American Journal of Case Reports

e-ISSN 1941-5923
© Am J Case Rep, 2018; 19: 884-890
DOI: 10.12659/AJCR.909387

Received: 2018.02.06
Accepted: 2018.05.09
Published: 2018.07.28

Endoscopically Assisted Laparoscopic Gastric Resection for Benign and Malignant Lesions: A Report of Two Cases

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

ABG 1 **Christophoros S. Kosmidis**
ABCDEFG 1 **Georgios D. Koimtzis**
ABG 2 **Georgios Anthimidis**
ABG 2 **Nikolaos Varsamis**
BG 1 **Stefanos Atmatzidis**
EFG 1 **Ioannis S. Koskinas**
BDEG 3 **Triantafyllia Koletsa**
BCDEG 3 **Katerina Zarampouka**
FG 1 **Eleni Georgakoudi**
BG 4 **Sofia Baka**
BG 2 **Christophoros Efthimiadis**
BG 5 **Maria S. Kosmidou**
ABG 6 **Georgios Kouklakis**

1 3rd Surgical Department, University Hospital of Thessaloniki AHEPA, Aristotle University of Thessaloniki, Thessaloniki, Greece
2 Department of Surgery, Interbalkan European Medical Center, Thessaloniki, Greece
3 Department of Pathology, Faculty of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece
4 Department of Oncology, Interbalkan European Medical Center, Thessaloniki, Greece
5 Department of Internal Pathology, University Hospital of Ioannena, Ioannena, Greece
6 Digestive System Endoscopy Unit, Democritus University of Thrace, Alexandroupoli, Greece

Corresponding Author: Georgios Koimtzis, e-mail: drgxkoimtzis@gmail.com
Conflict of interest: None declared

Case series
Patient: Male, 67 • Female, 60
Final Diagnosis: Gastric ulcer • early gastric cancer
Symptoms: Upper gastrointestinal bleeding • atypical epigastric pain
Medication: —
Clinical Procedure: Endoscopically assisted laparoscopic wedge gastric resection
Specialty: Surgery

Objective: Educational purpose

Background: The first gastric resection for stomach cancer was performed in 1879, and the first gastric resection for gastric ulcer disease was performed in 1882. During the 1990s, the first laparoscopic gastrostomies were reported. During the past decade, laparoscopic techniques have developed rapidly, gaining wide clinical acceptance. Minimally invasive surgery is now shifting the balance away from traditional open methods. We report 2 cases of endoscopically assisted laparoscopic local gastric resections for both gastric cancer and gastric ulcer disease.

Case Report: The first case involves a 67-year-old male patient who suffered from recurrent bleeding from a gastric ulcer located 4–5 cm from the gastroesophageal junction. The patient was subjected to endoscopically assisted laparoscopic wedge resection of the affected part of the stomach, had an uneventful recovery and was discharged on the third postoperative day. The second case involves a 60-year-old female patient who was diagnosed with intramucosal gastric adenocarcinoma and was also subjected to endoscopically assisted laparoscopic wedge gastrectomy. This patient also had an uneventful recovery and was discharged on the second postoperative day.

Conclusions: Endoscopically assisted laparoscopic local gastric resection is a minimally invasive procedure which allows the surgeon to operate under direct visualization of the internal part of the stomach. Thus, it enables the surgeon to safely remove the affected part within healthy margins, providing the patient with all the advantages of laparoscopic surgery.

MeSH Keywords: Endoscopy • Gastrectomy • Laparoscopy • Peptic Ulcer • Stomach Neoplasms

