Chapter

Laparoscopic Hiatal Hernia Repair during in-Sleeve Gastrectomy

Seyfi Emir, Hasan Erdem, Mehmet Gençtürk, Muhammed Said Dalkılıç, Abdullah Şişik and Selim Sözen

Abstract

Obesity is one of the most important health problems in developed and developing countries. Morbid obesity is defined as having a body mass index (BMI) of more than 40 kg/m^2. Obesity does not only predispose to gastroesophageal reflux, but is also an important independent risk factor for the development of hiatal hernia (HH). There are articles advocating about half of obese patients have a hiatal hernia. Hiatal hernia not only exacerbates reflux symptoms, but may also lead to incomplete removal of the gastric fundus during laparoscopic sleeve gastrectomy (LSG). When hiatal hernias are seen preoperatively or intraoperatively for bariatric surgery, surgical correction should ideally be made with mesh reinforcement to prevent further clinical progression.

Keywords: obesity, laparoscopic sleeve gastrectomy, gastroesophageal reflux and hiatal hernia

1. Introduction

Obesity has an important place among the most important health problems of developed and developing countries [1–3]. If the body mass index (BMI), calculated by evaluating the height and weight together, is greater than 40 kg/m^2, it is called morbid obesity. Along with obesity, the risk of systemic diseases such as diabetes mellitus (DM), obstructive sleep apnea and cardiovascular diseases increases, resulting in an increase in mortality rates. However, one of the independent risk factors for the development of gastroesophageal reflux disease (GERD) is obesity. In addition to predisposing to gastroesophageal reflux, one of the important independent risk factors for the development of hiatal hernia (HH) is obesity [4–8].

On the other side, the hiatal hernia (HH) is closely related to the presence of GERD.

2. Discussion

Gastroesophageal reflux disease (GERD) and HH have a relatively high incidence in the morbidly obese population, the underlying pathophysiology is transient lower

esophageal sphincter relaxation in combination with increased intra-abdominal pressure [9].

It has been proven that obesity is an important independent risk factor for the development of GERD and/or HH; while approximately 50–70% of patients undergoing bariatric surgery for morbid obesity have symptomatic reflux, 15% of them have symptomatic HH. GERD and HH are closely related with high BMI [10]. There are studies indicating the prevalence of GERD (defined as an increase in acid exposure and/or fissures in the esophageal mucosa) as 41% before laparoscopic sleeve gastrectomy (LSG) and 71% after LSG [11, 12].

There are articles advocating about half of obese patients have a hiatal hernia [5, 13]. Hiatal hernia not only exacerbates reflux symptoms, but may also lead to incomplete removal of the gastric fundus during LSG [3]. With the increasing use of LSG, more patients have been observed with relatively common side effects such as GERD and other somewhat rare anatomical complications such as strictures, ulcerations, and HH [14]. Small esophageal sliding herniation of LSG is thought to be associated with GERD after LSG, therefore surgical repair of HH is advocated by many [15]. Gastric narrowing, progressive enlargement of the esophageal hiatal opening, division of natural connections such as the phrenoesophageal membrane, and removal of the gastric fundus near the angle of His are possible factors associated with postoperative weight loss and reduction in visceral fat, and intrathoracic migration of the stomach [16]. Some authors have suggested that previous hiatal hernia repair (HHR) may accelerate postoperative LSG migration due to hiatal dissection, which may lead to phreno-esophageal membrane disruption, gastric sleeve instability, and associated loss of antireflux mechanisms [17].

In a study by Daes et al., it was found that hiatal hernia was detected intraoperatively in 25% of patients undergoing LSG, and reflux symptoms were significantly reduced after hiatal hernia repair (HHR) [18]. Baumann et al. [16], using multisection computed tomography, monitored 27 patients with gastric sleeve and they found that the migration of the staple line to the thorax is associated with the presence of gastroesophageal reflux. Interestingly, they demonstrated a 37% migration rate of the gastric sleeve into the posterior mediastinum 1–10 months after surgery. While 40% of these patients complained of reflux symptoms, 60% were asymptomatic. Most studies like this show an improvement in GERD when the hernia is repaired [19].

