Single Surgical Approach for Gastric Gastrointestinal Stromal Tumor and Cholecystolithiasis by Laparoscopic Procedure

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ABSTRACT

Introduction: Gastrointestinal stromal tumor (GIST) is a rare neoplasm representing 80% of gastrointestinal neoplasms. Laparoscopic resection is only recommended for GIST less than 2 cm and 5 cm for laparoscopic wedge resection. Thus, a large GIST is recommended to complete resection through laparotomy. A large GIST of the gastric fundus can be found in patients, which coincides with an upper right abdominal quadrant pain caused by cholecystolithiasis. A suggested laparotomy for tumor resection and cholecystectomy may result in poor recovery in the post-operative period. Therefore, one approach surgery with minimally invasive laparoscopic partial gastrectomy using Endoflex stapler and cholecystectomy was performed to achieve the optimal outcome.

Case Presentation: A 43-year-old male had a major complaint of hematemesis and melena for one month and colicky pain in the right upper quadrant of the abdomen with increased intensity in the last two months. Contrast-enhanced abdominal MSCT revealed a solid 4.6 x 4 x 5.6 cm exophytic mass on the gastric fundus, added with 0.5 cm gall bladder stone. Laparoscopic partial gastrectomy and cholecystectomy were performed in a single minimal invasive surgical procedure. The post-operative period was uneventful. The patient experienced minimum pain, early mobilization, and better diet tolerance. He was discharged on day four after the surgery. Besides, the histopathologic result revealed a malignant mesenchymal tumor according to GIST with a tumor-free margin of resection.

Conclusions: Single approach surgery with minimal laparoscopic partial gastrectomy and cholecystectomy has provided optimal outcomes for patients with large GIST and cholecystolithiasis.

INTRODUCTION

A gastrointestinal stromal tumor (GIST) is a rare neoplasm. Although it represents only 0.1-3% of all gastrointestinal malignancies, 80% of gastrointestinal neoplasms are GISTs. Approximately 5,000 – 6,000 new cases are diagnosed per year in the United States for an annual incidence of 14.5 per million and a prevalence of 129 per million [1]. GIST originates from interstitial cells of Cajal, the pacemakers of the gastrointestinal tract, and the most common location is in the stomach [2].

Gastric GIST has a malignant potential since it can spread by hematogenous pathways to the solid viscera organs, including the liver, small bowel, and lungs [2,3]. The preferable curative treatment for GISTs is a surgical procedure. All patients with resectable gastric GISTs are recommended to perform a surgical procedure with radical resection without lymphadenectomy because it grows by expansion rather than diffuse infiltration. Besides, it rarely spreads to locoregional lymph nodes unless there is a pathological enlargement or has invaded surrounding organs, which would necessitate

en bloc resection to achieve a negative microscopic (R0) resection margin [1,3,4].

Many cases of GISTs, especially in patients with comorbidities and other unrelated diseases like the patient, in this case, are considered to perform minimally invasive surgery, which reduces post-operative discomfort and enhances recovery after surgery to reduce the length of stay. The extent of surgery is usually a wedge or segmental resection of the involved stomach or bowel without the necessary wide margins, as with adenocarcinoma. Laparoscopic wedge resection or partial gastrectomy for GIST gastric surgery has many advantages and similar oncological outcomes compared to laparotomy. During the surgical dissection, care must be taken to avoid disruption of tumor pseudo-capsule and prevent peritoneal seeding [3,4]. However, using laparoscopic to resect larger GIST and achieve free margin is a challenging technique and requires highly skilled operators. In addition, laparoscopic and laparoscopic-assisted resection of primary GIST has the same safety and feasibility not only for gastric GIST below 2 cm but also for a larger one. A series of 35 gastric GISTs (2–5 cm) resected laparoscopically showed no local or distant recurrences for tumors under 4 cm in size, while another study of 50 patients with gastric GIST (1.0–8.5 cm) resected laparoscopically or by assisted laparoscopy reported that 92% of patients were disease-free after three years of follow-up [1].

