Laparoscopic Resection for Benign Tumors of the Stomach
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ABSTRACT

Background: Of all gastric tumors, less than 5% are benign. The traditional treatment of symptomatic and some asymptomatic benign tumors has ranged from mucosal resection to limited gastrectomy. Since the advent of laparoscopy, many different laparoscopic approaches to resection of benign gastric tumors have now been described in the literature.

Methods: We reviewed our experience with laparoscopic approaches to surgical resection of 7 benign gastric tumors. The tumor locations were the body (posterior wall), 3 cases; body (anterior wall), 1 case; lesser curvature, 1 case; fundus, 1 case, and antrum, 1 case. Laparoscopic wedge resection was done in 6 cases. The seventh patient underwent a Billroth I procedure because he had leiomyoma at the antrum. There was no conversion to laparotomy.

Results: The mean operative time was 105±15 minutes, and mean blood loss was 50±15 mL. The mean length of hospital stay was 5 days. There were no complications or mortalities. Tumor size ranged from 2 cm to 6 cm in the greatest diameter. There has been no tumor recurrence with a mean follow-up of 26 months.

Discussion: Laparoscopic approach is slowly carving a niche for itself in the treatment of benign tumors of the stomach. The basic principles are obtaining a precise preoperative pathological diagnosis; accurate tumor localization; achievement of tumor-free margins; avoidance of spillage of stomach contents, careful dissection of tumors in the esophagogastroduodenal junction, and preventing tumor seeding.

Conclusion: Based on ours and other studies, laparoscopic resection of benign gastric tumors is safe and feasible.

Key Words: Benign gastric tumors, Laparoscopic resection, Tumor localization, Combined approach.

INTRODUCTION

Benign neoplastic lesions can arise from any component of the gastric epithelium: glandular, endocrine, or mesenchymal. The gastric epithelium, especially mucosa is composed of numerous epithelial, neural, and endocrine cells arranged in glands that are distributed to perform specialized functions. Any of these cells have the potential for neoplastic transformation. Fewer than 5% of all stomach tumors are benign. Most benign stomach tumors are asymptomatic and are found during examinations performed for unrelated symptoms. The most common presenting finding is anemia from chronic occult bleeding. Less commonly, epigastric pain or acute GI bleeding from tumor ulceration occurs.

Gastrointestinal stromal tumors (GIST) account for 1% to 3% of all resected gastric tumors and are the most common submucosal masses found in the stomach. Tumors may be benign or malignant, but here we will only deal with the benign variety, which is of unknown cause, and its incidence is unclear. Gastric stromal tumors are solitary, usually asymptomatic, lesions that can bleed, become obstructive, or even degenerate into malignant neoplasms. On endoscopy, such a tumor may go unnoticed unless it ulcerates the overlying mucosa. Establishing a diagnosis when these lesions are encountered usually is not possible with limited biopsies. Submucosal gastric tumors are rare, accounting for 5% of all gastric tumors. These tumors are termed heterotopic, corresponding to normal endocrine or connective tissue developing in an ectopic location.

The diagnosis is based on endoscopy, computed tomography, and especially findings on endoscopic ultrasonography. It is the only method that can identify the intramural nature of the tumor, with a diagnostic precision of 92%. The precise localization of the tumor in the different layers may be suggestive of the histological type, but the entire tumor must be examined to establish a definite diagnosis. Surgery is mandatory for symptomatic tumors, but its role in asymptomatic tumors (especially small-sized tumors) is still controversial. Until recently, laparotomy has been the preferred procedure despite significant morbidity, but the advent of minimally invasive surgery has stimulated several studies regarding laparoscopic resec-
tion of submucosal gastric tumors. A limited number of cases has been reported in the literature, and to date only 2 series have included more than 30 patients. We present our series of 7 patients with benign gastric tumors that we studied retrospectively at our institute.

METHODS

At our institution, we have encountered 7 patients with benign gastric tumors. There were 4 cases of GIST and 3 cases of leiomyoma. The symptoms were similar in most of these patients, regardless of the pathological type of tumor. Most common (in 5 cases) symptoms were vague upper abdominal pain and dyspepsia. The other 2 patients had hematemesis. Endoscopy and biopsy was done in all cases. Endoscopically, the lesions were well-circumscribed, mucosal ulcerations were seen in 4 cases, and in 2 cases the tumor bled when touch, mimicking carcinoma. Histopathological examination revealed 4 cases of benign GIST and 3 cases of leiomyoma. CT scan showed no serosal involvement and no lymph node enlargement. The size of the tumors ranged from 2cm to 6cm. The extent and type of resection for the tumors were based on the exact location and size. Table 1 indicates the location, number, and type of tumor.