In the light of this information, if the presence of a hiatal hernia is known before bariatric surgery or if a hiatal hernia is detected during surgery, it is recommended to repair it [20–22]. In bariatric surgery, if it is detected in the preoperative evaluation or intraoperatively, concomitant repair should be performed [23, 24]. The repair of hiatal hernia during a gastric sleeve due to morbid obesity decreases the prevalence of GERD. It was revealed that dyspeptic symptoms and reflux symptoms regressed after HHR and that proton pump inhibitor usage declined. Unsuccessful hiatal hernia repair (HHR) can lead to an exacerbation of reflux symptoms after surgery. There are authors who advocate anterior and posterior placement of sutures in HHR to prevent anterior hiatal dilation during weight loss [25]. There are also articles in the literature reporting that HHR was performed safely with a mesh after LSG [26, 27].

3. Management and treatment

Fundoplication after bariatric surgery is not technically possible due to the lack of excess stomach tissue due to previous sleeve gastrectomy. Mesh reinforcement has been proven to have a lower incidence of recurrence than primary repair. Although

there is no difference in complication rates between synthetic and biological mesh, it has been proven that synthetic mesh has a lower recurrence rate compared to biological mesh [28].

A randomized controlled trial conducted by Snyder at al [29] showed no difference between repairing and not performing HH during sleeve gastrectomy. Santonicola et al. [30] showed the results of repairing HH during gastric sleeve in 78 patients. The incidence of preoperative reflux was 38.4%, and 30.8% after 15 months of follow-up ($p = 0.3$). Dakour Aridi et al. studied the safety of repairing HH during gastrectomy [31]. The 28,000 patients who had only sleeve gastrectomy and 4687 patients who had sleeve gastrectomy + HH repair recorded in the database of the National Surgical Quality Improvement Program were compared. Examined groups were not different from each other in terms of complications and mortality. In fact, there were no

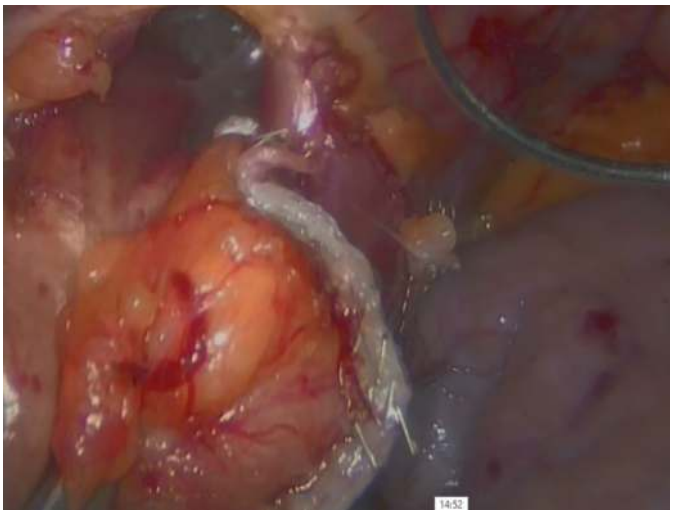

Figure 1.
Large hiatus/sleeve stapled line.

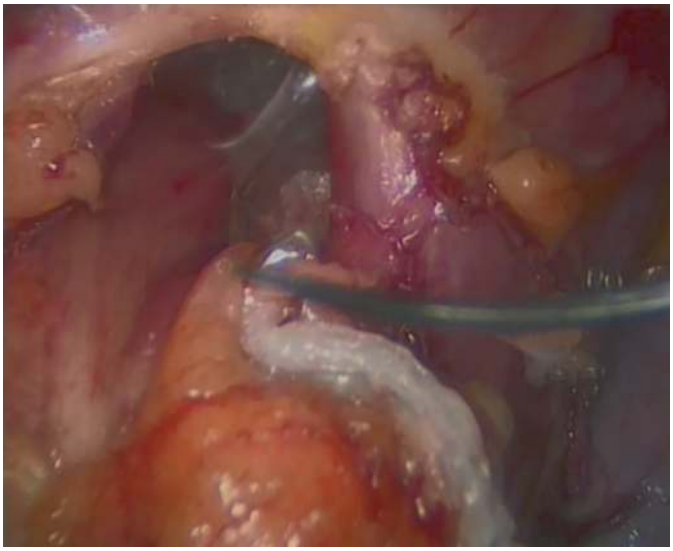

Figure 2.
Laparoscopic view of gastric sleeve herniation through esophageal hiatus.