In this case, a patient with a 4.6 x 4 x 5.6 cm gastric fundus GIST coinciding with cholecystolithiasis was referred to our hospital. However, an open laparotomy to perform double resection might result in poor postoperative clinical outcomes. While performing a laparoscopic partial gastrectomy and cholecystectomy requires experienced operators, and even with minimal access, we could perform a single approach laparoscopic partial gastrectomy and cholecystectomy to achieve negative resection margins and better postoperative outcomes.

CASE PRESENTATION

A 43-year-old male came to our center with major sporadic hematemesis and melena symptoms for one month and colicky pain on his right upper quadrant of abdomen with increased intensity in the last two months. An esophagogastroduodenoscopy was performed and revealed a tumor on the gastric fundus with a smooth surface of mucosa without inflammation, erosion, and ulceration. However, ulceration was found at gastric cardia mucosa surface without any polyp or profuse bleeding (**Figure 1**).

An abdominal contrast-enhanced MSCT was performed for diagnosis and staging. A solid exophytic mass, lobulated on gastric fundus sized AP 4.6 x CC 4.5 x LL 5.6 cm, was found along with regional left gastro-

pancreatic multiple lymph node metastases without any liver or lung involvement. Based on the workup done to the case, we staged a T3N1M0 tumor according to the American Joint Committee on Cancer (AJCC) for gastric cancer. Besides, there was a single hyperdense lesion on the gall bladder suspect of cholecystolithiasis (**Figure 2**).

A laparoscopic procedure was then undertaken to remove the tumor, and a frozen section was done during surgery to decide on the surgical procedure by confirming the origin of tumor malignancy as the gold standard for diagnosis. From the endoscopic clinical of the tumor and abdominal CT scan, it is suspected whether the GIST is from adenocarcinoma or mesenchymal tissue such as GISTs. Then, we decided to perform a partial gastrectomy followed by cholecystectomy simultaneously. The patient was positioned under the general antithesis, and we used a midline infraumbilical Veress needle to create a CO₂ pneumoperitoneum condition and insert a 12-mm camera port. Two 5-mm trocars, one 12-mm trocar, and one 5-mm port in the midline below the xiphoid were used as access ports for the Nathanson liver retractor and working port when cholecystectomy was performed (**Figure 3**).

When laparoscopic and laparoscopy-assisted approaches for partial gastrectomy are undertaken, modified split leg positioning should be considered for heightened visualization and organ manipulation. In addition, a 30° angled camera and a reticulating laparoscopic stapler may assist in a safe resection and extraction of the tumor with a 2-cm safe resection margin. The goal of surgery for GIST is to perform a margin-negative resection. However, unlike visceral adenocarcinomas or sarcomas at other sites, wide margins are unnecessary. Wide margins beyond an R0 resection have not been definitively linked with increased survival or recurrence, particularly in the era of effective medical therapy. There are also no data indicating that patients with R1 (microscopically involved) resection require re-excision [1].

The tumor was found in the gastric fundus (**Figure 4**), and we made a dissection with Endo Harmonic focus scalpel through the lesser sac and lesser curvature of the stomach. The tumor was lifted away from the fundus with a grasper, and a stapled partial gastrectomy was performed utilizing an Echelon Flex™ (Ethicon), and then the stapled side was sutured on the stomach with 2.0 polyglycolic acid to prevent leakage from the resected side (**Figure 5**). The tumor was placed into an Endobag, and a frozen section biopsy was previously made to the Pathological Anatomy Laboratory for histopathological analysis. A frozen section was made to distinguish whether the tumor origin was from mesenchymal cells or suspicious adenocarcinoma. In the early growth of adenocarcinoma gastric cancer, the gross appearance of advanced gastric carcinoma can

Figure 1. Esophagogastric-duodenoscopy reveal Tumour on gastric fundus suspect GISTS (arrow)

Figure 2. Abdominal CT scan reveal solid mass on gastric fundus (yellow arrow) and Cholecystolithiasis (blue arrow)

Figure 3. Instruments access points

Figure 4. Tumor on gastric fundus

Figure 5. Laparoscopic partial gastrectomy using Echelon Flex™ stapler

Figure 6. (A) Histopathologic (400 x HPF) revealed oval and spindle nucleus (black arrow), pleomorphic and hyperchromatic nuclei features (green arrow), mitotic cells (red arrow), and eosinophilic cytoplasm (blue arrow); (B) Immunohistochemistry staining of CD 117 positive on tumor cells (black arrow) support the diagnose of GISTS.

