

## LAPAROSCOPIC SURGERY FOR THE TREATMENT OF GASTROINTESTINAL STROMAL TUMORS: EXPERIENCE FROM DA NANG HOSPITAL

Dang Van Thoi<sup>1</sup>, Nguyen Hoang<sup>2</sup>

<sup>1</sup>Department of Surgery, Da Nang University of Medical Technology and Pharmacy, Vietnam

<sup>2</sup>Department of Gastrointestinal Surgery, Da Nang Hospital, Vietnam

### ABSTRACT

**Background:** *Gastrointestinal stromal tumors (GISTs) are the most common mesenchymal neoplasms of the gastrointestinal tract. Surgical resection with negative margins remains the cornerstone of curative treatment. Laparoscopic surgery has increasingly been adopted because of its safety and favorable perioperative outcomes. This study aimed to describe the clinical and paraclinical characteristics of GIST and to evaluate the early outcomes of laparoscopic surgery for GIST treatment.*

**Methods:** *A cross-sectional descriptive study was conducted in 48 patients with pathologically confirmed gastrointestinal stromal tumors who underwent laparoscopic surgery at Da Nang Hospital from January 2022 to August 2023.*

**Results:** *The mean age was 52.2 years, and the female-to-male ratio was 1.2:1. The stomach was the most common tumor location (54.2%), followed by the small intestine (27.1%). Abdominal pain was the most frequent presenting symptom (75.0%). Tumor detection rates were 77.3% by ultrasonography and 97.9% by computed tomography. The mean tumor size was 6.21 cm, and spindle-cell morphology accounted for 91.7% of cases. Laparoscopic surgery was completed successfully in 89.6% of patients, whereas 10.4% required conversion to open surgery. No intraoperative complications were recorded. The mean postoperative hospital stay was 6.1 days, and postoperative complications occurred in 4.2% of patients, all of which were mild surgical site infections.*

**Conclusion:** *GISTs often present with non-specific clinical manifestations. Diagnosis should be based on a combination of imaging and histopathological evaluation, especially computed tomography and pathological examination. Laparoscopic surgery is a safe and effective treatment option for GIST and is associated with favorable early postoperative outcomes.*

**Keywords:** *Gastrointestinal stromal tumor, GIST, laparoscopic surgery, surgical outcomes.*

### I. INTRODUCTION

Gastrointestinal stromal tumors (GISTs) are the most common mesenchymal tumors of the gastrointestinal tract and are believed to originate from the interstitial cells of Cajal [1]. In current pathological practice, GISTs are defined as mesenchymal neoplasms of the digestive tract characterized by positivity for CD117 and frequently associated with mutations in the KIT or PDGFRA genes, with histological

patterns ranging from spindle-cell to epithelioid morphology [2]. Before the recognition of their distinct immunohistochemical and molecular features, these tumors were often misclassified as leiomyomas, leiomyosarcomas, or schwannomas because of overlapping histopathological appearances [3].

Clinically, most GISTs present with non-specific symptoms that vary according to tumor size and location, including abdominal pain, abdominal

---

Received: 13/3/2026. Revised: 25/4/2026. Accepted: 29/4/2026.

Corresponding author: Dang Van Thoi. Email: dvthoi@dhktyduocdn.edu.vn. Phone: +84 972468234

distension, palpable mass, fatigue, poor appetite, and weight loss. Some patients present with complications such as gastrointestinal bleeding, perforation, or, less commonly, bowel obstruction. Others are detected incidentally during abdominal ultrasonography, computed tomography (CT), or gastrointestinal endoscopy [4]. Definitive diagnosis relies on histopathology and immunohistochemical examination.

Although many GISTs were previously considered benign, current evidence indicates that these tumors carry variable malignant potential, which is strongly related to tumor size and mitotic activity [2, 3]. Complete surgical resection with negative margins remains the primary treatment modality. However, postoperative recurrence remains clinically relevant, especially in advanced or locally invasive disease [5].

In Vietnam, several studies have reported the clinical features and treatment outcomes of GIST. At Da Nang Hospital, laparoscopic surgery for GIST has been routinely performed; however, local data on clinical characteristics and surgical outcomes remain limited. Therefore, this study was conducted with two objectives: (1) to describe the clinical and paraclinical characteristics of gastrointestinal stromal tumors, and (2) to evaluate the early outcomes of laparoscopic surgery for GIST treatment.

## **II. MATERIALS AND METHODS**

### **2.1. Study design and setting**

This was a cross-sectional descriptive study conducted at the Department of Gastrointestinal Surgery, Da Nang Hospital, Vietnam. The study included patients who underwent laparoscopic surgery for gastrointestinal tumors and were subsequently confirmed to have gastrointestinal stromal tumors (GISTs) by postoperative histopathological examination. The study period extended from January 2022 to August 2023.