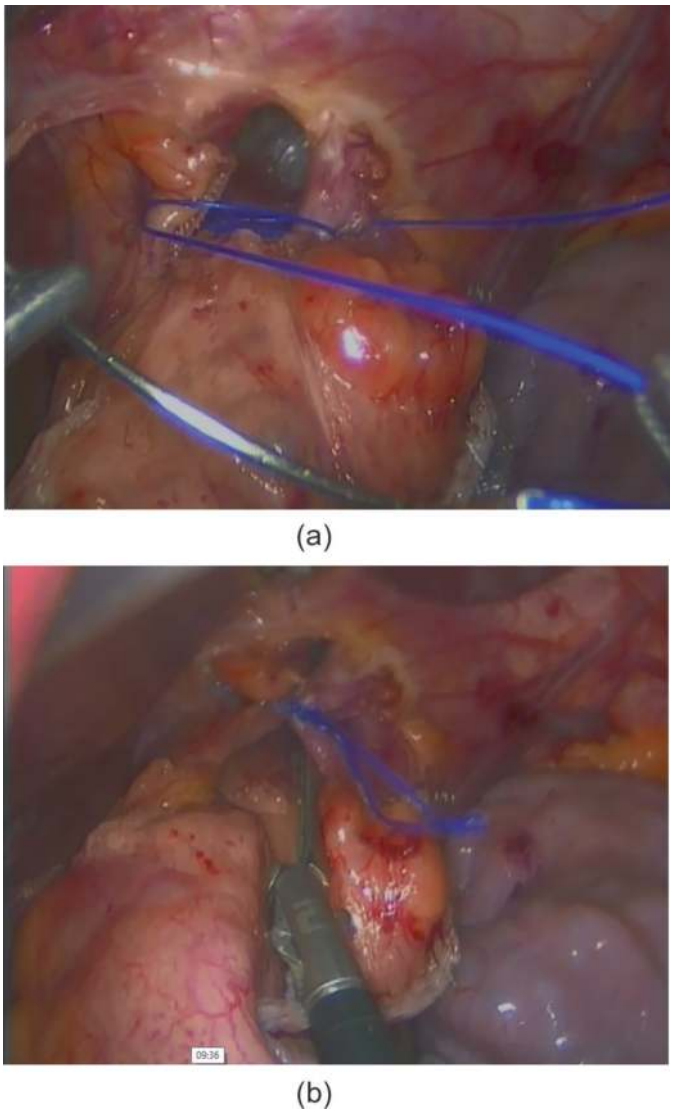

Figure 3.
(a) Laparoscopic view hiatal hernia repair. (b) Final aspect closed esophageal hiatus.

unexpected or adverse outcomes of performing esophageal dissection and performing hiatus repair. In addition, some anatomical and physiological results of sleeve gastrectomy surgery can explain the regression in preoperative symptoms. With LSG, the total gastric mucosal surface and, accordingly, the amount of acid-producing parietal cells are reduced. In addition, gastric emptying increases and intra-abdominal pressure decreases as total weight decreases. These may explain the improvement in symptoms without HH repair.

Soricelli et al. [32] published 6 patients who underwent HH repair during LSG. In 2 patients with hiatal defects larger than 5 cm, polypropylene mesh was suitable following crus repair, while crus repair was performed with 2 or 3 sutures with non-absorbable suture materials in the other 4 patients. No complications were observed during or after the operation, but HH recurrence was detected in 1 (17%) patient during long-term follow-up. In the literature, there are authors suggesting to use bio-absorbable mesh if HH repair is required during LSG, or to fix the remaining stomach to the colonic mucosa with bio-absorbable mesh, thus preventing both migration in the

remaining stomach and possible volvulus [33, 34]. Occlusion of the esophagus due to imprisoned HH in the early postoperative period secondary to crus repair can be seen as a very rare complication. To the best of our knowledge, only one case was reported by Mizrahi et al. [35] in the literature. This potential complication does not change the fact that it is safe to perform HH repair if necessary during LSG. We think that conversion to Laparoscopic Roux and Y gastric bypass (LRYGB), in which the alimentary limb is fixed to the diaphragm, is the most appropriate option due to the presence of a short intra-abdominal esophagus and the tension in the sleeved stomach in patients where LSG and hiatoplasty are applied together and no success is achieved. Our biggest concern in the reoperation was how to prevent the reherniation of the stomach with a tube. While making our decision, we considered that the transition to LRYGB could provide several advantages; (1) it is an anti-reflux procedure in itself, (2) traction produced by the small intestine anatomically placed in the gastric pouch can help hold the stomach in place (3) Unlike LGS, it is a low pressure system. Also, fixing the blind loop of the alimentary limb to the diaphragm provides further fixation.

With regard to strengthening the hiatal repair with a patch, it is performed in symptomatic cases where the hiatal defect is >5 cm (detected intraoperatively) and where it is not possible to bring the cruses closer together without tension. Nocca et al. [12] and our experience it has been proven that this technique significantly reduces the recurrence rate of HH in patients with a hiatal defect >5 cm.