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/909387

Background

The first gastric resection for stomach cancer was reported by Jules Emile Pean in 1879, and the first successful partial gastrectomy followed by gastroduodenostomy was performed by the famous Austrian surgeon Theodor Billroth in 1881 [1,2]. One year later, von Rydiger performed the first gastric resection for gastric ulcer disease, which became the standard operation for this condition by the 1930s [2]. In 1994, Kitano reported the first laparoscopically assisted distal gastrectomy for gastric cancer, while Azagra et al. from Belgium reported the first totally laparoscopic distal gastrectomy for cancer in 1993 and the first laparoscopic total gastrectomy for cancer in 2001 [1]. Regarding peptic ulcer disease, although nowadays it is initially managed conservatively with a very high success rate, still, the risk of surgery after upper gastrointestinal bleeding secondary to peptic ulcer disease ranges from 3.8% to 7% [3]. Endoscopically assisted laparoscopic local gastric resection is a groundbreaking minimally invasive technique that exploits both the advantages of laparoscopic surgery and provides the surgeon with the ability to perform safe, full thickness resections of the affected parts of the stomach within healthy margins [4].

We present 2 cases of endoscopically assisted laparoscopic local gastric resection. The first was applied to a patient with recurrent bleeding from a gastric ulcer that could not be treated conservatively and the second was to a patient with intramucosal gastric cancer.

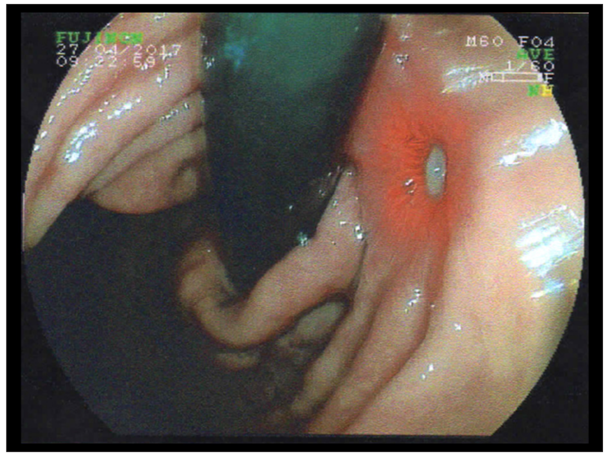

Figure 1. Esophagogastroduodenoscopy image revealing the presence of an ulcerative crypt at the upper third of the lesser curvature.

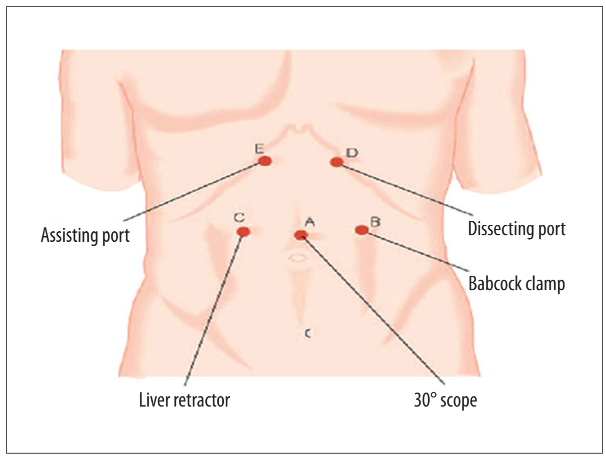

Figure 2. Placement of the trocars.

Case Report

Case 1

A 67-year-old male patient with a free medical history presented himself in the Emergency Department after an episode of loss of consciousness accompanied by melena. His vital signs were stable with a heart rate of 97 beats/min, a blood pressure of 99/59 mm Hg, a respiratory rate of 19 cycles/min and an oxygen saturation of 97%. The laboratory results revealed anemia with a hematocrit value of 23.4% and a hemoglobin value of 7.8 g/dL (normal ranges 40–51% and 13.8–17.0 g/dL respectively). All other laboratory values were within normal range. The patient was admitted initially to the Gastroenterology Department, where he was immediately administered 2 units of compact erythrocytes and was scheduled for esophagogastroduodenoscopy the next day, with a hematocrit value of 29.7% and a hemoglobin value of 9.6 g/dL. The esophagogastroduodenoscopy revealed a deep, round ulcerative crypt at the lesser curvature, 4–5 cm from the gastroesophageal junction (type IV according to Johnson's classification) with the presence of exudates and a visible vessel with intense hyperemic margins (Figure 1). No active bleeding was found and thus no hemostasis was attempted. However, the next day the patient had another melena leading to a drop in the hematocrit value of 6% and in the hemoglobin value of 2 g/dL, requiring a transfusion of another 2 units of compact erythrocytes to stabilize. A second esophagogastroduodenoscopy revealed once again no active bleeding. Based on the recurrence of the bleeding and the high risk for malignancy of type IV ulcers, surgical excision of the ulcer was planned. As a result, the patient was transferred to the surgical department and was scheduled for endoscopically assisted laparoscopic wedge resection (EAWR) of the ulcer.

