Relative contraindications to SG as listed by the participants are enumerated in **Table 4**.

Preoperative assessment

A total of 559 (65%) surgeons reported that they perform routine preoperative Upper Gastro-Intestinal Endoscopy (UGIE) before SG while 275 (32%) did not. A slightly lower number (n=527; 61%) of surgeons perform routine ultrasound of the abdomen while 330 (38%) did not.

Intraoperative technical details

Orogastric tube - An overwhelming 97% (n=835) surgeons routinely use an orogastric tube to size the sleeve. A wide variation was observed in the size of the orogastric tube used, which has been provided in **Figure 1**. Size of 36 Fr was used by maximum number of surgeons (n=344; 40%)

Distance from the pylorus at the beginning of gastric transection - Wide variation was also observed in the distance from the pylorus at the beginning of gastric transection while fashioning the sleeve, as enumerated in **Figure 2**. Most surgeons prefer to begin the gastric transection at 4-5 cm from pylorus (n=501; 58%)

Intraoperative detection and management of hiatus hernia - Routine hiatal dissection to rule out occult hiatus hernia was performed by 24% (n=204) surgeons, while 623 (72%) surgeons did not. Once encountered with a preoperatively or intraoperatively diagnosed diaphragmatic hernia, posterior crural approximation is preferred by 34% (n=296) surgeons, anterior crural approximation by 8.2% (n=71) surgeons, while 26% (n=221) surgeons perform anterior or posterior crural approximation depending on the anatomy. Approximately 29% (n=249) surgeons do not routinely approximate the diaphragmatic crura in patients with identified hiatus hernias.

Staple line reinforcement – Approximately 54% (n=467) surgeons routinely use staple line reinforcement while fashioning the sleeve while 43% (n=369) surgeons do not use routine staple line reinforcement. 334 surgeons (39%) mentioned that they do not use any

reinforcement. A total of 502 (58%) surgeons mentioned their choice of staple line reinforcement and a wide variation was observed in their choices as enumerated in **Table 5**. 18% (n=154) surgeons routinely anchored the omentum to the sleeve at the end of the procedure while 77% (n=668) did not.

Clipping of short gastric vessels – 89% (n=771) do not clip the splenic end of short gastric vessels before dividing it with energy device, while 3.2% (n=28) clip the short gastric vessels routinely. 61 (7.1%) clip it only when faced with a large vessel.

Intraoperative leak test - 65% (n=565) surgeons perform routine intraoperative leak test at the end of the procedure, while 11% (n=96) perform routine intraoperative UGIE. 732 (85%) surgeons mentioned their choice of the leak test method which is enumerated in **Table 6**.

Use of abdominal drain – Approximately 65% (n=558) surgeons do not use an intraabdominal drain routinely after SG, 21% (n=180) use it for <48 hours, while 12.5% (n=108) leave a drain for ≥48 hours.

Single Incision and Robotic Sleeve Gastrectomy – Approximately 12% (n=105) perform single incision SG while 10% (n=86) surgeons perform the procedure robotically.

Postoperative management

Water soluble contrast study - 25% (n=218) surgeons perform a routine water-soluble contrast study in the early postoperative period while 73% (n=629) do not. Oral intake is encouraged on the day of surgery by 45.5% (n=393) surgeons, on the first day after surgery by 41% (n=353) surgeons, and on the second day after surgery by 6.4% (n=55) surgeons. A total of 45 (5.2%) surgeons start oral intake only after confirming the absence of leak on a water-soluble contrast study.

Micronutrient supplementation - Lifelong multivitamin/mineral supplements after SG is recommended by 66% (n=567) surgeons, iron supplements by 29% (n=250) surgeons, vitamin D supplements by 41% (n=346) surgeons, calcium supplements by 38% (n=324) surgeons, and vitamin B12 supplements by 44% (n=383) surgeons.

PPI and gallstone prophylaxis – Approximately 79% (n=681) surgeons routinely use PPI prophylaxis after SG, while only 20% (n=172) use ursodeoxycholic acid for prophylaxis of gall stones.

Revisional procedure after Sleeve Gastrectomy for further weight loss and resolution of comorbidities - For further weight loss and resolution of co-morbidities after SG, the preferred revisional procedure offered to patients is Roux-en-Y gastric bypass (RYGB) by 51% (n=441) surgeons, one anastomosis gastric bypass (OAGB) by 25% (n=217) surgeons, single anastomosis duodeno-ileal bypass with sleeve gastrectomy (SADI-S) procedure by 10% (n=87) surgeons, and duodenal switch (DS) by 3.2% (n=28) surgeons, while only 2.2% (n=19) surgeons prefer to re-sleeve their patients.

