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1 **MANUSCRIPT TITLE**

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

4 **ABSTRACT**

5 **Background**

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

10 **Methods**

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

13 **Results**

14 Response of 863 bariatric surgeons from 67 countries with a cumulative experience of
15 520,230 SGs were recorded. A total of 689 (80%) and 764 (89%) surgeons listed 13 absolute
16 and relative contraindications, respectively. 65% (n = 559) surgeons perform routine
17 preoperative endoscopy and 97% (n=835) routinely use intraoperative orogastric tube for
18 sizing the resection. A wide variation is observed in the diameter of the tube used. 73%
19 (n=627) surgeons start dividing the stomach at a distance of 3-5 cm from the pylorus, and
20 54% (n=467) routinely use staple line reinforcement. Majority (65%, n=565) of surgeons
21 perform routine intraoperative leak test at the end of the procedure, while 25% (n=218)
22 surgeons perform a routine contrast study in the early postoperative period. Lifelong

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

25 **Conclusion**

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

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43 **INTRODUCTION**

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

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

60 Though there have been previous attempts to build consensus on various aspects of SG
61 [10,11], these efforts have been hampered somewhat by lack of published scientific data on
62 global variation in practices concerning this procedure. The objective of this study was to
63 understand the variations in perioperative practices concerning SG through a survey of global
64 community of bariatric surgeons on its contraindications, preoperative assessment,
65 intraoperative technical details and postoperative management. It is expected that
66 understanding variations in practice scientifically may pave way for focused studies to

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

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87 **METHODS**

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

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

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

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110 **RESULTS**

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

114 **Nationality of the respondents**

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

117 **Experience of the respondents**

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

122 **Absolute contraindications of SG**

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

126 **Relative contraindications of SG**

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

130 **Preoperative assessment**

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

135 **Intraoperative technical details**

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

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

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

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

155 reinforcement. A total of 502 (58%) surgeons mentioned their choice of staple line
156 reinforcement and a wide variation was observed in their choices as enumerated in **Table 5**.
157 18% (n=154) surgeons routinely anchored the omentum to the sleeve at the end of the
158 procedure while 77% (n=668) did not.

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

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

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

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

170 **Postoperative management**

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

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

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

184 *Revisional procedure after Sleeve Gastrectomy for further weight loss and resolution of*
185 *comorbidities* - For further weight loss and resolution of co-morbidities after SG, the
186 preferred revisional procedure offered to patients is Roux-en-Y gastric bypass (RYGB) by
187 51% (n=441) surgeons, one anastomosis gastric bypass (OAGB) by 25% (n=217) surgeons,
188 single anastomosis duodeno-ileal bypass with sleeve gastrectomy (SADI-S) procedure by
189 10% (n=87) surgeons, and duodenal switch (DS) by 3.2% (n=28) surgeons, while only 2.2%
190 (n=19) surgeons prefer to re-sleeve their patients.

191 *Revisional procedure after Sleeve Gastrectomy for gastro-esophageal reflux disease (GERD)*
192 - For patients troubled with symptoms of GERD unresponsive to maximal medical therapy,
193 the preferred revisional procedure of choice offered is RYGB by 87% (n=752) surgeons.
194 Other revisional options offered for GERD are OAGB by 64 (7.4%) surgeons, SADI-S by 7
195 (0.81%) surgeons and duodenal switch by 1 (0.12%) surgeon.

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200 **DISCUSSION**

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

205 Literature on how SG influences Barrett's esophagus and GERD is conflicting. Gagner noted
206 that "SG improves symptoms and reduces reflux in most morbidly obese patients with
207 preoperative reflux. [14]". Genco *et al*, on the other hand, published a series of 110 patients
208 and showed an increase GERD symptoms and PPI intake after SG along with newly
209 diagnosed Barrett's esophagus occurring in 17.2% of patients at a follow up of 58 months
210 [15]. In this survey, 79% surgeons believed Barrett's esophagus to be an absolute
211 contraindication to SG and 28% believed it to be a relative contraindication. In contrast, only
212 23% surgeons viewed GERD to be an absolute contraindication while 56% surgeons believed
213 only severe GERD requiring daily PPI therapy to be an absolute contraindication to SG. This
214 survey showed that what constitutes as a relative contraindication to one group of surgeons is
215 an absolute contraindication for another suggesting a lack of clarity due to conflicting
216 literature on the safety of SG in individual groups of patients. More studies comparing
217 different procedures are needed for patients with GORD.