After receiving general anesthesia under endotracheal intubation, the patient was placed in a lithotomy position with both legs abducted 30°. The surgeon stood between the patient’s legs with the camera surgeon and the operative assistant on the right and left sides of the patient, respectively.

A 10-mm trocar (optic) was placed in the umbilicus, 10-mm trocar in the left (right-hand working) midclavicular line, a 5-mm trocar at the right (left-hand working) midclavicular line, and a 5-mm trocar inserted under the xiphoid (liver retraction). An additional 5-mm trocar in the left midclavicular line at the left iliac fossa region is helpful for providing caudal traction on the stomach.

The first order of business is to accurately localize the tumor, as the location will decide the extent of resection (Figure 1). It is also important to confirm the distance between tumor and esophagogastric junction after the tumor is localized.

Omentum dissection is begun from the middle-inferior pole of the spleen and proceeds along outside of the left gastroepiploic vascular arch. After entering the omental bursa, the gastric posterior wall is turned to the right by a fan retractor (Tyco Health Care Group LP, Mansfield, MA). Next, the short gastric vessels are coagulated and cut with the Harmonic scalpel to completely divide the gastric fundus from the superior pole of the spleen.

Resection of the gastric fundus is achieved by firing an EndoGIA staple. The firing times of the EndoGIA depends on the size of tumors. Complete resection of tumors with a sufficient margin in our cases required 2 to 3 sequential firings. When the EndoGIA was placed near the left side of the cardia, special care was taken to ensure that the esophagogastric junction was not involved so as to avoid postoperative esophageal stenosis.

For the tumor of the proximal lesser curvature, the left gastric artery was divided with a Harmonic scalpel (Figure 2). Wedge resection was done using a staple (Figures 3 and 4). Intracorporeal seromuscular stitches were taken to cover the staple line (Figure 5).

Wedge resection was done in 6 patients. For tumors of the posterior wall, gastrotomy on the anterior gastric wall and excision of the tumor on the posterior gastric wall with the

| Location                  | Number (Type)                                                                 |
|---------------------------|------------------------------------------------------------------------------|
| Body (posterior wall)     | 3 (1 Gastrointestinal stromal tumor and 2 leiomyomas)                         |
| Body (anterior wall)      | 1 (Gastrointestinal stromal tumor)                                           |
| Lesser curvature          | 1 (Gastrointestinal stromal tumor)                                           |
| Fundus                    | 1 (Gastrointestinal stromal tumor)                                           |
| Antrum                    | 1 (leiomyoma)                                                                |

Figure 1. Tumor located in the lesser curvature, near the esophagogastric junction.
EndoGIA stapler was performed. The classical Billroth I operation was performed for the patient with leiomyoma of the antrum (Figure 6). The antrum (with tumor) was resected with an endostapler (Figure 7). Gastroduodenal anastomosis was done laparoscopically by intracorporeal suturing (Figures 8 and 9).

Specimens were taken out through the 10-mm port after enlarging it (Figure 10). A specimen bag was used in all cases to avoid tumor seeding. The pathology examination was routinely carried out after the procedure.

RESULTS

No complications, such as anastomotic leak, hemorrhage, or wound infection, occurred. No mortalities occurred. Mean blood loss was about 50 mL, and no peroperative blood transfusions were given. The mean operating time was 105 minutes. All patients except one started a liquid diet on the second postoperative day (POD), a soft diet the next day, and were discharged on the fourth POD. The other patient (who underwent the Billroth I procedure) moved his bowels only on the fourth POD, so he was discharged on the sixth POD. Drainage tubes were kept in
for 48 hours in all the cases. They were removed after oral gastrograffin study confirmed the absence of leaks. No conversions were necessary. Histopathological examination confirmed 4 cases of GIST and 3 cases of leiomyoma. Resected margins were free of tumor with evidence of malignancy. Patients were followed up for 26 months (mean). No evidence of recurrence was noted on endoscopy.

**DISCUSSION**

Clinically, benign gastric tumors are difficult to differentiate from malignant ones. Even in benign tumors, malignant transformation, severe complications of obstruction, and bleeding may take place later. So, active measures should be taken to surgically resect the tumors. If the nature of the tumor remains doubtful, surgical resection should be performed. The most appropriate surgical approach remains to be determined. The only indication for gastrectomy concerns tumors involving the gastric orifices, tumors of 5 cm or more in size, and tumors with a wide implantation base prohibiting wedge resection. As to the resection depth, the tendency is to remove the total layer of gastric wall. Several laparoscopic procedures are described in the literature for benign tumors of the stomach. The various options are a totally laparoscopic ap-
approach (wedge resection, intragastric resection, transgastric endoluminal resection, distal gastrectomy, and gastrojejunostomy) and a combined laparoscopic-endoscopic approach (Endo-organ intragastric resection, double endoscopic intraluminal operation (DEILO), transgastric tumor-evert ing resection, enucleation.