Revisional procedure after Sleeve Gastrectomy for gastro-esophageal reflux disease (GERD) - For patients troubled with symptoms of GERD unresponsive to maximal medical therapy, the preferred revisional procedure of choice offered is RYGB by 87% (n=752) surgeons. Other revisional options offered for GERD are OAGB by 64 (7.4%) surgeons, SADI-S by 7 (0.81%) surgeons and duodenal switch by 1 (0.12%) surgeon.

DISCUSSION

This survey on 863 bariatric and metabolic surgeons from 67 countries with a cumulative experience of 520,230 SGs is the largest survey of surgical community in scientific literature aimed to capture the global practices concerning SG and is expected to identify areas of future research and building of consensus that might help in improving outcomes.

Literature on how SG influences Barrett's esophagus and GERD is conflicting. Gagner noted that "SG improves symptoms and reduces reflux in most morbidly obese patietns with preoperative reflux. [14]". Genco *et al*, on the other hand, published a series of 110 patients and showed an increase GERD symptoms and PPI intake after SG along with newly diagnosed Barrett's esophagus occurring in 17.2% of patients at a follow up of 58 months [15]. In this survey, 79% surgeons believed Barrett's esophagus to be an absolute contraindication to SG and 28% believed it to be a relative contraindication. In contrast, only 23% surgeons viewed GERD to be an absolute contraindication while 56% surgeons believed only severe GERD requiring daily PPI therapy to be an absolute contraindication to SG. This survey showed that what constitutes as a relative contraindication to one group of surgeons is an absolute contraindication for another suggesting a lack of clarity due to conflicting literature on the safety of SG in individual groups of patients. More studies comparing different procedures are needed for patients with GORD.

The ASMBS guidelines advocates the use of UGIE preoperatively on a selective basis based on the presence of symptoms [16]. This is in contrast to the observation by another study that found significant findings relevant for SG (hiatus hernia, esophagitis, Barrett's esophagus, esophageal dysplasia) in 23% patients, of whom only half were symptomatic and the authors concluded that preoperative UGIE was indicated before SG for all patients irrespective of

symptoms [17]. Once again, significant variation was observed in this survey with only 65% surgeons advocating routine UGIE before SG.

This survey found wide variation in the diameter of the orogastric tube used to size the sleeve, even though the majority (40%) of surgeons preferred a size of 36 Fr. The International Sleeve Gastrectomy Consensus recommends a 32-36 Fr sized orogastric tube and a distance of 2-6 cm from the pylorus as per their survey based best practice guidelines [10]. A meta-analysis of 9,991 patients showed reduced leak rate by increasing the diameter of the bougie (>40 Fr), however, neither the diameter of the bougie nor the distance from pylorus at the beginning of distal section showed any correlation with excess weight loss [18]. This is in contrast to a few studies that showed a higher excess weight loss by reducing the size of the bougie and closing the distance of the first section nearer to the pylorus [19,20]. Another study showed that increasing the size of the bougie (>38 Fr) was associated with lower leak rate while increasing the distance of the beginning of gastric transection from the pylorus was associated with greater weight loss [21]. This survey showed that 82% surgeons prefer an orogastric tube <40 Fr in diameter while 16% surgeons prefer >40 Fr. 73% surgeons prefer a distance of 3-5 cm from the pylorus at the beginning of gastric transection, while 1.39% prefer a distance of >6cm. Significant variation among surgeons with regard to the size of orogastric tube and distance of the beginning of gastric transection from the pylorus, as demonstrated in this survey, could be due to conflicting literature and reflects the need for high quality randomized controlled trials on the topic.

The use of reinforcements with the stapling device to construct the sleeve has been a matter of contextual debate among bariatric and metabolic surgeons, with this survey showing 54% surgeons who prefer to reinforce the staple line routinely. Of those who use reinforcements (n=502), 41% prefer to oversew the staple line with running suture, 30% use Seamguard^{TM} (absorbable polymer membrane), 17% invaginate the staple line with running suture, 15% use