be exophytic like GIST, ulcerated, infiltrative, or combined. Based on Borrmann's classification, the gross appearance of advanced gastric carcinoma type I for polypoid growth was like GISTs; we could determine the preferred surgical procedure based on the frozen section [8]. Then, we performed laparoscopic cholecystectomy in one stage, placed a gall bladder into an Endobag together with the tumor, and removed it endoscopically. Frozen section biopsy analysis revealed a malignant tumor from mesenchymal tissue with suspected gastrointestinal stromal tumor; thus, no further procedure was needed, and we finished the surgery.

Moreover, the histopathological analysis showed a CD117-positive malignant mesenchymal tumor confirming a gastrointestinal stromal tumor, and there were more than six mitoses per 50 high-powered fields (**Figure 6A and 6B**). The tumor was 5 cm in size; according to the National Institutes of Health's (NIH) GIST risk table, the histopathology showed a moderate grade of GIST [5].

The surgical procedure lasted 120 minutes, and there were no immediate postoperative complications. The post-operative period was uneventful, and there was minimum pain so the patient could mobilize early and better tolerate liquid intake. Within the third day of post-operation, the patient could tolerate a porridge diet. The patient was then discharged on the fourth day after the surgery.

DISCUSSION

GIST is a rare neoplasm that arises from the pacemaker cells of the intestinal tract called interstitial cells of Cajal. It is primarily located in the submucosa within muscularis propria or subserosa, solitary, and can degenerate into a malignant neoplasm [4,6]. Kindblom et al. [6] found that GIST expressed the CD117 antigen (C-kit) as a functioning antigen for the mutation responsible for activating this tumor growth [5].

GIST is also most frequently located in the stomach, followed by the small bowel. Patients may present with nonspecific symptoms of nausea, vomiting, abdominal distension, early satiety, abdominal pain, and rarely palpable abdominal mass. A larger tumor may obstruct the gastrointestinal lumen by endophytic growth or GIT compression from the exophytic growth leading to dysphagia, obstructive jaundice, or constipation, depending on the mass's location. Perforated neoplasms will present with signs of peritonitis or gastrointestinal bleeding. Indolent or massive intraperitoneal bleeding is secondary to pressure necrosis, and ulceration reveals a sign of hematemesis and melena [5].

The primary aims of laparoscopic as a surgical treatment for primary GISTs, which are less than 5 cm, resectable, and located in the stomach and small bowel, are to margin negative resection and preserve anatomical function [5]. The goal of surgery should be an R0

resection. The rupture of the tumor capsule during surgery is associated with an increased risk of recurrence [1]. In this case, the main goals of laparoscopic partial gastrectomy for primary fundus exophytic GISTs without involving D2 lymph nodes within other disease problems of regional anatomy such as cholecystolithiasis may be to perform a laparoscopic procedure with the same port access to minimize postoperative complications, preservation of remnant stomach, and enhance recovery after surgery with negative resection margin [1].

Moreover, the laparoscopic procedure for GIST gastric resection has many advantages over laparotomy. Chen et al. [7] retrospectively reviewed 58 cases of GIST. Sixteen cases (27%) underwent laparoscopic surgery (LSG), and 42 cases (73%) completed an open surgery (OSG). One LSG patient had a recurrence at a median follow-up of 33 months and two OSG patients at a median follow-up of 40 months. Post-operative recovery in the LSG group resumed a normal diet sooner, had a shorter length of stay, and required less pain management than the OSG group. Post-operative morbidity was 6.3 % and 19 % in the LSG and OSG groups, respectively. Laparoscopy seems a preferable resection method in GIST [5].