The patient was placed in a supine, split-legged, 15° reverse Trendelenburg position with the surgeon standing between the patient's legs, the scope operator and the scrub nurse on the right side of the patient and the assistant on the left. Initially, a 10 mm camera port was placed through a supra-umbilical incision using Hasson's technique. After a pneumoperitoneum

Figure 3. Intraoperative esophagogastroduodenoscopy with marking of the lesion with Indian blue (yellow arrow).

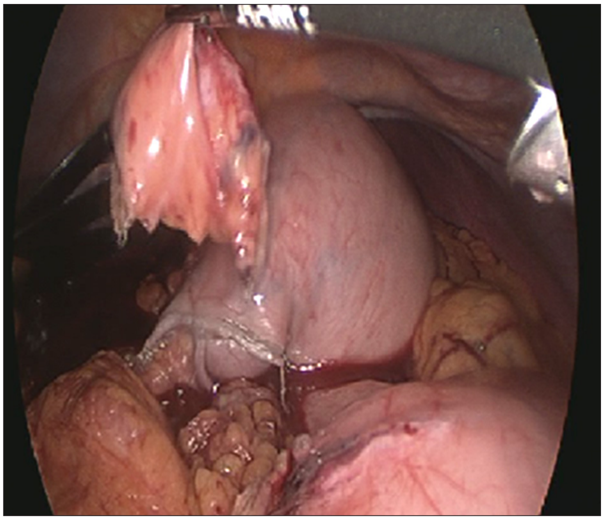

Figure 5. Intraoperative image of the specimen after its complete excision.

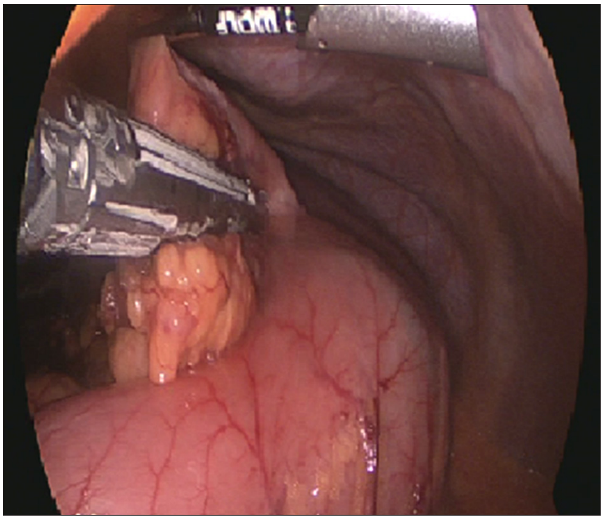

Figure 4. The specimen being resected by the use of a linear stapler.

Figure 6. The specimen after being removed from the abdominal cavity.

of 12 mm Hg was achieved, ports were placed at the right upper quadrant, right lateral side, left upper quadrant and left lateral side of the abdomen under direct visualization (Figure 2). As an energy source, a 5 mm blunt tip 37 cm LigaSure device with a dolphin tip was used. Initially, the lesser curvature of the stomach was identified and the lesser omentum was dissected. The affected part of the stomach was identified, was confirmed endoscopically and was marked with Indian blue (Figure 3). Subsequently, it was excised by the use of 4, 45 mm, endo-GIA, linear stapler devices (Figures 4–6) and a drainage tube was placed at the suture line through the right abdominal side port. The patient recovered safely and was transferred to the floor. The entire procedure lasted 110 minutes and the estimated blood loss was 40 mL.