Medtronic™ reinforced staples, 5.3% use Peristrips™ (bovine pericardial strips) and 4.6% use fibrin sealant. A systematic review of 30 studies (4,881 patients) and a meta-analysis of 791 patients from 8 randomized controlled trials on staple-line reinforcements in SG showed no statistical difference in terms of staple line leak and bleeding, though bleeding tended to reduce with reinforcements [22, 23]. Similar findings were observed by Dapri *et al* who compared three techniques – non-reinforcement, absorbable membrane, and staple line suture. The study found no difference in staple line leak between the three groups but the use of absorbable membrane reduced bleeding [24]. Contradictory data is obtained from Choi *et al* who performed a review of 1345 patients and Gagner *et al* who analyzed 88 articles with 8,920 patients [25, 26]. Both of these studies found reduced incidence of staple line leak with reinforcements [25, 26]. A systematic review of 148 studies with 40,653 patients compared the different types of reinforcements and found absorbable polymer membrane to be superior to oversewing, fibrin glue, bovine pericardial strips and no reinforcement in the prevention of staple line leak [27].

Literature shows no correlation between intraoperative leak test with staple line leaks, with most leaks known to occur in patients with negative intraoperative leak test [28-30]. Some authors have in fact described a higher likelihood of staple line leak after intraoperative leak test [29,30]. Contradictory data is obtained from a review of four studies that suggested routine use of methylene blue test intraoperatively [31]. Some studies endorse routine use of leak test using intraoperative endoscopy utilizing air insufflation [32]. Another study on 712 patients showed intraoperative leak test with methylene blue to be a sensitive and effective method for detecting intraoperative leak during SG with the authors suggesting its routine use in all cases [33]. However, no correlation was observed in this study with early postoperative water-soluble contrast study and the authors suggested that the use of routine contrast study in the postoperative period was not indicated unless clinically indicated in selected patients

[33]. This survey captured the existing practice of 863 bariatric surgeons and found that 65% surgeons perform routine intraoperative leak test while only 11% surgeons perform routine intraoperative endoscopy in SG. Of those who routinely perform intraoperative leak test (n=732), dilute methylene blue solution is the preferred choice among 63% surgeons, 11.4% preferred air insufflation using orogastric tube, while 9.4% surgeons prefer to use air insufflation with an endoscope. In contrast, only 25% surgeons perform a contrast study in the early postoperative period for detection of staple line leak routinely. 65% surgeons do not advocate the routine use of intraoperative drain which was found to be in keeping with a review of 353 patients of SG that found no benefit with intraabdominal drains in terms of detection of leak, abscess, bleeding or reoperation due to these complications [34].

A limitation of this study is that in spite of the large number of surgeons who participated from different countries, there is a possibility of missing out on bariatric surgeons who have not participated in the survey. However, the aim of this survey was to get a worldwide snapshot of the prevailing practices concerning SG and the authors believe that this was accomplished based on the large number of participating surgeons from 67 countries. Another limitation is that because of our methodology, we are not able to give an exact response rate but we believe our sample is representative because of the large number of surgeons who participated in the survey from all parts of the world in this very narrow surgical specialty. Certain intraoperative factors like the snugness of the stapler to the orogastric tube and the method of measurement of the distance between the pylorus and beginning of gastric transection were not addressed in this survey.

Finally, authors would like to caution against over interpretation of this data. The purpose of this study is simply to capture global variation and not to identify best practice as that can only be done through adequately designed scientific studies. In that sense, even a variation practiced by the majority may not be the scientifically correct choice and should be examined

in future studies. At the same time, knowing the variations might make it easier to design future studies to identify best practice and future attempts at consensus building while we wait for those studies to be conducted.

CONCLUSION

This study found significant variation amongst global community of bariatric surgeons with regards to various perioperative practices concerning SG and identifies areas for future research and consensus building.

Conflict of Interest Statement: K.M. has been paid honoraria by Medtronic, Gore and Olympus for educational activities, outside the submitted work. All other authors do not declare any Conflict of Interest.

Statement of Human and Animal Rights: Not Applicable

Statement of Informed Consent: Not Applicable

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AUTHOR CONTRIBUTION: K.M. and M.T.A. conceived the idea. M.T.A. and K.M. drafted the initial questionnaire. All other authors contributed to the survey design. All authors were responsible for the distribution of the survey link. M.T.A wrote the manuscript with help from KM. All other authors contributed to the manuscript and approved the final draft.

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FIGURE LEGENDS

Figure 1. Size of orogastric tube in sleeve gastrectomy preferred by the participants of the survey (n=856).

Figure 2. Distance from the pylorus at the beginning of gastric transection preferred by the participants of the survey (n=863).

