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Original article

Barium swallow for hiatal hernia detection is unnecessary prior to primary sleeve gastrectomy

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Abstract

Background: Hiatal hernia (HH) is common in the bariatric population. Its presence imposes various degrees of difficulty in performing laparoscopic sleeve gastrectomy (LSG). Preoperative upper gastrointestinal evaluation consists of fluoroscopic and or endoscopic studies

Objectives: To evaluate the efficacy of routine, preoperative barium swallow in identifying HH in patients undergoing LSG, and determine if such foreknowledge changes operative and immediate postoperative course regarding operative time, intraoperative adverse events, and length of hospital stay (LOS). In addition, to quantify HH prevalence in these patients and correlate preoperative patient characteristics with its presence.

Setting: High-volume bariatric practice in a private hospital in Israel

Methods: Retrospective analysis of prospectively collected data between October 2010 and March 2015: anthropometrics, co-morbidities, previous barium swallow, preoperative HH workup (type and result), operative and immediate postoperative course.

Results: Primary LSG was performed in 2417 patients. The overall prevalence of HH was 7.3%. Preoperative diagnosis of gastroesophageal reflux disease and female gender were independent risk factors for HH presence. Operative times were significantly longer when HH was concomitantly repaired but "foreknowledge" thereof did not assist in shortening this time. Looking for an HH that was suggested in preoperative upper gastrointestinal evaluation slightly prolonged surgery. LOS was not changed in a significant fashion by HH presence and repair, whether suspected or incidentally found.

Conclusion: Routine, pre-LSG barium swallow does not seem to offer an advantage over selective intraoperative hiatal exploration, in the discovery and management of HH. Conversely, when preoperative workup yields a false-positive result, surgery is slightly prolonged. (Surg Obes Relat Dis 2016;▮:00–00.) © 2016 American Society for Metabolic and Bariatric Surgery. All rights reserved.

Keywords: Hiatal hernia; Paraesophageal hernia; Diaphragmatic hernia; Sleeve gastrectomy; Barium swallow

Hiatal hernia (HH) is not uncommon, with prevalence increasing with age and obesity [1–3]. The association between HH, gastroesophageal reflux disease (GERD), and morbid obesity is well documented [4]. HH diagnosis is

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achieved by upper gastrointestinal (GI) fluoroscopy, endoscopic studies or manometry [5]. Unsurprisingly, evaluation of upper GI anatomy before bariatric surgery (BS) is common, with fluoroscopic and or endoscopic examination of the gastroesophageal junction (GEJ) routinely performed in most centers [6,7]. Some centers advocate a more selective approach, studying only patients with upper GI symptoms such as dysphagia, heartburn, etc. [8,9].

Despite preoperative upper GI evaluation, incidental or unexpected HH are often found during surgery, whereas some patients, in whom a preoperative workup shows a HH, are not found to have one during intraoperative hiatal exploration [6].

Identifying the required anatomic landmarks when performing laparoscopic sleeve gastrectomy (LSG), requires definite visualization and identification of the GEJ. In the presence of a HH, when the GEJ resides in the lower mediastinum, failure to correctly identify it will result in completing the gastric partitioning at an incorrect location, leaving part of the fundus above a misconstructed sleeve.

The primary aim of this study was to evaluate the efficacy of routine, preoperative barium swallow in identifying HH, and to determine if such foreknowledge changed the operative and immediate postoperative course in regards to operative time, intraoperative adverse events, and length of hospital stay (LOS).

The secondary aims were to quantify HH prevalence in patients undergoing primary LSG and correlate preoperative patient characteristics with its presence.

Methods

A retrospective review of a prospectively maintained, detailed database of all bariatric procedures performed in a high-volume bariatric service was carried out quarrying patients who underwent primary LSG. Data collected included demographic, anthropometric, co-morbidities, preoperative barium swallow result, operative and immediate postoperative course. For this work, only selected co-morbidities were recorded: GERD; hypertension (HTN); type 2 diabetes mellitus (T2D); obstructive sleep apnea (OSA); and dyslipidemia (all requiring pharmacologic treatment, except OSA, which necessitated nightly CPAP).

A directive issued by the Israeli ministry of health mandates a uniform prebariatric surgery series of tests, including upper GI fluoroscopy for all candidates. Surgeon discretion allows performance of preoperative endoscopy in selected cases. A government-subsidized health maintenance organization (HMO) is provided for all citizens and completes all preoperative testing and thus, upper GI evaluation was performed by different diagnostic imaging and or gastroenterology centers, as provided by the individual HMOs.

Surgical technique: LSG was performed as previously described [10]. The posterior aspect of the stomach was meticulously dissected to completely expose the left crus of diaphragm from the esophago-phrenic ligament superiorly, to the crural junction with the posterior lesser curvature, inferiorly.