The patient had an uneventful postoperative period with the drainage tube being removed on the first postoperative day and oral intake of food starting on the same day, as well. He was discharged on the third postoperative day with a prescription for 40 mg omeprazole orally every day for 4 weeks.

The histopathological report revealed findings compatible with a healed gastric ulcer accompanied with chronic gastritis lesions with no evidence of malignancy (Figure 7). The presence of *Helicobacter pylori* was not confirmed. Follow-up esophagogastroduodenoscopy at 3 months after the operation revealed no recurrence of the ulcer. The patient remains disease-free 1 year after the operation with no clinical evidence of recurrence and no need for further regular follow-up.

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

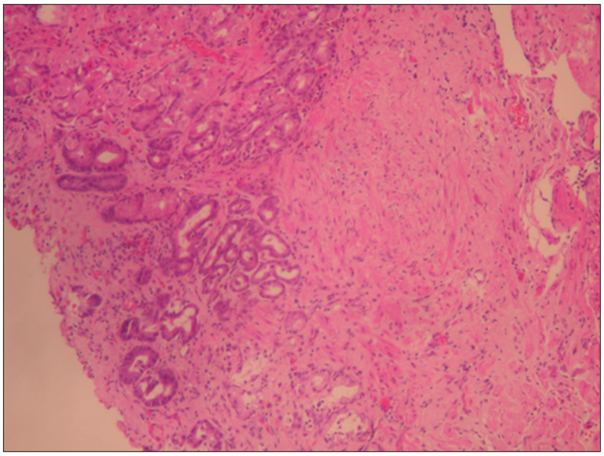

Figure 7. Pathological image showing fibrosis and mucosa with abnormal architecture and mild inflammatory infiltration.

Case 2

A 60-year-old female patient presented herself in the Gastroenterology Department complaining of pain located in the epigastrium, radiating to the back and the chest, accompanied by nausea and vomiting for 2 weeks. The patient had a known history of arterial hypertension for which she was on 50 mg of metoprolol and a combination of (40+5) mg of olmesartan/amlodipine per day. She also suffered from minor depressive disorder for which she was on 0.25 mg of alprazolam and 10 mg of escitalopram per day. The patient was subjected to esophagogastroduodenoscopy, which revealed the presence of a 2–3 cm long polyp in the middle of the greater curvature of the stomach (Figure 8). The lesion was marked with Indian blue in order to guide the laparoscopy and biopsies were taken. These revealed an inflammatory gastric polyp accompanied by the presence of intramucosal gastric adenocarcinoma (T1 according to TNM classification). The patient was subjected to thoracic and abdominal computed tomography scans for staging purposes, which revealed no evident site of metastatic disease. Thus, the cancer was classified as stage IA according to TNM classification and the patient was scheduled for EAWR.

The patient and the operative team were positioned exactly as in the first case. However, in this case, only 3 trocars were used (trocars A, B, and C in Figure 2). The energy source that was used was the same as in the first case. After the pneumoperitoneum was achieved, the greater curvature of the stomach was grasped with a Babcock forceps and the gastrocolic ligament was ligated. The lesion that had to be removed was identified by intraluminal endoscopic illumination of the preoperative marking and was grasped with a Babcock forceps firmly so as to disappear completely from the endoscopic image (Figure 9). Subsequently, a sphenoid resection of the lesion

