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ORIGINAL ARTICLE

Clinical significance of upper gastrointestinal endoscopy before laparoscopic bariatric procedures in Japanese patients

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Abstract

Purposes The choice between performing routine and selective upper gastrointestinal endoscopy (UGE) before bariatric surgery remains controversial. This study aimed to evaluate the clinical significance of UGE before laparoscopic bariatric procedures.

Methods We enrolled 155 obese Japanese patients who underwent laparoscopic bariatric procedures at our institute and evaluated their endoscopic findings, such as reflux esophagitis (RE), hiatal hernia (HH), Barrett's esophagus, gastritis, duodenitis, gastroduodenal ulcer, gastric cancer, and polyps.

Results Preoperative endoscopy revealed abnormal findings in 102 patients (66%), including gastritis in 57 (37%), HH in 51 (32%), RE in 27 (17%), benign gastric polyps in 16 (10%), duodenitis in 6 (4%), and Barrett's esophagus in 1 (0.6%). Two patients with definite HH were treated with simultaneous crural repair at the time of bariatric surgery. Duodenitis was graded as severe in three of these six patients and treated with a proton pump inhibitor before surgery. Eleven patients received therapy to eradicate *Helicobacter pylori* (H. pylori), either before or after the surgery. In summary, preoperative endoscopy changed the perioperative management for 16 of the 155 patients (10%).

Conclusions Routine UGE may be necessary before bariatric procedures in obese Japanese patients.

Keywords Upper gastrointestinal endoscopy · Laparoscopic bariatric surgery · Hiatal hernia · Perioperative management

Introduction

The incidence of obesity is increasing rapidly among children, adolescents, and adults in developed and developing countries [1]. The World Health Organization estimated that there were 1.9 billion overweight and more than 600 million obese adults worldwide in 2014 [2]. Obesity increases the risk of hypertension, diabetes, dyslipidemia, coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea, and cancer [3, 4]. Although medical treatments for obesity and obesity-related metabolic diseases show poor long-term results, bariatric surgery has demonstrated reliable and sustainable weight loss as well as an improvement in comorbidities, such as diabetes and cardiovascular disease [5–7].

The use of upper gastrointestinal endoscopy (UGE) for routine preoperative assessment remains controversial in obese patients scheduled to undergo bariatric surgery. Morbidly obese patients may need higher doses of sedation, which can increase procedural risks during endoscopy [8]. The European Association for Endoscopic Surgery has affirmed that UGE is available for all patients with bariatric procedures planned and is strongly recommended for those undergoing gastric bypass [9]. Recently, the American Society for Gastrointestinal Endoscopy, in conjunction with the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) and the American Society for Metabolic and Bariatric Surgery (ASMBS), recommended that the decision to perform UGE before bariatric surgery should be personalized [10]. In other words, the indication for preoperative UGE would depend on the institution, surgeon, and the patient's gastrointestinal symptoms.

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In Japan, the incidences of gastric cancer and *Helicobacter pylori* (H. pylori) infection are high [11]; therefore, routine preoperative UGE is commonly performed before bariatric and several other types of surgeries. Routine UGE may not have much impact on bariatric surgery from the viewpoint of the Japanese situation. Laparoscopic sleeve gastrectomy (LSG) has been covered by the government health insurance scheme since 2014 and the number of bariatric procedures has been increasing every year. In 2017, 471 bariatric procedures were performed in Japan, with LSG being the most frequent, accounting for 90% ($n=423$) of all bariatric procedures.

We conducted this study to evaluate the incidence of clinical lesions detected on routine preoperative UGE and assess the need for UGE before laparoscopic bariatric surgery.

Methods

We analyzed, retrospectively, a prospective database of consecutive Japanese patients ($n=155$) who underwent laparoscopic bariatric procedures between August, 2005 and October, 2017 at our institute. Three non-Japanese patients were excluded from the study. LSG was performed in 122 patients, laparoscopic adjustable gastric banding (LAGB) was performed in 28, and LSG with duodenojejunal bypass (LSG-DJB) was performed in 5. Physicians performed a medical examination and no patient reported abdominal symptoms at the time of UGE.