### **2.2. Study population**

The study population consisted of patients with pathologically confirmed GIST after surgical resection. Patients were included if they had undergone an initial laparoscopic approach for a gastrointestinal tumor and had a final postoperative histopathological diagnosis of GIST.

Patients were excluded if the final pathological diagnosis was not GIST, if the tumor was treated by primary open surgery without an initial laparoscopic approach, or if essential clinical, operative, or pathological data were incomplete for analysis.

### **2.3. Data collection and preoperative assessment**

Data were collected retrospectively from medical records using a standardized data extraction form. The recorded variables included age, sex, presenting clinical symptoms, preoperative imaging findings, tumor location, tumor size, histological morphology, operative approach, conversion to open surgery, intraoperative complications, postoperative complications, length of hospital stay, and discharge outcome.

Clinical manifestations recorded in this study included abdominal pain, palpable abdominal mass, gastrointestinal bleeding, poor appetite, weight loss, and anemia. Preoperative imaging assessment was based mainly on abdominal ultrasonography and computed tomography. The detection of the tumor by ultrasonography and computed tomography was recorded for descriptive analysis.

### **2.4. Surgical management**

All patients were initially managed using a laparoscopic approach. The operative procedure was selected according to tumor location, tumor size, and intraoperative findings. Laparoscopic surgery was considered completed when tumor resection was achieved without conversion to open surgery.

Conversion to open surgery was recorded when the laparoscopic approach could not be completed and an open procedure was required. Intraoperative complications were recorded based on operative reports.

### **2.5. Histopathological evaluation**

All resected specimens were examined by postoperative histopathology. The pathological variables recorded for this study included final diagnosis, tumor size, and histological morphology. Histological morphology was classified as spindle-cell, epithelioid-cell, or mixed-cell type according to the pathological report.

### **2.6. Outcome assessment**

Early surgical outcomes were assessed during the index hospitalization. The evaluated

outcomes included laparoscopic completion rate, conversion rate, intraoperative complications, postoperative complications, total hospital stay, postoperative hospital stay, and discharge outcome.

Postoperative complications were recorded when documented in the medical records. Overall outcome at discharge was categorized as good recovery and discharge, severe postoperative condition, discharge against medical advice, or death.

**2.7. Statistical analysis**

Data were entered into a database and analyzed descriptively. Categorical variables were summarized as frequencies and percentages. Continuous variables were expressed as mean, standard deviation, and range when appropriate. Results were presented in tables according to tumor location, operative approach, postoperative complications, and overall outcome.

**2.8. Ethical considerations**

This study used data obtained from routine clinical care and hospital medical records. Patient information was kept confidential, and personal identifiers were removed during data collection and analysis. The study was conducted in accordance with institutional regulations for retrospective clinical research.

**III. RESULTS**

A total of 48 patients with pathologically confirmed GIST underwent laparoscopic surgery during the study period.

The stomach was the most common tumor site, accounting for 54.2% of cases, followed by the small intestine (27.1%). Tumors of the colorectum accounted for 14.5%, whereas duodenal GISTs were uncommon, representing only 4.2% of cases (Table 1).

**Table 1:** Distribution of tumor location

Tumor location	n	%
Stomach	26	54.2
Duodenum	2	4.2
Small intestine	13	27.1
Colorectum	7	14.5
Total	48	100.0

The mean age of the patients was 52.2 years, and GIST was slightly more common in females, with a female-to-male ratio of 1.2:1. The most frequent presenting symptom was abdominal pain, reported in 75.0% of patients. Other common manifestations included a palpable abdominal mass (41.7%), gastrointestinal bleeding (27.1%), poor appetite and weight loss (20.1%), and anemia (20.1%). Regarding imaging, abdominal ultrasonography detected the tumor in 77.3% of examined patients, whereas computed tomography identified the lesion in 97.9%, indicating a high diagnostic yield for CT in this cohort. The mean tumor size on pathological examination was 6.21 cm. Tumors measuring 5-10 cm constituted the largest subgroup. Histologically, spindle-cell morphology predominated, accounting for 91.7% of cases, while mixed-cell morphology was rare.

Laparoscopic surgery was completed successfully in 43 of 48 patients (89.6%), while 5 patients (10.4%) required conversion to open surgery. Successful laparoscopic resection was achieved in all gastric and small-intestinal GISTs. In contrast, both duodenal tumors and 3 of 7 colorectal tumors required conversion or were technically more challenging (Table 2). No intraoperative complications were recorded in this series.