In cases, crural repair was performed by means of two or three interrupted non-absorbable stitches (**Figures 1**-**3**), while in the two cases with a HH > 5 cm, a U shaped polypropylene mesh was superimposed to aid crural closure.

4. Conclusions

When hiatal hernias are seen preoperatively or intraoperatively for bariatric surgery, surgical correction should ideally be made with mesh reinforcement to prevent further clinical progression. Prosthetic reinforcement of the hiatal closure should be performed in selected cases where an increased risk of HH recurrence exists. To evaluate the effectiveness of this procedure and as well as the feasibility and safety of prosthetic hiatal closure, further series with larger numbers of patients and longer follow-up are needed.

Conflict of interest

The authors declare no conflict of interest.

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References

[1] Nocon M, Labenz J, Willich SN. Lifestyle factors and symptoms of gastro-oesophageal reflux: A population-based study. Alimentary Pharmacology & Therapeutics. 2006;**23**:169-174

[2] Kang JH, Le QA. Effectiveness of bariatric surgical procedures. A systematic review and network meta-analysis of randomized controlled trials. Medicine. 2017;**96**:e8632

[3] Stenard F, Iannelli A. Laparoscopic sleeve gastrectomy and gastroesophageal reflux. World Journal of Gastroenterology. 2015;**21**:10348-10357

[4] Chang VW, Langa KM, Weir D, Iwashyna TJ. The obesity paradox and incident cardiovascular disease: A population-based study. PLoS One. 2017;**12**:e0188636

[5] Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C. Global, regional and national prevalence of overweight and obesity in children and adults 1980-2013: A systematic analysis. Lancet. 2014;**384**:766-781

[6] Kasotakis G, Mittal SK, Sudan R. Combined treatment of symptomatic massive paraesophageal hernia in the morbidly obese. JSLS. 2011;**15**:188-192

[7] Wilson LJ, Ma W, Hirschowitz BI. Association of obesity with hiatal hernia and esophagitis. The American Journal of Gastroenterology. 1999;**94**:2840-2844

[8] Dutta SK, Arora M, Kireet A, Bashandy H, Gandsas A. Upper gastrointestinal symptoms and associated disorders in morbidly obese patients: A prospective study. Digestive Diseases and Sciences. 2009;**54**:1243-1246

[9] Schneider JH, Küper M, Königsrainer A, Brücher B. Transient lower esophageal sphincter relaxation in morbid obesity. Obesity Surgery. 2009;**19**:595-600

[10] Morgenthal CB, Lin E, Shane MD, Hunter JG, Smith CD. Who will fail laparoscopic Nissen fundoplication? Preoperative prediction of long-term outcomes. Surgical Endoscopy. 2007;**21**(11):1978-1984

[11] Gulkarov I, Wetterau M, Ren CJ, Fielding GA. Hiatal hernia repair at the initial laparoscopic adjustable gastric band operation reduces the need for reoperation. Surgical Endoscopy. 2008;**22**(4):1035-1041

[12] Nocca D, Krawczykowsky D, Bomans B, Noel P, Picot MC, Blanc PM, et al. A prospective multicenter study of 163 sleeve gastrectomies: Results at 1 and 2 years. Obesity Surgery. 2008;**18**(5):560-565

[13] Prachand VN, Alverdy JC. Gastroesophageal reflux disease and severe obesity: Fundoplication or bariatric surgery? World Journal of Gastroenterology. 2010;**16**:3757-3761

[14] Yang P, Chen B, Xiang S, Lin XF, Luo F, Li W. Long-term outcomes of laparoscopic sleeve gastrectomy versus rouxen- Y gastric bypass for morbid obesity: Results from a metaanalysis of randomized controlled trials. Surgery for Obesity and Related Diseases. 2019;**15**:546-555

[15] Kohn GP, Price RR, DeMeester SR, Zehetner J, Muensterer OJ, Awad Z, et al. Guidelines for the management of hiatal hernia. Surgical Endoscopy. 2013;**27**:4409-4428

[16] Baumann T, Grueneberger J, Pache G, Kuesters S, Marjanovic G, Kulemann B, et al. Three-dimensional stomach analysis with computed tomography after laparoscopic sleeve gastrectomy: Sleeve dilation and thoracic migration. Surgical Endoscopy. 2011;**25**:2323-2329

[17] Saber AA, Shoar S, Khoursheed M. Intra-thoracic sleeve migration (ITSM): An underreported phenomenon after laparoscopic sleeve gastrectomy. Obesity Surgery. 2017;**27**:1917-1923