476 **Table 1: Survey questionnaire with summary of responses (Edited)**

477

Questions	**Responses**		
Please confirm that you are a bariatric surgeon already performing SG	Yes, I am a bariatric surgeon already performing SG	No, I do not perform SG	No, I am not a bariatric surgeon
Which country do you work In?	Data summarised in Table 2		
How many SG procedures have you personally performed till date?			
Please mention the exact number of SG procedures you have personally performed till date?			
Are there any absolute contraindications to SG in your practice? Please list them	Data summarised in Table 3		
Are there any relative contraindications to SG in your practice? Please list them	Data summarised in Table 4		
Do you routinely perform a preoperative upper gastrointestinal endoscopy?	Yes	No	
Do you routinely perform a preoperative Ultrasound scan of the abdomen?	Yes	No	
Do you always use an orogastric tube to size the sleeve?	Yes	No	
If the answer to the last question is "Yes", please provide us with the size of the orogastric tube you use?	Data summarised in Figure 1		
How far from the pylorus do you start while fashioning the sleeve?	Data summarised in Figure 2		
Do you routinely dissect the hiatus to diagnose occult hiatus hernia?	Yes	No	
Do you routinely approximate the diaphragmatic crura in patients with prediagnosed or intraoperatively identified	Yes	No	

hiatus hernia?		
Do you routinely use staple line reinforcement?	Yes	No
If the answer to the last question is "Yes", please let us know what form of staple line reinforcement you use.	Data summarised in Table 5	
Do you place ligaclips on splenic side of short gastric vessels before dividing them using energy device?	Yes	No
Do you routinely anchor the omentum to the sleeve at the end of the procedure?	Yes	No
Do you routinely perform an intraoperative upper gastrointestinal endoscopy?	Yes	No
Do you routinely perform a leak test after sleeve gastrectomy?	Yes	No
If the answer to the last question is "Yes", please mention the technique you use.	Data summarised in Table 6	
Do you routinely leave an intra-abdominal drain?	Yes	No
Do you perform robotic sleeve gastrectomy?	Yes	No
Do you perform single port sleeve gastrectomy?	Yes	No
Do you routinely carry out contrast study in the early postoperative period?	Yes	No
Please describe when you start oral intake for your patients postoperatively.		
Do you recommend lifelong multivitamin/mineral supplements after sleeve gastrectomy?	Yes	No
Do you recommend lifelong additional iron supplements?	Yes	No
Do you routinely recommend lifelong	Yes	No

additional Vitamin D supplements?		
Do you routinely recommend lifelong additional Vitamin B12 supplements?	Yes	No
Do you routinely recommend lifelong additional calcium supplements?	Yes	No
Do you routinely use PPI prophylaxis after SG?	Yes	No
Do you routinely use Ursodeoxycholic acid for prophylaxis of gall stones?	Yes	No
What is your preferred procedure for patients seeking revisional bariatric procedure for further weight loss or co-morbidity resolution after SG?		
What is your preferred procedure for patients presenting with symptoms of GORD unresponsive to medical management after SG?		
Do you have any other thoughts relevant to this survey?		

492 **Table 2: Country of origin of the survey participants in alphabetical order.**

Country of Origin	Number of Responses	Percentage
Argentina	24	2.78%
Australia	20	2.32%
Austria	4	0.46%
Azerbaijan	2	0.23%
Bahrain	1	0.12%
Belgium	12	1.39%
Bolivia	4	0.46%
Brazil	65	7.53%
Canada	3	0.35%
Chile	15	1.74%
China	9	1.04%
Colombia	17	1.97%
Costa Rica	3	0.35%
Czech Republic	5	0.58%
Dominican Republic	4	0.46%
Ecuador	1	0.12%
Egypt	20	2.32%
France	37	4.29%
Germany	18	2.09%
Greece	7	0.81%
Guatemala	1	0.12%
Iceland	1	0.12%
India	56	6.49%
Indonesia	2	0.23%
Iran	10	1.16%
Ireland	3	0.35%

Israel	4	0.46%
Italy	43	4.98%
Japan	3	0.35%
Jordan	4	0.46%
Kazakhstan	1	0.12%
Kuwait	5	0.58%
Lebanon	11	1.27%
Malaysia	5	0.58%
Mexico	46	5.33%
Netherlands	16	1.85%
New Zealand	1	0.12%
Nicaragua	3	0.35%
Norway	3	0.35%
Oman	4	0.46%
Pakistan	9	1.04%
Paraguay	4	0.46%
Peru	3	0.35%
Philippines	5	0.58%
Poland	6	0.7%
Portugal	9	1.04%
Republic of Korea	4	0.46%
Romania	2	0.23%
Russian Federation	7	0.81%
Saudi Arabia	24	2.78%
Singapore	8	0.93%
Slovenia	2	0.23%
Spain	44	5.1%
Sudan	1	0.12%
Swaziland	1	0.12%
Sweden	7	0.81%
Switzerland	2	0.23%
Syrian Arab Republic	1	0.12%