Preoperative UGE was performed routinely by experienced endoscopists using standard flexible endoscopes (H260 and Q260; Olympus, Tokyo, Japan). The endoscopic findings, including hiatal hernia (HH), reflux esophagitis (RE), gastritis, duodenitis, Barrett's esophagus, benign gastric polyp, gastroduodenal ulcer, and gastric cancer, were evaluated and documented in the electronic medical records. Gastritis included atrophic and erosive findings and was defined according to the updated Sydney System [12]. HH was assessed using the modified Makuuchi classification [13], and RE was defined using the Los Angeles classification [14]. Until the end of 2013, *H. pylori* screening was performed only in patients with atrophic gastritis, but since 2014, it has been performed routinely before surgery. Although postoperative UGE was not performed routinely during most of the study period, data on the postoperative findings in these patients were available.

Data are presented as means ± SD for continuous variables and as frequencies or percentages for categorical variables. Statistical analysis was performed using JMP for Windows, version 13 (SAS Institute Inc., Cary, NC, USA). Significance was determined using the Fisher's exact test, and a P value of <0.05 was considered significant.

Table 1 Patient characteristics

Number of patients	155
Age (year)	40 ± 10
Gender (female/male)	93/62
Body weight (kg)	120 ± 24
BMI (kg/m^2)	45 ± 8
Abdominal symptoms	0
Type of operation (LSG/LAGB/LSGB)	122/28/5

BMI body mass index, *LSG* laparoscopic sleeve gastrectomy, *LAGB* laparoscopic gastric banding, *LSGB* laparoscopic sleeve gastrectomy with duodenojejunal bypass

Average ± SD

Table 2 Preoperative endoscopic findings

Abnormal findings	102 (66%)
Gastritis	57 (37%)
Hiatal hernia	51 (32%)
Reflux esophagitis	27 (17%)
Gastric benign polyp	16 (10%)
Duodenitis	6 (4%)
Barrett's esophagus	1 (0.4%)
Gastroduodenal ulcer	0 (0%)
Gastric cancer	0 (0%)
Normal findings	53 (34%)

Results

The 155 patients comprised 93 women and 62 men (average age, 40 years) with a mean preoperative weight and body mass index of 120 kg and 45 kg/m^2, respectively (Table 1). In 102 patients (66%), the preoperative UGE revealed abnormal findings, including gastritis in 57 (37%), HH in 51 (32%), RE in 27 (17%), benign gastric polyps in 16 (10%), duodenitis in 6 (4%), and Barrett's esophagus in 1 (0.7%) (Table 2; Fig. 1). Gastroduodenal ulcer and gastric cancer were not found in any patient.

The majority of HHs were classified as grade 2 or 3 and diagnosed as minor hernias. In fact, these minor hernias were not detected during the surgery. Preoperative UGE confirmed a definite HH in only 2 of the 51 patients. Both these HHs were classified as grade 4 (Fig. 1a) and managed with simultaneous crural repair during the surgery. Three of the six patients with duodenitis had severe disease (Fig. 1c) and were treated with a proton pump inhibitor before the surgery. Both the surgery and recovery times were prolonged in these patients. Prior to the end of 2013, *H. pylori* infection was detected in two patients with atrophic gastritis, and after 2013 it was detected in nine patients. Treatment to eradicate *H. pylori* infection was