Gastric GIST is a relatively rare mesenchymal neoplasm with increasing diagnosis rates due to the widespread use of upper endoscopy and endoscopic ultrasound. According to previous serial cases series from De Vogelaere et al. [8], GIST with tumor size larger than 2 cm represents more than 80 % of cases, and partial gastrectomy method with a gross free surgical margin is accepted as a treatment method since GIST rarely involves the lymph nodes. However, the feasibility of laparoscopic resection for large GISTs greater than 10 cm in size according to the GIST classification system is limited based on the mitotic rate of more than 5 per 50 high-powered fields in gastric GIST, giving a high gastric metastasis and recurrence rate of about 55 %. Based on that, the GIST Consensus Conference in 2004 recommended the limitation of laparoscopic resection to the tumor with the size of less than 2 cm due to the increased risk of tumor rupture and spillage. Meanwhile, according to the consensus of Chinese experts, laparoscopic surgery is recommended for GISTs less than 5 cm [8–11].

The location of trocars during laparoscopic for partial gastrectomy procedure varies by tumor locations and operators and is not much different from the locations used in laparoscopic surgeries for early gastric cancer or Nissen fundoplication. The operator can stand either between the patient's legs or at the patient's right side according to the preferences. The trocar location for the linear stapler and the needle holder should be selected considering the direction of stapling or suturing. To make the stapler line perpendicular to the long axis of the stomach to avoid stenosis, the stapler may be

introduced from the left side. The trocar location is adjusted to the left and proximal for a lesion at the upper stomach and distally for a lesion in the lower stomach. One or two assistants' trocar and epigastric trocar for liver retraction can be added as needed; in this case, it can be used as a port for cholecystectomy procedures.

Furthermore, different laparoscopic surgical techniques are used depending on the size and location of the lesions. The location is in the fundus or body for anterior wall lesions, and the mass is elevated by grabbing nearby normal mucosa or adjacent soft tissue. For the lesions near the lesser or greater curvature, ligation of the vascular pedicle using a laparoscopic energy-based device can be applied, and the linear stapler can be applied to cut out the mass with nearby normal tissue; it is called the exogastric method. If the lesion is growing endophytically, a relatively large amount of normal mucosa is removed by a simple linear stapling method. To prevent stenosis after resection by removing excessive normal tissue, the stapler's direction should be perpendicular to the long axis of the stomach, and multiple staplers may be needed. In addition, the eversion technique can be applied within a gastrostomy made either proximally or distally with a negative gross margin of normal mucosa about half the length of the tumor circumference. The mass is then everted outside of the stomach, and the gastrostomy and normal mucosa attached to the mass are stapled in a direction perpendicular to the long axis of the stomach. In this technique, continuous suction of the intragastric contents and a nasogastric tube should be performed to minimize contamination and decompression of the stomach. For a lesion at the posterior wall of the stomach, it is often necessary not only to open the gastrohepatic ligament and rotate the stomach caudally but also to open the gastrocolic ligament and rotate the stomach cephalad even for a lesion close to the lesser curvature. The lesion then can be resected with an "exogastric" technique similar to that described for anterior lesions [2,10].

The current evidence shows that gastric GISTs resection performed conventionally through open surgery in the present and future can be achieved frequently by minimally invasive surgery with equivalent safety efficacy. The decision to perform an open or laparoscopic surgery depends on the site, size, and local invasion of the primary GISTs. Laparoscopic gastric GISTs surgery has many advantages, and more importantly, it can achieve similar oncological outcomes compared to open surgery. Laparoscopy partial gastrectomy is preferred for large GISTs between 4–5 cm, although total gastrectomy may be necessary in some complex cases. During the surgical dissection and resection, care must be taken to avoid disruption of the tumor pseudocapsule and, more importantly, intraperitoneal

implantation. Although complete surgical R0 resection of gastric GISTs may represent curative treatment, specific high-risk features of the resected GISTs can still give rise to disease recurrence [4,9,10].

CONCLUSIONS

Laparoscopic partial gastrectomy can be maintained for 4–5 cm large of the tumor, with a simple partial gastric resection technique with echelon flex™ (Ethicon) stapler used for GISTs in the gastric fundus with optimal preservation of the stomach. More importantly, it is to achieve a safety margin for surgery with a cholecystectomy procedure with a single laparoscopic approach to offer optimal outcomes, minimized pain, and well-tolerated food intake to enhance recovery after surgery.

DECLARATIONS

Ethics of Approval Consent to Participate

Written informed consent was obtained from the participants of the study.

Competing of Interest

The authors declare no competing interest in this study.

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