**Table 2:** Surgical approach according to tumor location

Tumor location	Laparoscopic completion, n (%)	Conversion to open surgery, n (%)	Total, n (%)
Stomach	26 (54.2)	0	26 (54.2)
Duodenum	0	2 (4.2)	2 (4.2)
Small intestine	13 (27.1)	0	13 (27.1)
Colorectum	4 (8.3)	3 (6.2)	7 (14.5)
Total	43 (89.6)	5 (10.4)	48 (100.0)

## Laparoscopic surgery for the treatment of gastrointestinal...

The mean total hospital stay was  $9.15 \pm 2.3$  days (range: 5-14 days), whereas the mean postoperative hospital stay was  $6.1 \pm 1.6$  days (range: 3-9 days). Early postoperative complications were uncommon. Overall, 46 patients (95.8%) had an uneventful postoperative course. Only 2 patients (4.2%) developed early complications, both of which were mild surgical site infections. No cases of pneumonia, postoperative bleeding, multiorgan failure, severe deterioration, or postoperative death were observed (Table 3). All 48 patients (100.0%) had a good recovery and were discharged from the hospital. No patient developed severe postoperative deterioration or was discharged against medical advice (Table 4).

**Table 3:** Early postoperative complications and overall outcome

Variable	n	%
No complication	46	95.8
Surgical site infection	2	4.2
Urinary tract infection	0	0
Pneumonia	0	0
Bleeding/multiorgan failure	0	0
Total	48	100.0

**Table 4:** Overall outcome

Overall outcome	n	%
Good recovery/discharged	48	100.0
Severe condition/ discharge against advice	0	0

## IV. DISCUSSION

In the present study, the mean age of patients was 52.2 years, and most cases occurred in middle-aged and older adults. This finding is consistent with previous reports showing that GIST can occur at any age but is most commonly diagnosed in middle-aged or elderly patients, whereas occurrence in younger individuals is relatively uncommon [6,7]. Female predominance was observed in our cohort, with a female-to-male ratio of 1.2:1, which is comparable to several Vietnamese studies [8,9].

With respect to tumor location, the stomach was the most frequent site, followed by the small

intestine. Duodenal and colorectal GISTs were much less common. This distribution is in agreement with both national and international data showing that GISTs can arise anywhere along the gastrointestinal tract but are most commonly located in the stomach and small bowel [4,10].

Clinically, abdominal pain was the most common presenting symptom, followed by palpable mass and gastrointestinal bleeding. These manifestations are non-specific and largely depend on tumor size, location, and growth pattern. Similar symptom profiles have been reported in previous studies, in which abdominal pain was the predominant complaint [8,11]. The relatively high proportion of patients presenting with a palpable mass in our study may reflect delayed presentation and larger tumor size at the time of diagnosis. At the same time, the literature also recognizes that many GISTs are asymptomatic and may be discovered incidentally during imaging or endoscopy [2,4].

Imaging plays a central role in the diagnostic work-up of GIST. In our series, ultrasonography detected the lesion in 77.3% of cases, whereas CT identified the tumor in 97.9%. This confirms the practical value of CT as the most informative preoperative imaging modality, providing details about tumor location, size, relation to adjacent organs, and possible metastatic lesions. Previous reports have also emphasized that GISTs on CT are often well-defined, hypervascular masses with heterogeneous enhancement, sometimes showing necrosis, hemorrhage, or cystic degeneration [11,12].

On pathological examination, the mean tumor size in our study was 6.21 cm, which is comparable to previously published series [9,13]. Most tumors were less than 10 cm in diameter, and spindle-cell morphology was the dominant histological subtype. This finding is in line with the known pathology of GIST, in which spindle-cell tumors account for the great majority of cases [2,14].

Regarding surgical treatment, laparoscopic resection was successfully completed in 89.6% of patients, while 10.4% required conversion to open surgery. Conversion occurred mainly in duodenal and colorectal tumors, likely because of anatomical complexity and technical difficulty in these locations. Gastric GISTs were managed successfully

by laparoscopy in all cases, most commonly using wedge resection. Small-intestinal GISTs were also well suited to laparoscopic segmental resection. These results are consistent with previous studies showing that laparoscopic surgery is feasible and safe for selected GISTs, particularly those located in the stomach and small bowel, provided that oncologic principles are respected, including avoidance of tumor rupture and achievement of negative resection margins [5,15,16].

Early postoperative outcomes in our cohort were favorable. The mean postoperative stay was 6.1 days, no intraoperative complications were recorded, and only 4.2% of patients developed postoperative complications, all of which were mild wound infections. No severe postoperative morbidity or mortality was observed. These findings support the safety of laparoscopic surgery for GIST and are in accordance with previous reports showing low perioperative morbidity and short hospital stay after minimally invasive resection [15,17].

This study has some limitations. First, the sample size was relatively small. Second, the study was conducted at a single center. Third, follow-up was limited to early postoperative outcomes, so recurrence, long-term survival, and postoperative quality of life could not be assessed. Nevertheless, the study provides useful local evidence regarding the clinical features and early surgical outcomes of GIST treated by laparoscopy in routine practice.