[18] Daes J, Jimenez M, Said N, Daza J, Dennis R. Laparoscopic sleeve gastrectomy: Symptoms of gastroesophageal reflux can be reduced by changes in surgical technique. Obesity Surgery. 2012;**22**:1874-1879

[19] Mahawar K, Carr W, Jennings N, Balupuri S, Small P. Simultaneous sleeve gastrectomy and hiatus hernia repair: A systematic review. Obesity Surgery. 2015;**25**:159-166

[20] Rebecchi F, Allaix ME, Patti MG, Schlottmann F, Morino M. Gastroesophageal reflux disease and morbid obesity: To sleeve or not to sleeve? World Journal of Gastroenterology. 2017;**23**:2269-2275

[21] Rosenthal RJ, Diaz AA, Arvidsson D, et al. International sleeve gastrectomy expert panel. International sleeve gastrectomy expert panel consensus statement: Best practice guidelines based on experience of >12,000 cases. Surgery for Obesity and Related Diseases. 2012;**8**:8-19

[22] Gibson SC, Le Page PA, Taylor CJ. Laparoscopic sleeve gastrectomy: Review of 500 cases in single surgeon Australian practice. ANZ Journal of Surgery. 2015;**85**:673-677

[23] Che F, Nguyen B, Cohen A, Nguyen NT. Prevalence of hiatal hernia in the morbidly obese. Surgery for Obesity and Related Diseases. 2014;**9**(6):920-924

[24] Pham DV, Protyniak B, Binenbaum SJ, Squillaro A, Borao FJ. Simultaneous laparoscopic paraesophageal hernia repair and sleeve gastrectomy in the morbidly obese. Surgery for Obesity and Related Diseases. 2014;**10**(2):257-261

[25] Jossart GH. Routine hiatal hernia repair to prevent GERD after sleeve gastrectomy. Bariatric Times. 2011; **8**(Suppl. 5):15-16

[26] Korwar V, Peters M, Adjepong S, Sigurdsson A. Laparoscopic hiatus hernia repair and simultaneous sleeve gastrectomy: A novel approach in the treatment of gastroesophageal reflux disease associated with morbid obesity. Journal of Laparoscopic Advance Surgery Technology. 2009;**19**:761-763

[27] Clapp B. Prosthetic bioabsorbable mesh for hiatal hernia repair during sleeve gastrectomy. JSLS. 2013;**17**:641-644

[28] Huddy JR, Sr M, Ni MA, et al. Laparoscopic repair of hiatus hernia: Does mesh type influence outcome? A meta-analysis and European survey study. Surgical Endoscopy. 2016;**30**(12):5209-5221

[29] Snyder B, Wilson E, Wilson T, Mehta S, Bajwa K, Klein C. A randomized trial comparing reflux symptoms in sleeve gastrectomy patients with or without hiatal hernia repair. Surgery for Obesity and Related Diseases. 2016;**12**(9):1681-1688

[30] Santonicola A, Angrisani L, Cutolo P, Formisano G, Iovino P. The effect of laparoscopic sleeve gastrectomy with or without hiatal hernia repair on

gastroesophageal reflux disease in obese patients. Surgery for Obesity and Related Diseases. Mar-Apr 2014;**10**(2):250-255

[31] Dakour Aridi HN, Tamim H, Mailhac A, Safadi BY. Concomitant hiatal hernia repair with laparoscopic sleeve gastrectomy is safe: Analysis of the ACS-NSQIP database. Surgery for Obesity and Related Diseases. Mar 2017;**13**(3):379-384

[32] Soricelli E, Casella G, Rizzello M, Calì B, Alessandri G, Basso N. Initial experience with laparoscopic crural closure in the management of hiatal hernia in obese patients undergoing sleeve gastrectomy. Obesity Surgery. 2010;**20**:1149-1153

[33] Levine MS, Carucci LR. Imaging of bariatric surgery: Normal anatomy and postoperative complications. Radiology. 2014;**270**:327-341

[34] de Godoy EP, Coelho D. Gastric sleeve fixation strategy in laparoscopic vertical sleeve gastrectomy. Arquivos Brasileiros de Cirurgia Digestiva. 2013;**26**(Suppl. 1):79-82

[35] Mizrahi I, Tabak A, Grinbaum R, Beglaibter N, Eid A, Simanovsky N, et al. The utility of routine postoperative upper gastrointestinal swallow studies following laparoscopic sleeve gastrectomy. Obesity Surgery. 2014;**24**:1415-1419