Hiatal exploration was undertaken when an HH was suggested in the preoperative workup or when a frank opening or distinct indentation was observed in the hiatus. This included opening of the pars flaccida and complete exposure of the right crus, in addition to the aforementioned careful exposure of the left crus. If an HH was suspected, the peritoneum alongside the crura was opened to verify or rule out this condition. When found, HH repair consisted of complete mobilization and reduction of the hernia sac, stomach, associated lipoma (when present), and distal esophagus until the GEJ was returned to the abdominal cavity (at least 3 cm, without retraction). The vagus nerve was visualized and conserved. The crural defect was suture-closed after sleeve formation over the bougie, using a nonabsorbable, braided suture. Anterior and or posterior closure was utilized according to surgeon preference.

Statistical analysis: Continuous variables are described as mean ± standard deviation and range and were compared by using Student's *t* test. Categoric variables are described using frequency distributions and are presented as frequency (%). Categoric variables were compared using the chi square, or Fisher's exact test as necessary. All tests are 2-tailed and considered significant at $P < .05$. Calculations were performed using STATA SE software.

Results

Between October 2010 and March 2015, 2417 patients (907 males; 37%) underwent primary LSG. Mean age and body mass index (BMI) were 43 ± 11.5 years and 42.7 ± 5.3 kg/m^2, respectively (Table 1). Males were significantly older (44.3 ± 11.2 versus 42.3 ± 11.6; $P < .0001$).

At least one co-morbidity was present in 1607 (66%) of the patients. There were statistically significant prevalence differences between genders: females had significantly higher rates of T2D, dyslipidemia, HTN, and GERD, whereas males had significantly more OSA (Table 1).

All patients underwent a preoperative barium swallow. A total of 215 patients (9%) had a putative preoperative diagnosis of an HH. Of these, 54 were male, making the gender distribution significantly skewed, compared with the entire group (25% versus 37%, respectively; $P < .0001$). Of these 215 patients, an HH was found and repaired in 65 patients (true positive 30%). Of the 2202 patients with a negative preoperative upper GI evaluation, 112 were found to have an HH (false negative 5.1%), which was repaired.

We considered intraoperative detection of an HH as the "gold standard" for diagnosis. All such hernias were repaired. The prevalence of HH in the entire cohort was 7.3% (177 of 2417 patients), but more prevalent in females (8.5% versus 5.3% in males; $P = .004$). Thus, the

Table 1
Patient data

	All	Female	Male	*P* value
n	2417	1510 (63%)	907 (37%)	<.0001
Age (years) average ± SD (range)	43.1 ± 11.5 (15 –76)	42.3 ± 11.6 (15 – 76)	44.3 ± 11.2 (16 – 72)	<.0001
BMI (kg/m^2) average ± SD (range)	42.7 ± 5.3 (28 –73)	42.7 ± 5.3 (35 – 70)	42.6 ± 5.2 (35 – 71)	NS
GERD n (%)	422 (17%)	293 (70%)	129 (30%)	<.0001
T2D n (%)	727 (30%)	402 (55%)	367 (45%)	<.0001
HTN n (%)	726 (30%)	437 (51%)	360 (49%)	<.0001
OSA n (%)	475 (20%)	170 (36%)	349 (64%)	<.0001
Chol n (%)	1266 (52%)	722 (57%)	544 (43%)	<.0001

BMI = body mass index; Chol = dyslipidemia; GERD = gastroesophageal reflux disease; HTN = hypertension; NS = not significant; OSA = obstructive sleep apnea; T2D = type 2 diabetes.

Demographic, anthropometric, and co-morbidity data of the patients.

sensitivity and specificity for the preoperative barium swallow were 30% and 94%, respectively. The positive and negative predictive values were 37% and 93%, respectively. We found no correlation between BMI and HH presence.

Of the co-morbidities collected, only GERD had a significant correlation with HH presence (RR 1.11 (95% CI = 1.07–1.16); $P < .0001$) but even in patients with preoperative diagnosis of GERD (n = 422; 17%), HH was found in only 58 (14%; Table 2).

As expected, operative times were significantly longer in patients in which an HH was found (and therefore repaired), compared with those who underwent BS alone: 109 ± 36 minutes versus 89 ± 28 minutes, respectively ($P < .0001$). The foreknowledge of an HH had no influence on the operative times (117 ± 35 min when predicted versus 120 ± 36 min when incidental). When an HH was expected, and therefore actively looked for, operative times were slightly longer than when the bariatric procedure was performed without hiatal exploration (95 ± 24 min versus 89 ± 28 min, respectively; $P = .2$).