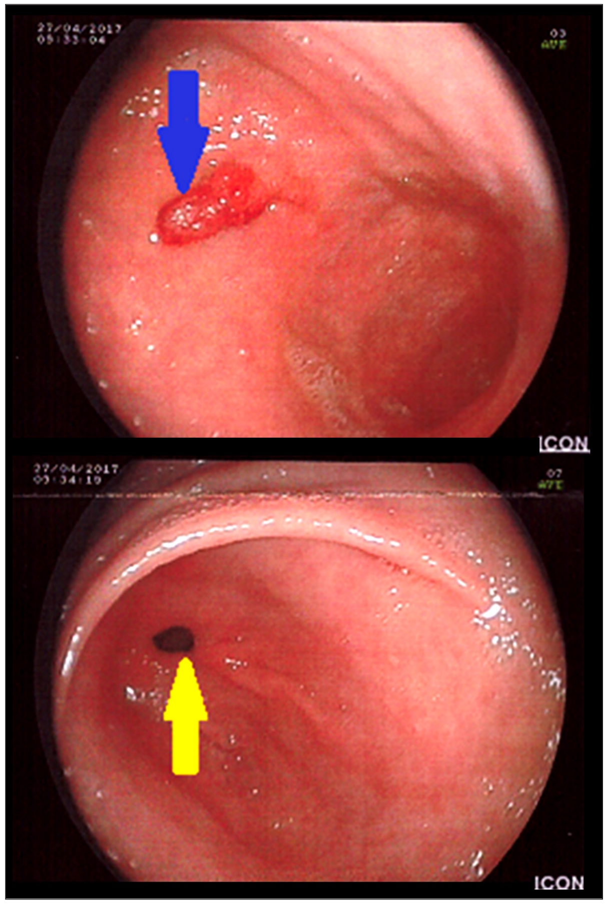

Figure 8. Preoperative esophagogastroduodenoscopy revealing the presence of a polyp (blue arrow) and its marking with Indian blue (yellow arrow).

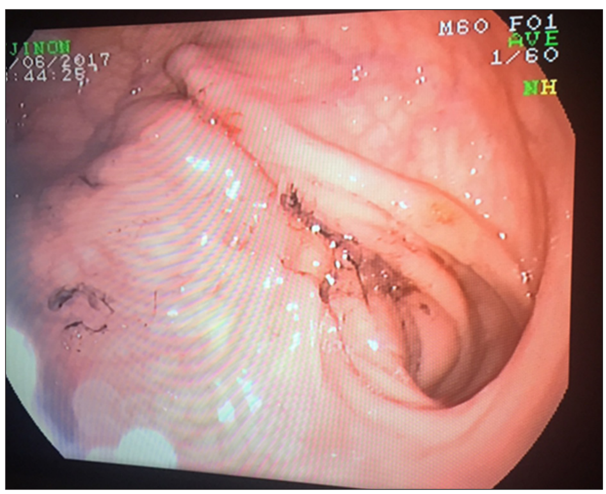

Figure 9. Intraoperative esophagogastroduodenoscopy showing the complete disappearance of the polyp after being grasped by a Babcock forceps.

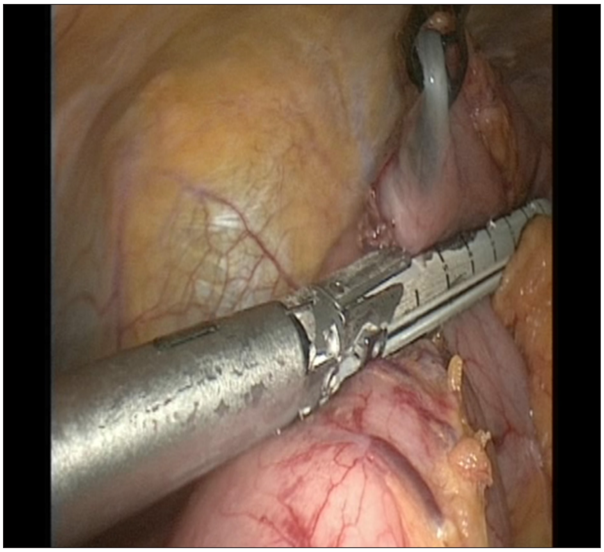

Figure 10. The specimen grasped by a Babcock forceps being resected by the use of a linear stapler device.

Figure 11. The specimen after being resected and opened.

was performed using 2, 45 mm, endo-GIA, linear stapler devices (Figures 10, 11). No drainage was placed. The patient recovered safely and was transferred to the floor. The entire procedure lasted 40 minutes and the estimated blood loss was 20 mL.

