

# Simultaneous use of gastroscopy and laparoscopy for resection of gastrointestinal stromal tumors

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## ABSTRACT

**Introduction:** Gastrointestinal stromal tumors (GIST) are rarely seen mesenchymal tumors originating from interstitial cells of Cajal. Today, with the wide use of minimally invasive techniques, laparoscopic surgery has come to the forefront in GIST surgery. The simultaneous use of laparoscopic gastric wedge resection (LGWR) and intraoperative gastroscopy is a surgical technique that relieves the surgeon. This article presents cases in which simultaneous intraoperative gastroscopic observations and LGWR were performed in appropriate GIST cases in one clinic.

**Materials and Methods:** The data of patients who underwent intraoperative gastroscopy and LGWR simultaneously due to GIST at the Kartal Koşuyolu High Specialty Training and Research Hospital between January 2014 and December 2015 were evaluated retrospectively.

**Results:** Between January 2014 and December 2015, 12 patients underwent intraoperative gastroscopy and LGWR simultaneously. When the endoscopic and radiological localizations of the tumors were examined, they were in the upper part in 7 patients, the middle part in 3 patients, and the lower part in 2 patients. The median tumor size was 4.4 cm (range: 2.7–6.3 cm) and the size of the resected stomach material was 6.7 cm (range: 4.5–9 cm). According to the Fletcher risk classification, 7 patients were among the low risk group and 5 patients were considered to be in the moderate risk group.

**Conclusion:** The LGWR procedure for GIST is a reliable and feasible method for centers with advanced laparoscopic surgery experience. The advantages of simultaneous gastroscopy include determining tumor localization, verifying removal of the tumor with negative surgical margins before the development of stenosis, and providing simultaneous evaluation of bleeding or leakage from the stapler line.

**Keywords:** Endoscopy; gastrointestinal stromal tumor; laparoscopy.

## Introduction

Gastrointestinal stromal tumors (GIST) are mesenchymal tumors originating from Cajal cells responsible for motor function in the intestinal wall. GISTs are a rarely seen tumor group and constitute less than 1% of the primary tu-

mors of the gastrointestinal tract. Although the incidence in the community is unknown, the incidence is thought to be 1 in 100,000.<sup>[1,2]</sup>

GISTs can locate in any portion of the gastrointestinal tract from esophagus to rectum.<sup>[3]</sup> In non-metastatic GISTs, the



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primary treatment option is surgery. The purpose of the surgery is to obtain a negative surgical margin.<sup>[4]</sup>

Today, with the common usage of minimally invasive techniques, laparoscopic surgery has come to the forefront in GIST surgery.<sup>[5]</sup> However, there can be some difficulties during application of laparoscopic techniques. The small size of the tumor and the absence of extragastric prolapse or posterior gastric wall lesions make laparoscopic resection difficult. In addition, laparoscopic gastric wedge resection (LGWR) in tumors lying near the cardia or the pylorus is complicated by stenosis that may develop after resection.<sup>[6]</sup>

The simultaneous performance of LGWR with intraoperative gastroscopy renders the procedure easier thanks to gastroscopic and laparoscopic determination of the localization of the tumor. Other advantages of simultaneous intraoperative gastroscopy include prevention of stenosis that can develop after wedge resection especially in tumors near pylorus and cardia and provision of hemostasis by realizing intraoperative staple line bleedings.<sup>[7]</sup>

In this article, we aimed to present cases in which simultaneous intraoperative gastroscopic observations and LGWR were performed in appropriate GIST cases in our clinic.

## Materials and Methods

Between January 2014 and December 2015, data of the patients who underwent surgery due to GIST at Kartal Kosuyolu High Specialization Training and Research Hospital were evaluated retrospectively. All patients had standard preoperative evaluation along with gastroscopy and intravenous (iv) contrast enhanced thoraco-abdominal computed tomography (CT) for preoperative tumor localization. The files of the patients who underwent intraoperative gastroscopy and LGWR simultaneously were scanned. From the file data the age, gender, height, weight, body mass index (BMI), endoscopic and radiological localization of tumor, the tumor size, type of operation, duration of operation, use of intraoperative gastroscopy, amount of hemorrhage during operation and from the pathology reports the tumor cell type, size, surgical margin distance, number of mitoses and GIST risk stratification scores were recorded.