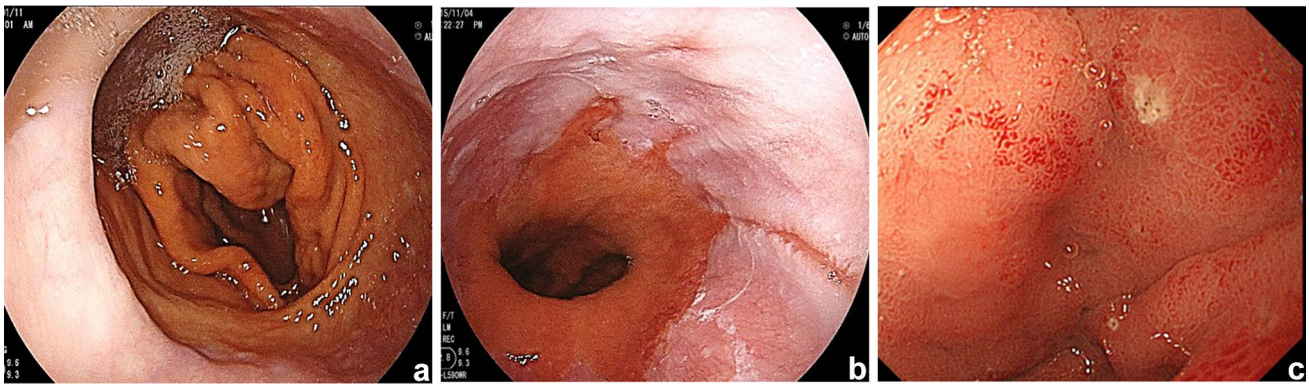

Fig. 1 Representative endoscopic findings of hiatal hernia, reflux esophagitis, and severe duodenitis. **a** Definite hiatal hernia (Makuuchi classification grade 4). **b** Reflux esophagitis (Los Angeles classification grade B). **c** Severe duodenitis

given before surgery to 9 of these 11 patients and after surgery to the other 2 (Table 3).

In summary, UGE changed the perioperative management of 16 of the 155 patients (10%, Table 3). Moreover, the number of patients whose perioperative management changed was significantly higher among those with abnormal findings on preoperative UGE than among those with normal findings [15 of 102 patients (15%) vs. 1 of 53 patients (2%); $P = 0.011$].

After surgery, 54 of the 155 patients underwent postoperative UGE during 43 months of follow-up. Among these 54 patients, 7 (13%) had abdominal symptoms, such as epigastralgia and heartburn, before endoscopy. Postoperative UGE revealed abnormal findings in 30 patients (56%), including gastritis in 11 (20%), HH in 29 (54%), RE in 23 (43%), benign gastric polyps in 10 (19%), duodenitis in 0 (0%), Barrett's esophagus in 1 (2%), and gastric ulcer in 1 (2%) (Table 4). Among the patients who underwent LSG, 32 underwent postoperative UGE, which revealed definite HH in 1 (3%) and RE in 19 (59%). One patient who underwent simultaneous crural repair with LSG did not present with definite HH. Thus, LSG may be associated with postoperative RE.

Table 3 Characteristics of patients whose perioperative management changed after preoperative upper gastrointestinal endoscopy

No.	Age (years)	Gender	Type of operation	Endoscopic abnormal findings	Treatments
1	51	Female	LSG	Atrophic gastritis	ET before operation
2	39	Female	LSG	Atrophic gastritis	ET before operation
3	56	Female	LSG	Atrophic gastritis	ET before operation
4	41	Male	LSG	Atrophic gastritis	ET after operation
5	36	Female	LSG	Atrophic gastritis	ET before operation
6	49	Male	LSG	Atrophic gastritis	ET before operation
7	45	Female	LSG	Atrophic gastritis	ET before operation
8	25	Male	LSG	Atrophic gastritis	ET before operation
9	34	Female	LSG	Atrophic gastritis	ET after operation
10	37	Male	LSG	Erosive gastritis	ET before operation
11	27	Female	LSG	Erosive gastritis	ET before operation
12	36	Male	LSG	Severe duodenitis	PPI
13	38	Male	LSG	Severe duodenitis	PPI
14	43	Female	LSG	Definite HH	Crural repair
15	44	Female	LAGB	Severe duodenitis	PPI
16	57	Female	LSG-DJB	Definite HH	Crural repair

LSG laparoscopic sleeve gastrectomy, *LAGB* laparoscopic adjustable gastric banding, *LSG-DJB* laparoscopic sleeve gastrectomy with duodenojejunal bypass, *HH* hiatal hernia, *ET* eradication therapy, *PPI* proton pump inhibitor

Table 4 Postoperative endoscopic findings

Abnormal findings	30 (56%)
Gastritis	11 (20%)
Hiatal hernia	29 (54%)
Reflux esophagitis	23 (43%)
Gastric benign polyp	10 (19%)
Duodenitis	0 (0%)
Barrett's esophagus	1 (2%)
Gastroduodenal ulcer	1 (2%)
Gastric cancer	0 (0%)
Normal findings	24 (44%)

Discussion

Abnormal preoperative UGE findings were confirmed in 66% of the patients in the present study, with gastritis (37%) being the most frequent. Atrophic gastritis (precancerous status) was identified in 31 patients (20%) and *H. pylori* infection was detected in 11 patients (7%) before surgery. HH was the second most frequent abnormal finding (51 patients; 32%), but only two (4%) of these patients had definite HH and were treated with crural repair simultaneously with surgery. Three of the six patients with duodenitis had severe disease and required prolonged bariatric procedures, including LSG and LAGB, with longer recovery times. The rate of changes in preoperative management between patients with and those without abnormal UGE findings was significant.