The patient had an uneventful postoperative period being started on oral intake of food on the first postoperative day and being discharged on the second postoperative day.

The histopathological report revealed a tubular adenoma of the stomach with low to high grade dysplasia accompanied with the presence of local, intramucosal, well-differentiated, enteric type according to Lauren's classification adenocarcinoma of the stomach (Figure 12). According to TNM classification, the lesion was classified as pT1aNx and immunohistochemically was found negative for c-erb-B2. Follow-up esophagogastroduodenoscopy at 3, 6, and 12 months after the operation revealed no evidence of recurrence. The patient remains

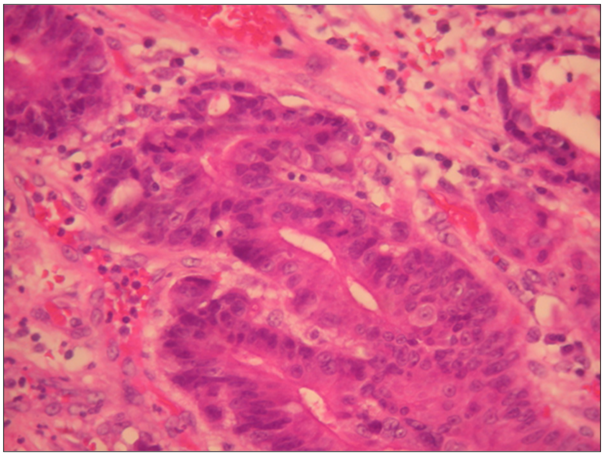

Figure 12. Pathological image showing a tubular adenoma with high grade dysplasia and minimal invasion by the tumor cells.

disease-free 1 year after the operation and is scheduled for follow-up visits every 6 months for the next year.

Discussion

Upper gastrointestinal bleeding (UGIB) is defined as hemorrhage originating proximal to the ligament of Treitz [5,6]. UGIB is classified into 2 major categories: non-variceal UGIB (NVUGIB) and variceal UGIB (VUGIB) [6]. Gastroduodenal peptic ulcers are the most common cause of NVUGIB accounting for about 31–67% of UGIB [5]. The overall incidence of NVUGIB, and particularly of that associated with peptic ulcer disease, has decreased over time, but the associated mortality remains high, with values ranging between different studies from 1.1% to 11% [6]. The mortality of peptic ulcer bleeding increases 2-fold to 5-fold in cases of rebleeding which occurs in 10–15% of individuals [6]. Our first case involved a patient with an increased mortality risk because of the rebleeding that caused a drop in the hemoglobin value below 8 mg/dL and rendered him unstable. In these high-risk patients with recurrent bleeding second-look endoscopy is indicated, as it was performed in our case [6]. Treatment choices for recurrent bleeding include endoscopic therapy, radiological interventions and surgery [5–7]. Randomized control trials comparing these options have showed that 93.1% of the patients who were treated surgically had long-term control of the bleeding compared to 73% of the patients who were treated endoscopically [6]. Transcatheter arterial embolization is a technically successful second-line treatment after failed endoscopy with a high clinical success rate [8]. However, a higher rebleeding rate when compared to surgery has been observed [6]. Surgical therapy is also indicated when malignancy is suspected [5]. Due to the location of the ulcer in our case (type IV according to Johnson's classification) and the patient's age the risk for malignancy

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

was high. As a result, surgical treatment was chosen in order to have better results in terms of controlling the hemorrhage and to obtain a full-thickness biopsy in order to exclude malignancy. A laparoscopic approach was chosen assisted by intraoperational endoscopy (EAWR) in order to better locate and visualize the lesion and achieve full-thickness excision.