Operations were performed under general anesthesia in lithotomy and reverse trendelenburg position. Veress needle was used to create pneumoperitoneum and a 10 mm

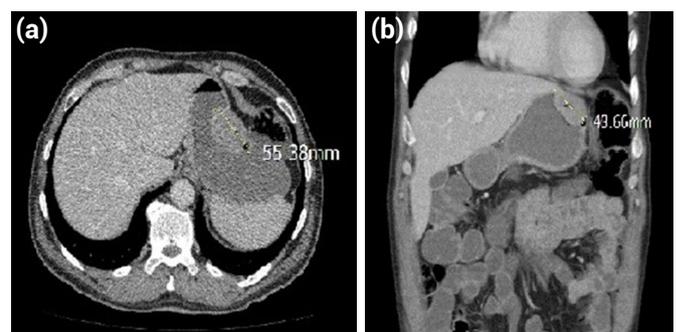
port was inserted under umbilicus. With a 10 mm flexible laparoscope, ports of 5 mm, 10 mm and 5 mm were inserted under direct vision to the right midclavicular line, the left midclavicular line and the left axillary line respectively. Upper gastrointestinal endoscopy was performed by another surgeon at this stage for intraoperative tumor localization. In posterior gastric wall tumors omental dissection was performed first with the help of vessel sealing device (Ligasure™, Covidien, Mansfield, MA) and the posterior gastric wall was visualized. Under endoscopic observation, laparoscopic suture/clip marking was performed on the area where tumor was located. Subsequently, laparoscopic wedge resection was performed with the help of an endoscopic linear stapling device. During and after the resection, it was evaluated whether the tumor was within the safe surgical margin, whether it caused narrowing during resection of the tumor close to the cardia or pylorus, and whether there was bleeding or leakage from the stapler line, and the resection material was removed with endobag.

Written informed consent for the operation was obtained from all patients presented in this study. This study was conducted according to Declaration of Helsinki Ethical Principals for Medical Research.

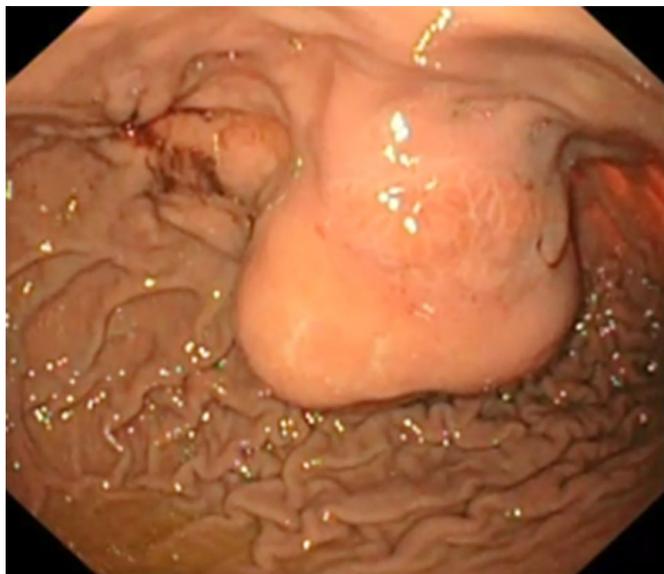
Statistical analysis; Statistical Package for the Social Sciences (SPSS 21 Inc., Chicago, IL, USA) computer software was used for bio-statistical analyses. When the data were presented as mean values their standard deviation values, when they were presented as median values their minimum-maximum values were also stated.

## Results

Between January 2014 and December 2015, a total of 21 patients underwent surgery for GIST in Kartal Kosuyolu High Specialization Training and Research Hospital. 9 of the



**Figure 1.** Computed tomography scan [(a) axial, (b) coronal] revealed a dumbbell shaped solid mass measuring approximately 5.5 cm × 4 cm.



**Figure 2.** Intraoperative endoscopic view of GIST.

patients underwent open surgery (distal gastrectomy for 5 patients, wedge resection for 4 patients). In 12 patients, intraoperative gastroscopy and LGWR were performed simultaneously.

Among the patients who underwent intraoperative gastroscopy and LGWR simultaneously, 5 were male (41.6%), 7 were female (58.3%) and the mean age was 59.1 (46–75 years). The mean body mass index (BMI) of the patients was 31.7 kg/m<sup>2</sup> (min 27–max 37). In preoperative evaluation medical history was obtained from all patients. As standard, blood tests, upper gastrointestinal endoscopy



**Figure 3.** Intraoperative laparoscopic view of GIST.

and oral + i.v. contrast thoraco-abdominal CT were performed on all patients (Fig. 1). In preoperative evaluation endoscopic ultrasonography and fine needle aspiration biopsy were not performed on any of the patients.

In all of the patients, operation was completed laparoscopically using 4 ports as described previously (Fig. 2, 3). The 10 mm port area on the left midclavicular line was expanded and the materials were removed with an endobag. Median operative time was 128 min (min 100–max 150 min) and mean operative blood loss was 28.5 ml. No bleeding or leakage from the staple line during simultaneous endoscopy was observed.