Almeida et al. [15] reported abnormal findings on preoperative UGE in 77% of 162 obese patients from Brazil, including esophagitis in 39% ($n=63$), gastritis in 51% ($n=83$), gastric ulcer in 2% ($n=3$), HH in 9% ($n=14$), gastric polyp in 0.6% ($n=1$), and duodenitis in 7% ($n=11$). Moreover, Fernandes et al. [16] reported abnormal findings on preoperative UGE in 345 of 613 (56%) obese patients from Portugal, demonstrating that the presence of gastroduodenal ulcer in those with *H. pylori* infection was associated with postoperative complications. Zanotti et al. [17] estimated the significance of UGE before bariatric surgeries at 49 bariatric units in the United Kingdom and reported that the operative plans were changed in 25 (51%) of the units due to preoperative UGE findings of peptic ulcer, HH, Barrett's esophagus, and gastrointestinal stromal tumor. Although all these studies were retrospective, their findings strongly support routine UGE before bariatric surgery.

The presence of HH is known to increase the risk of gastroesophageal reflux disease (GERD) developing [18]. HH can be identified either on preoperative upper gastrointestinal contrast studies or endoscopy or by intraoperative inspection. However, identifying HH is sometimes difficult in morbidly obese patients because of a large fat pad [18]. Some studies have reported the efficacy of routine upper gastrointestinal examination before bariatric surgery [19, 20]. Recent studies have demonstrated that concomitant repair can be performed safely when HH is detected before or during the operation and that it is not associated with an increased risk of morbidity or mortality [21–24]. However, the most appropriate surgical procedure and indications for HH repair have not been investigated. Currently, the decision to perform intraoperative HH repair varies according to each institution's criteria. At our institute, concomitant HH repair is performed only for patients with definite HH.

An on-site anonymous survey conducted during the Second International Consensus Summit for Sleeve Gastrectomy revealed that the mean prevalence of postoperative GERD is 6.5% (range, 0–83%) [25]. Factors increasing the incidence of GERD following LSG included reduced LES pressure, possibly related to the division of ligaments and blunting of the angle of His; reduced gastric compliance; increased sleeve pressure with an intact pylorus; decreased sleeve volume and distensibility; and a dilated upper part of the sleeve with a relative narrowing of the mid-stomach without complete obstruction. However, Oor et al. [26] and Melissas et al. [27] reported in their meta-analyses that the prevalence of GERD following LSG remains unknown and that careful evaluation, including UGE, is imperative when selecting the appropriate bariatric procedure for patients with GERD.

Obese patients are at significant risk of the development of cancer [28]. In Japan, the presence of *H. pylori* infection is associated with > 95% of cases of gastric cancer [29]. The incidence of *H. pylori* infection was assumed to be approximately 80% in patients aged > 50 years; therefore, *H. pylori* eradication therapy has been made available through the Japanese government health insurance scheme since the middle of 2013. Csendes et al. [30] recommended routine preoperative UGE and *H. pylori* screening for patients scheduled to undergo bariatric surgery. Moreover, the SAGES guideline recommends the preoperative eradication of *H. pylori* infection [31] because it is considered to increase postoperative complications and the incidence of gastric cancer [30]. The presence of gastroduodenal ulcers before surgery is also associated with postoperative complications [16]. Thus, routine preoperative UGE and *H. pylori* screening are critical for decreasing the risk of postoperative complications and gastric cancer in patients undergoing bariatric surgery.

Our study has some limitations. First, it was a retrospective study of a small cohort. Second, *H. pylori* screening was not performed routinely until the end of 2013. Nevertheless, this study was the first to demonstrate the clinical significance of routine preoperative UGE regardless of symptoms in Asian patients.

In conclusion, preoperative UGE findings can influence the operative technique and perioperative management of

bariatric surgery. Therefore, routine UGE may be necessary before bariatric procedures in obese Japanese patients.

Compliance with ethical standards

Conflict of interest Yuichi Endo and his co-authors have no conflicts of interest to declare.

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