Since 2000, there have been 25 studies with more than 10 patients each have been published regarding a cooperative laparoscopic and endoscopic approach for upper gastrointestinal tumors [9]. The most common of these techniques is EAWR with more than 500 cases published [9] and it is the technique we used in both of our cases. EAWR has been used mainly for the resection of submucosal gastric tumors, such as gastrointestinal stroma tumors (GISTs), leiomyomas and schwannomas [4,9,10], but a few teams have also reported the use of this technique for the resection of early gastric cancer (pT1aNx) as well as of duodenal tumors [9,11]. Specifically, in 2000, Choi et al. reported the first EAWRs for 21 cases of submucosal gastric tumors, while Schubert et al. reported the first use of this technique for the resection of early gastric cancer in 4 patients on 2005 [9,11]. Ohata et al. also reported the use of this technique for the resection of early duodenal cancer in 22 patients in 2014 [12].

In EAWR the role of the endoscopy team is the localization and the exposure of the tumor, while the role of the surgical team is the tumor's full thickness resection [9]. In classic laparoscopic and endoscopic cooperative surgery, the surgeon stands on the patient's right side along with the scrub nurse, while the first assistant stands on the patient's left side, the scope operator on the patient's foot side and the endoscopist near the patient's head side [13]. However, in our cases we used an alternative method, where the patients were placed in the split-legged position with the surgeon positioned between the patients' legs, which provides a more realistic view of the operative field, something that has also been described in the literature [9,14]. Usually, a 10 mm camera port is inserted into the umbilicus and then four additional ports (three 5 mm ports and one 12 mm port) are placed in the left and right upper and lower quadrants of the abdomen [13]. This setup was the one we used in our first case. However, in our second case we chose to omit the 2 assisting 5 mm trocars and completed the procedure using only 3 trocars in total. This was because the tumor was located on the greater curvature of the stomach far enough from the gastroesophageal junction that no liver retraction or manipulation of the fundus of the stomach or the esophagus was required. According to our review of the literature, the use of only 3 trocars in EAWR has never been described previously. The procedure goes on by identifying the lesion endoscopically and lifting the gastric wall with either stay sutures or a laparoscopic Babcock clamp [11]. We opted for the clamp so as to avoid any unnecessary damage to the stomach. The procedure is completed by excising the lesion within free margins by firing one or in most cases multiple shots with a stapler device [9,11], as in our case. Finally, the endoscopist confirms the complete resection of the lesion and the absence of any leak or bleeding [9].

Based on our review of the literature, in 9 major studies from 2008 to 2015 the median operating time for the procedure ranged from 81.6 min to 213 min, the median estimated blood loss from 3.5 mL to 29.8 mL and the mean hospitalization time from 3.4 days to 15.1 days [9,10], numbers that are consistent with our results. Complications of this method include mainly hemorrhage, hypoperistalsis of the stomach caused by injury to the vagus nerve, bowel injury, leak from the staple or suture line, gastric deformation or stenosis from stapling and incomplete resection [9]. However, in large series the complication rate was 0–3% [9,15] and the conversion to open surgery rate was 0% [11].

EAWR is a technique that offers all the advantages of minimally-invasive surgery including less pain and inflammatory response along with a faster recovery, a shorter hospital stay and a better quality of life [4,12]. It also renders the easier recognition and full-thickness resection of the tumor possible, thus, leading to a therapeutic result or at least to a reliable histopathologic analysis, ensuring shorter operative time and complete hemostasis [4]. The technique requires no advanced laparoscopic or endoscopic skills, and it is therefore appropriate for teams new to cooperative techniques [9].

Despite these advantages, the technique has its limitations, as well. Important factors that need to be taken into account when considering the application of this method are the location of the tumor, its size and histological type, and the depth of gastric wall invasion and expansion of the tumor [12]. Combined laparoscopic and endoscopic surgical techniques are generally indicated for the resection of submucosal tumors, such as leiomyomas, lipomas and schwannomas, polyps with broad bases, lesions with low malignant potential such as GISTs and carcinoid tumors and early-stage, localized gastric carcinomas [14]. On the other hand, EAWR is absolutely contraindicated for large, locally advanced and metastatic tumors [4]. Specifically, the 3 largest published series amassing 256 patients involved mainly the resection of GISTs and secondarily the resection of benign submucosal tumors [9]. Taking the 2015 National Comprehensive Cancer Network (NCCN) sarcoma guidelines into account, GISTs smaller than 5 cm regardless of their location are valid candidates for EAWR [5]. Nonetheless, the application of EAWR has also been reported for the treatment of early gastric cancer (T1a), where the associated lymph node metastatic involvement is virtually zero [9,16]. Although patients with early gastric cancer are candidates for endoscopic mucosal resection, a local recurrence rate of 2–17%