Taiwan	3	0.35%
Tunisia	1	0.12%
Turkey	15	1.74%
Ukraine	1	0.12%
United Arab Emirates	26	3.01%
United Kingdom	71	8.23%
United States of America	105	12.17%
Uruguay	1	0.12%
Venezuela	5	0.58%

Table 3: Absolute contraindications to sleeve gastrectomy as reported by the participants of the survey.

Absolute Contraindications	Number of Participants (n=863)	Percentage of Participants
Anatomical and Physiological Absolute Contraindications		
Barrett's Esophagus	683	79.14%
Hiatus Hernia (irrespective of size)	85	9.85%
Moderate (2.0-4.0 cm) and Large (≥4.0 cm) Hiatus Hernia	159	18.42%
Large (≥4.0 cm) Hiatus Hernia only	347	40.21%
GERD (irrespective of severity)	198	22.94%
Severe GERD (needing daily PPI therapy)	486	56.32%
Weight-related Absolute Contraindications		
BMI > 50.0	39	4.52%
BMI > 45.0	16	1.85%
BMI > 40.0	9	1.04%
Co-morbidity related Absolute Contraindications		
Diabetes Mellitus (irrespective of severity or duration)	28	3.24%
Uncontrolled Diabetes Mellitus	128	14.83%
Insulin Dependent Diabetes Mellitus	71	8.23%
Cirrhosis of Liver	138	15.99%
Miscellaneous Absolute Contraindications		
Other	68	7.88%
No Absolute Contraindications		
No Absolute Contraindications	106	12.28%

GERD, Gastro-esophageal Reflux Disease; **PPI**, Proton Pump Inhibitor; **BMI**, Body Mass Index

Table 4: Relative contraindications to sleeve gastrectomy as reported by the participants of the survey.

Relative Contraindications	Number of Participants (n=863)	Percentage of Participants
Anatomical and Physiological Relative Contraindications		
Barrett's Oesophagus	243	28.16%
Hiatus Hernia (irrespective of size)	172	11.93%
Moderate (2.0-4.0 cm) and Large (≥4.0 cm) Hiatus Hernia	220	25.49%
Large (≥4.0 cm) Hiatus Hernia only	254	29.43%
GERD (irrespective of severity)	295	34.18%
Severe GERD (needing daily PPI therapy)	289	33.49%
Weight-related Relative Contraindications		
BMI > 50.0	106	12.28%
BMI > 45.0	36	4.17%
BMI > 40.0	16	1.85%
Co-morbidity related Relative Contraindications		
Diabetes Mellitus (irrespective of severity or duration)	106	12.28%
Uncontrolled Diabetes Mellitus	221	25.61%
Insulin Dependent Diabetes Mellitus	140	16.22%
Cirrhosis of Liver	155	17.96%
Miscellaneous Relative Contraindications		
Other	35	4.06%
No Relative Contraindications		
No Absolute Contraindications	64	7.42%

GERD, Gastro-esophageal Reflux Disease; **PPI**, Proton Pump Inhibitor; **BMI**, Body Mass Index

Table 5: Type of staple line reinforcement in sleeve gastrectomy preferred by the participants of the survey.

Staple Line Reinforcement	Number of Participants (n=863)	Percentage of Participants
Oversewing with running suture	208	24.10%
Seamguard™	149	17.26%
Invagination with running suture	84	9.73%
Medtronic™ Reinforced Staples	73	8.46%
Peristrips™	27	5.38%
Fibrin sealant	23	3.12%
Other	35	6.97%
No Reinforcement	334	38.70%

*Multi responses were allowed for this question

Table 6: Technique of intraoperative leak test in sleeve gastrectomy preferred by the participants of the survey.

Intraoperative Leak Test Technique	Number of Participants (n=863)	Percentage of Participants
Dilute Methylene Blue Solution	458	53.07%
Air insufflation using orogastric tube	84	9.73%
Air insufflation using an endoscope	69	7.99%
Other	131	15.19%
No intraoperative leak test	121	14.02%