### V. CONCLUSION

Gastrointestinal stromal tumors often present with non-specific symptoms, making diagnosis challenging on clinical grounds alone. A combination of imaging studies, especially computed tomography, and histopathological examination is essential for accurate diagnosis. Laparoscopic surgery is a safe and effective treatment option for GIST, with a high completion rate, low complication rate, and favorable early postoperative outcomes. Further studies with larger sample sizes and longer follow-up are needed to better evaluate recurrence and long-term prognosis.

### Conflict of interest

The authors declare that they have no conflict of interest.

### REFERENCES

1. Miettinen M, Lasota J. Gastrointestinal stromal tumors: review on morphology, molecular pathology, prognosis, and differential diagnosis. *Arch Pathol Lab Med.* 2006;130(10):1466-1478.
2. Foo WC, Liegl-Atzwanger B, Lazar AJ. Pathology of gastrointestinal stromal tumors. *Clin Med Insights Pathol.* 2012;5:23-33.
3. Nguyen Van Hai, Do Dinh Cong. *Gastrointestinal Surgery.* Thanh Nien Publishing House; 2016.
4. Bui Trung Nghia. Clinical and paraclinical characteristics and surgical treatment outcomes of gastrointestinal stromal tumors at Viet Duc Hospital from January 2005 to December 2010. Residency thesis. 2011.
5. Blay JY, Bonvalot S, Casali P, Choi H, Debiec-Richter M, Dei Tos AP, et al. Consensus meeting for the management of gastrointestinal stromal tumors. Report of the GIST Consensus Conference of 20-21 March 2004, under the auspices of ESMO. *Ann Oncol.* 2005;16(4):566-578.
6. Unalp HR, Derici H, Kamer E, Bozdogan AD, Tansug T, Onal MA. Gastrointestinal stromal tumours: outcomes of surgical management and analysis of prognostic variables. *Can J Surg.* 2009;52(1):31-38.
7. Zhu H, Yang G, Ma Y, Huo Q, Wan D, Yang Q, et al. Update of epidemiology, survival and initial treatment in patients with gastrointestinal stromal tumour in the USA: a retrospective study based on SEER database. *BMJ Open.* 2023;13(7):e072945.
8. Pham Minh Hai. Clinical and paraclinical characteristics and early outcomes of surgical treatment for gastrointestinal stromal tumors. University of Medicine and Pharmacy at Ho Chi Minh City; 2008.
9. Diep Bao Tuan. Diagnosis and treatment of gastrointestinal stromal tumors. Doctoral dissertation. University of Medicine and Pharmacy at Ho Chi Minh City; 2016.
10. Shen C, Wang C, He T, Cai Z, Yin X, Yin Y, et al. Long-term survival among patients with gastrointestinal stromal tumors diagnosed after another malignancy: a SEER population-based study. *World J Surg Oncol.* 2020;18:88.
11. Nguyen Thanh Sang. Clinical and paraclinical characteristics and early outcomes of surgery for gastric gastrointestinal stromal tumors. University of Medicine and Pharmacy at Ho Chi Minh City; 2012.
12. Wang L, Ni Z, Xu W, Mei Y, Li C, Zhu Z, et al. Clinical characteristics and outcomes of gastrointestinal stromal tumor patients receiving surgery with or without TKI therapy: a retrospective real-world study. *World J Surg Oncol.* 2023;21:21.

## *Laparoscopic surgery for the treatment of gastrointestinal...*

13. Al-Kalaawy M, El-Zohairy MA, Mostafa A, Al-Kalaawy A, El-Sebae H. Gastrointestinal stromal tumors (GISTs), 10-year experience: patterns of failure and prognostic factors for survival of 127 patients. *J Egypt Natl Canc Inst.* 2012;24(1):31-39.
14. Colakoglu-Akgul N, Gunel H, Beyazadam D, Ozsoy MS. Gastrointestinal stromal tumors: recurrence and survival analysis of 49 patients. *Middle East J Dig Dis.* 2023;15(1):19-25.
15. Poškus E, Petrik P, Petrik E, Lipnickas V, Stanaitis J, Strupas K. Surgical management of gastrointestinal stromal tumors: a single center experience. *Videosurgery Miniinv.* 2014;9(1):71-77.
16. Liu DN, Jia WW, Wang HY. Cytoreductive surgery offers prognostic benefits in metastatic gastrointestinal stromal tumors with generalized progression following imatinib therapy: a single-institute retrospective study. *BMC Surg.* 2023;23:189.
17. Unalp HR, Derici H, Kamer E, Bozdog AD, Tansug T, Onal MA. Gastrointestinal stromal tumours: outcomes of surgical management and analysis of prognostic variables. *Can J Surg.* 2009;52(1):31-38.