Table 2

		HH absent (%)	HH present (%)	*P* value	RR (95% CI)
Gender (n)	Female	1381	129	.004	.96 (.95 – .99)
	Male	859	48		
GERD		448 (17%)	58 (14%)	<.0001	1.17 (1.10 – 1.25)
T2D		769 (30%)	70 (30%)	NS	
HTN		77 (30%)	70 (30%)	NS	
OSA		504 (19%)	47 (20%)	NS	
Chol		1350 (52%)	126 (53%)	NS	
+ BarSw		150 (7%)	65 (37%)	<.0001	1.36 (1.24 – 1.49)

+ BarSw = positive preoperative barium swallow for hiatal hernia; Chol = dyslipidemia; CI = confidence interval; GERD = gastroesophageal reflux disease; HTN = hypertension; NS = nonsignificant; OSA = obstructive sleep apnea; RR = relative risk; T2D = type 2 diabetes.

Prevalence of hiatal hernia (HH) by preoperative data.

Major complications (Clavien–Dindo grade 3-4) occurred in 51 patients (2.1%) including bleeding (n = 26), leak (n = 20), and thromboembolic events (n = 5). There was 1 perioperative mortality (0.04%) due to massive bleeding from a ruptured subcapsular splenic hematoma in a patient without HH. No statistical difference was found between the 2 groups for either specific or all complications.

LOS was identical between the 2 groups (2.21 ± 1.6 days).

Discussion

HH are present in 11%–37% of patients undergoing BS [9,11,12]. Soricelli et al., however, found HH in only 2.4% of 245 patients subjected to LSG [13]. In our cohort of 2417 patients, HH presence was preoperatively suggested in 9%. This lower-than-expected incidence may be due to the fact that upper GI evaluation was performed by external centers, as provided by different HMOs, and not in a single, dedicated bariatric center. Although a limitation of this study, this is the "real-world" situation in which we operate.

The presence of HH impinges on the straightforward performance of LSG. For this reason, upper GI evaluation has become a pillar in preoperative evaluation, either by fluoroscopy or endoscopy. Various pathologies, HH included, are found in these studies, but most have no clinical or practical bearing [9]. Simultaneous HH repair and bariatric surgery is safely and routinely performed in most centers [14].

Whereas barium swallow and gastroscopy have taken a role as accepted preoperative evaluation methods of the upper GI, their low sensitivity and low positive predictive value call to question their utility, especially with the low impact of "foreknowledge" on operative times and LOS. Several authors have addressed this issue with conflicting conclusions. Muñoz et al. described various pathologies in 46% of patients who underwent pre-LRYGB gastroscopies. They concluded that "preoperative endoscopy should be performed to all patients before surgery" [12]. This might

be particularly true if considering diagnoses other than HH (e.g., Barrett's esophagus, gastric malignancy, etc.), especially in bypass procedures that render the proximal GI tract inaccessible for endoscopic evaluation. Azagury et al., however, reported that in only 4% of 319 asymptomatic patients did the preoperative endoscopy have any clinical implication [15]. This finding was echoed by Sharaf et al. with fluoroscopic evaluation in 171 patients before various bariatric procedures, which revealed 5.3% clinically relevant findings [9].

Several reports quote obesity as a definite risk factor for HH, with prevalence increasing with rising BMI [3,11]. We, however, did not find this correlation between BMI and HH presence, either suspected by preoperative evaluation or found during surgery.

Preexisting co-morbidities were present in over 50% of our study population. Only the presence of GERD was predictive of HH presence.

Repairing an HH concomitantly with LSG has been reported by several authors. Pham et al. described their experience with 23 patients who underwent concomitant LSG and HH repair, which prolonged surgery by ~40 minutes [16]. Samakar et al. reported on 58 patients with simultaneous HH repair and LSG. As in our study, they found preoperative evaluation to be of limited value. HH repair relieved GERD symptoms in 35% of symptomatic patients but was associated to de novo GERD in 15.6%, perhaps due to disruption of the hiatal region [17]. Mahawar et al. recently published a systematic review of concomitant HH repair and LSG concluding it is an acceptable strategy for this patient population [18].

In our experience, concomitant repair of HH and BS prolonged the procedure by ~20 minutes but no significant difference was found when HH was known or incidentally found. Operative times were not significantly prolonged by hiatal exploration when a hernia was suspected but not present.

Limitations of this study include its inherent observational, retrospective design. There is no control group, in which no preoperative swallow studies were performed, making definite conclusions as to its utility speculative. The nonuniform method of preoperative upper GI evaluation has been addressed previously.

Conclusion

Routine preoperative swallow studies do not seem to offer an advantage over selective intraoperative hiatal exploration, in the discovery and management of HH in patients undergoing primary LSG. Conversely, when preoperative workup yields a false positive result, surgery is slightly but unnecessarily prolonged. If hiatal exploration is selectively performed, the barium swallow might be rendered obsolete in future bariatric preoperative assessments. Careful and meticulous hiatal exploration should be performed in patients with a preoperative diagnosis of GERD or when a frank opening or distinct indentation is observed at the hiatus.

Disclosures

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