Recent advances in miniaturized laparoscopic instrumentation have expanded the laparoscopic options, including intraluminal resection. A totally laparoscopic approach was used for all our cases. Because of difficult diagnosis and malignant phenotype, resulting in liver metastasis and peritoneal dissemination, it is desirable to treat this disease with as little manipulation as possible. Laparoscopic wedge resection of GIST has been shown to be safe and effective. The removal of these tumors at the esophagogastric junction is not amenable to a typical local resection because of anatomic inaccessibility and potential luminal restriction after resection. Tumors of the posterior wall are resected using laparoscopic intragastral resection, and tumors located in the anterior wall are resected using the lesion-lifting technique or routine laparoscopic wedge resection. Through our technique, we could avoid intraperitoneal contamination, splenic injury, and postoperative esophageal stenosis. Exophytic tumors are easily identified, both in the anterior and posterior wall, but small intramural tumors or tumors lying close to the pylorus may be difficult to identify. Most surgeons use preoperative endoscopy to locate the tumor in difficult situations, guiding the resection with transillumination. Laparoscopic ultrasonography would be an attractive solution. With an endoscope, the extent of the resection, bleeding, or stenosis can also be checked at the end of the procedure. Avoiding a gastrotomy reduces the risk of contamination but has some drawbacks, such as the cost of the stapling material and the impossibility of checking the quality of the resection. Also the risk of bleeding along the staple line is present. Tumor localization is the main criterion for a decision on an extra- or intragastral approach.

The location of some tumors makes resection more difficult. If the tumor lies in or near the fundus, the entire upper portion of the stomach may have to be mobilized. If the tumor lies posteriorly, a posterior access to the tumor may be required after opening the omental bursa. Otherwise an anterior access may be achieved via anterior gastrotomy. Tumors lying near the cardia or the pylorus must be removed with as little healthy tissue as possible to avoid stenosis of the gastric lumen. Small gastric leiomyomas can be resected by a totally laparoscopic approach, assisted with intraoperative laparoscopic ultrasonography because the lesions cannot be palpated. Laparoscopic distal gastrectomy with gastrojejunostomy is done for tumors of the pylorus. A combined laparoscopic-endoscopic approach allows precise localization of the lesion by direct visualization. Laparoscopic resection of benign gastric tumors is a reliable and safe method as shown by data in the literature. The conversion rate has varied from 0% to 22%. Operative time is not much longer than that with laparotomy, and there is an advantage in terms of less postoperative pain, earlier oral feeding, and shorter hospital stay. The mean duration of the postoperative hospital stay was 5 days (range, 4 to 6) in our patients, similar to that in many reports. Routine use of drains could be attributed to paranoia and is probably not necessary. Cheng et al compared a series of 9 patients who underwent laparoscopic resection with 9 others who underwent laparotomy. These authors stressed the uncomplicated postoperative period after laparoscopy. Matthews et al reported a comparative study of 33 patients and found that no significant differences existed in mean operative time, mean estimated blood loss, or perioperative complication rate between the laparoscopic and open groups, respectively. The mean length of stay was significantly less in the laparoscopic group. The laparoscopic approach is not without drawbacks and raises several problems. The question of whether laparoscopic resection increases the risk of tumor seeding arises. The hypothetical risk of perioperative tumor dissemination exists. It can be minimized by strictly adhering to the rules of oncology: avoid repeated exsufflation and tumor manipulation, prefer closed stomach resection, extraction of the surgical...
A specimen in a bag, wash out the peritoneum and ports at the end of the procedure. To date, there has been no report of tumor dissemination after resection of connective tissue tumors of the stomach.

CONCLUSION

With the advent of minimally invasive surgery, laparoscopic resection has become the first choice of many surgeons. Comparative studies show that laparoscopic resection of GIST is safe and appropriate. Tumor size, operating time, and estimated blood loss was equivalent to that with the open approach, and there was a statistically shorter hospital stay in the laparoscopic group. Based on our experience, laparoscopic surgery (especially combined with endoscopy) can be recommended as the first-line approach for benign submucosal gastric tumors, conversion still being possible in case of difficulty.

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