has been reported after this procedure [11]. Thus, the application of EAWR in these cases, which until now has provided results of decreasing the local recurrence rate to 0–3.6%, seems a very promising suggestion [11]. However, due to relatively small number of patients with early gastric cancer treated with EAWR so far, further research is required to validate these results [11].

Conclusions

EAWR is a groundbreaking minimally-invasive technique, which offers all the advantages of endoscopic and laparoscopic procedures to the patient and to the surgeon as well. However, the proper application of this method mandates careful patient selection, accurate preoperative diagnosis and appropriate preoperative planning.

References:

1. Kotidis E, Koimtzis G: Tips and tricks in laparoscopic gastrectomy. Hellenic Surgical Oncology, 2016; 7(2): 107–10
2. Blalock JB Jr.: History and evolution of peptic ulcer surgery. Am J Surg, 1981; 141(3): 317–22
3. Quan S, Frolkis A, Milne K et al: Upper-gastrointestinal bleeding secondary to peptic ulcer disease: Incidence and outcomes. World J Gastroenterol, 2014; 20(46): 17568–77
4. Kosmidis C, Efthimiadis C, Anthimidis G et al: Endoscopically assisted laparoscopic local resection of gastric tumor. BMC Res Notes, 2013; 6: 410
5. Samuel R, Bilal M, Tayyem O, Guturu P: Evaluation and management of gastrointestinal bleeding. Dis Mon, 2018 [Epub ahead of print]
6. Lanas A, Dumonceau JM, Hunt RH et al: Non-variceal upper gastrointestinal bleeding. Nat Rev Dis Primers, 2018; 4: 18020
7. Dworzynski K, Pollit V, Kelsey A et al., Guideline Development Group: Management of acute upper gastrointestinal bleeding: summary of NICE guidance. BMJ, 2012; 344: e3412
8. Spiliopoulos S, Inchingolo R, Lucatelli P et al: Transcatheter arterial embolization for bleeding peptic ulcers: A multicenter study. Cardiovasc Intervent Radiol, 2018 [Epub ahead of print]
9. Ntourakis D, Mavrogenis G: Cooperative laparoscopic endoscopic and hybrid laparoscopic surgery for upper gastrointestinal tumors: Current status. World J Gastroenterol, 2015; 21(43): 12482–97
10. Namikawa T, Hanazaki K: Laparoscopic endoscopic cooperative surgery as a minimally invasive treatment for gastric submucosal tumor. World J Gastrointest Endosc, 2015; 7(14): 1150–56
11. Schubert D, Kuhn R, Nestler G et al: Laparoscopic-endoscopic rendezvous resection of upper gastrointestinal tumors. Dig Dis, 2005; 23: 106–12
12. Ohata K, Murakami M, Yamazaki K et al: Feasibility of endoscopy-assisted laparoscopic full-thickness resection for superficial duodenal neoplasms. ScientificWorldJournal, 2014; 2014: 239627
13. Matsuda T, Nunobe S, Ohashi M, Hiki N: Laparoscopic endoscopic cooperative surgery (LECS) for the upper gastrointestinal tract. Transl Gastroenterol Hepatol, 2017; 2: 40
14. Kang W-M, Yu J-C, Ma Z-Q et al: Laparoscopic-endoscopic cooperative surgery for gastric submucosal tumors. World J Gastroenterol, 2013; 19(34): 5720–26
15. Isik A, Eken H, Demiryilmaz İ et al: Rectal Lymphoma. Kolon Rektum Hast Derg, 2015; 25: 106–8
16. Isik A, Firat D, Soyturk M et al: Idiopathic periportal lymphadenopathy. GMJ, 2016; 27: 51–52

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]