When the endoscopic and radiological locations of the tumors were examined, they were on anterior gastric wall in 8 patients and posterior gastric wall in 4 patients, in upper part of the stomach in 7 patients, middle part in 3

**Table 1.** Pathological characteristics of GISTs

Cases	Tumor Location Gastric Wall	Tumor Localization	Tumor Size (cm)	Specimen Size (cm)	Surgical Margin Distance (mm)	Number of Mitoses (/50 HPF)	GIST risk group
1	Posterior	Upper	3x3	6x5	10	4	Low
2	Anterior	Upper	5.5x4	7.2x6	14	2	Intermediate
3	Anterior	Upper	6x4.5	9x8	16	2–3	Intermediate
4	Anterior	Middle	6x4	9x8	15	1–2	Intermediate
5	Anterior	Upper	4.5x4.3	6.5x5.5	25	4	Low
6	Anterior	Lower	2.7x2.5	4.5x3.5	5	2	Low
7	Posterior	Middle	3.5x3	6.8x5.5	15	3	Low
8	Anterior	Lower	3.1x2.1	4.5x3.5	5	3	Low
9	Posterior	Upper	4.2x2.7	6.1x4	12	2	Low
10	Anterior	Middle	5.1x3.8	7.5x5	15	2	Intermediate
11	Posterior	Upper	3.8x2.3	5.6x4	8	2–3	Low
12	Anterior	Upper	6.3x4.1	8x5.6	12	3	Intermediate

patients and lower part in 2 patients far enough to pylorus or esophagogastric junction (Table 1).

The pathological features of the resected material are given in Table 1. The median tumor size was 4.4 cm (min 2.7 cm–max 6.3 cm) when the greatest size was considered, and the median resection material size of stomach was 6.7 cm (min 4.5 cm–max 9 cm) again when the greatest size was considered. The result of the histopathologic evaluation was compatible with the postoperative GIST and negative surgical margins were succeeded in all resection material by pathological examination.

Risk classification was made as described by Fletcher et al.<sup>[8]</sup> According to this, 7 patients were in low risk group and 5 patients were in middle risk group (Table 1).

## Discussion

As there is no diffusion to non-tumor tissue in GIST surgery, excision with negative surgical margin is sufficient instead of removal with 1-2 cm surgical margin as mentioned in the previous publications. Also, there is no need for lymph node dissection as the rates of nodal metastases are very low.<sup>[4]</sup>

The most appropriate approach for gastric submucosal tumors or GISTs is still controversial. While minimally invasive method is the preferred method for lesions <2 cm, the risk of malignancy increases with lesions larger than 5 cm and some authors put emphasis on the need to prefer open methods complying with the principles of oncology in this group of patients.<sup>[9]</sup>

Laparoscopic procedures are becoming increasingly widespread in GIST surgery. This technique was first used by Ohgami et al. in 1999 and “lesion-lifting partial gastrectomy” technique was developed.<sup>[10]</sup> The LGWR procedure for SMTs is a reliable and feasible method for centers with advanced laparoscopic surgery experience.<sup>[11]</sup>

LGWR is easily performed in small gastric SMTs with extraluminal extension located in the 1/3 middle part of the stomach, however, traditionally, open surgical methods are preferred to obtain a negative surgical margin in large tumors or in tumors located on posterior stomach wall or near the esophagogastric junction.<sup>[12]</sup> Nevertheless, studies are available in the literature reporting successful performances of LGWR in large tumors, in tumors located in esophagogastric junction or on the posterior wall of the stomach.<sup>[13–15]</sup>

During LGWR, there is a risk of stenosis in tumors located in the esophagogastric junction or near the pylorus. With simultaneous gastroscopy, the intraluminal opening is easily evaluated and development of stenosis after inserting staple is also evaluated instantly.<sup>[16]</sup> Other advantages of simultaneous gastroscopy include; giving information to the laparoscopist during operation in terms of best technique to perform, localization of the tumor, simultaneous verification of removal of the tumor with negative surgical margins, and simultaneous evaluation of staple line bleeds or leaks.<sup>[14,16]</sup>

Today, with the continuous development of endoscopic invasive techniques, simultaneous use of LGWR and endoscopic mucosal resection (EMR) has been increased. The authors of this technique reports that combination of conventional LGWR and EMR make operation easier and shorten the duration of the surgery. Especially in the tumors located in the entry or exit of the stomach, unnecessary stomach tissue is removed through conventional LGWR in relation to the angulation during staple insertion but, this can be avoided by combination of the operation with EMR.<sup>[17,18]</sup>

The average tumor size in our series was 4.4 cm. When the tumor location was taken into account, they were in upper part in 7 patients, in middle part in 3 patients and in lower part in 2 patient far enough to pylorus or esophagogastric junction. During surgery and in the follow-ups, no stenosis or bleeding due to resection was observed in any patient. When pathological pieces were examined in all patients, surgical margins were sufficient.

The limitations of the study are retrospective design, limited number of patients and lack of comparison group.

## Conclusion

As a result; we think that intraoperative gastroscopy for all patients, who are planning to go LGWR, will increase the surgical reliability as it gives information about intraoperative tumor localization and also enables evaluation of stenosis, hemorrhage and leaks that may develop at the same time. A comparative study of the patient group performed without gastroscopy during LGWR will reveal the advantages of concurrent endoscopy in a clearer way.

## Disclosures

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**Ethics Committee Approval:** Retrospective study.

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** None declared.

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