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

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

225 This survey found wide variation in the diameter of the orogastric tube used to size the
226 sleeve, even though the majority (40%) of surgeons preferred a size of 36 Fr. The
227 International Sleeve Gastrectomy Consensus recommends a 32-36 Fr sized orogastric tube
228 and a distance of 2-6 cm from the pylorus as per their survey based best practice guidelines
229 [10]. A meta-analysis of 9,991 patients showed reduced leak rate by increasing the diameter
230 of the bougie (>40 Fr), however, neither the diameter of the bougie nor the distance from
231 pylorus at the beginning of distal section showed any correlation with excess weight loss
232 [18]. This is in contrast to a few studies that showed a higher excess weight loss by reducing
233 the size of the bougie and closing the distance of the first section nearer to the pylorus
234 [19,20]. Another study showed that increasing the size of the bougie (>38 Fr) was associated
235 with lower leak rate while increasing the distance of the beginning of gastric transection from
236 the pylorus was associated with greater weight loss [21]. This survey showed that 82%
237 surgeons prefer an orogastric tube <40 Fr in diameter while 16% surgeons prefer >40 Fr.
238 73% surgeons prefer a distance of 3-5 cm from the pylorus at the beginning of gastric
239 transection, while 1.39% prefer a distance of >6cm. Significant variation among surgeons
240 with regard to the size of orogastric tube and distance of the beginning of gastric transection
241 from the pylorus, as demonstrated in this survey, could be due to conflicting literature and
242 reflects the need for high quality randomized controlled trials on the topic.

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

248 Medtronic™ reinforced staples, 5.3% use Peristrips™ (bovine pericardial strips) and 4.6%
249 use fibrin sealant. A systematic review of 30 studies (4,881 patients) and a meta-analysis of
250 791 patients from 8 randomized controlled trials on staple-line reinforcements in SG showed
251 no statistical difference in terms of staple line leak and bleeding, though bleeding tended to
252 reduce with reinforcements [22, 23]. Similar findings were observed by Dapri *et al* who
253 compared three techniques – non-reinforcement, absorbable membrane, and staple line
254 suture. The study found no difference in staple line leak between the three groups but the use
255 of absorbable membrane reduced bleeding [24]. Contradictory data is obtained from Choi *et*
256 *al* who performed a review of 1345 patients and Gagner *et al* who analyzed 88 articles with
257 8,920 patients [25, 26]. Both of these studies found reduced incidence of staple line leak with
258 reinforcements [25, 26]. A systematic review of 148 studies with 40,653 patients compared
259 the different types of reinforcements and found absorbable polymer membrane to be superior
260 to oversewing, fibrin glue, bovine pericardial strips and no reinforcement in the prevention of
261 staple line leak [27].

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

273 [33]. This survey captured the existing practice of 863 bariatric surgeons and found that 65%
274 surgeons perform routine intraoperative leak test while only 11% surgeons perform routine
275 intraoperative endoscopy in SG. Of those who routinely perform intraoperative leak test
276 (n=732), dilute methylene blue solution is the preferred choice among 63% surgeons, 11.4%
277 preferred air insufflation using orogastric tube, while 9.4% surgeons prefer to use air
278 insufflation with an endoscope. In contrast, only 25% surgeons perform a contrast study in
279 the early postoperative period for detection of staple line leak routinely. 65% surgeons do not
280 advocate the routine use of intraoperative drain which was found to be in keeping with a
281 review of 353 patients of SG that found no benefit with intraabdominal drains in terms of
282 detection of leak, abscess, bleeding or reoperation due to these complications [34].

283 A limitation of this study is that in spite of the large number of surgeons who participated
284 from different countries, there is a possibility of missing out on bariatric surgeons who have
285 not participated in the survey. However, the aim of this survey was to get a worldwide
286 snapshot of the prevailing practices concerning SG and the authors believe that this was
287 accomplished based on the large number of participating surgeons from 67 countries.

288 Another limitation is that because of our methodology, we are not able to give an exact
289 response rate but we believe our sample is representative because of the large number of
290 surgeons who participated in the survey from all parts of the world in this very narrow
291 surgical specialty. Certain intraoperative factors like the snugness of the stapler to the
292 orogastric tube and the method of measurement of the distance between the pylorus and
293 beginning of gastric transection were not addressed in this survey.

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

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

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318 **CONCLUSION**

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

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

328

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330 **Statement of Informed Consent:** Not Applicable

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334

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

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442 **FIGURE LEGENDS**

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

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

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

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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?		

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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%	493
Tunisia	1	0.12%	494
Turkey	15	1.74%	495
Ukraine	1	0.12%	496
United Arab Emirates	26	3.01%	497
United Kingdom	71	8.23%	498
United States of America	105	12.17%	499
Uruguay	1	0.12%	500
Venezuela	5	0.58%	501

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

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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%

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

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

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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%

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

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

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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%

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 546 *Multi responses were allowed for this question

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

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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%