



Clinicopathological Properties of Mesenchymal Tumors of the Stomach and Surgical Treatment Outcomes

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Abstract

Background: Mesenchymal tumors are part of a heterogeneous group of neoplasms.

Objectives: The present study investigated the clinicopathological properties and surgical outcomes of patients with gastric mesenchymal tumors who underwent surgical treatment.

Methods: This study included all cases who underwent surgical treatment for mesenchymal tumors in Başakşehir Çam and Sakura City Hospital, Turkey, between August 2020 and August 2022. The demographic data and clinical properties of the patients, operative details, postoperative assessments, pathological specifications of the tumor, and immunohistochemical analysis results were evaluated.

Results: The study included 14 patients, 57% of whom were male. Patients had a mean age of 59.7±9.3 years. The most frequent American Society of Anesthesiologists (ASA) score was ASA 2 in 10 (72%) patients, and the mean hemoglobin level was 12±1.9 g/dl. All patients underwent wedge resection, 5 (35.7%) by a minimally invasive method. The mean duration of operation was 98.9±29.4 min. There were no intraoperative complications, conversions, or postoperative mortalities, and the mean duration of hospital stay was 6.2±3.2 days. One patient made an unplanned re-admission to the hospital due to inadequate oral intake. As an adjuvant treatment, three patients were prescribed imatinib. The tumor location was most frequently the corpus in 5 (36%) patients, and the mean tumor diameter was 62±35.2 mm. Stromal tumors were the most common histological type in 10 (72%) patients, and the other histological types were leiomyoma in 3 (21%) and pancreatoblastoma in 1 (7%) patient. The median and maximum Ki-67 index were 3 and 80, respectively, and the median and maximum mitotic index were 3 and 18, respectively. The number of dissected lymph nodes was nine in one patient and five in another. The surgical margin was positive in one patient, and no patient had a perforated tumor.

Conclusion: Among the different types of mesenchymal tumors of the gastrointestinal system, which are rare, stromal tumors are the most common histological type. Gastric mesenchymal tumors can be safely treated with wedge resection, an approach that is associated with low postoperative morbidity and mortality.

Keywords: Mesenchymal tumor, Stomach, Wedge resection

1. Background

Mesenchymal tumors are a heterogeneous group of neoplasms that include malignant, intermediate malignant, and benign components. Sarcomas are extremely rare, constituting only 1% of malignancies in adults. Mesenchymal lesions can rarely develop in the gastrointestinal (GI) channel. Benign soft tissue neoplasms have an incidence that is 100-fold higher than malignant forms (1).

The vast majority of tumors in the GI system are epithelial. Both epithelial and mesenchymal tumors occur in the GI channel, with GI stromal tumors (GIST) being the most common mesenchymal tumors in this location. Mesenchymal tumors other than GISTs are extremely rare and originate from mesodermal tissues, resembling their counterparts in soft tissue. They are in a large spectrum and originate in muscle tissue, nerve tissue, fat and connective tissue, and vessel elements (2).

Recent developments in the treatment of GIST have rendered the diagnosis and differential diagnosis of such tumors more important. Immunohistochemical

panel applications facilitate diagnosis in GIST and should include Cluster of Differentiation-117 (CD117), Cluster of Differentiation-34 (CD34), desmin, and actin. Extensive experience is required to understand the behavior of the tumor and predict the outcome of the disease, but gaining such experience is difficult due to the low incidence of GISTs. Studies to date have taken a powerful statistical approach due to the rarity of the neoplasms, and series in the literature present only limited information due to the low number of patients (3, 4).

Although this subject has been addressed in many studies, analysis has been complicated due to the heterogeneous patient population and the variety in clinical presentations, anatomical localizations, and morphological properties (5, 6).

2. Objectives

The present study aimed to evaluate the clinicopathological properties and the outcomes of surgical treatment in patients with gastric mesenchymal tumors who underwent surgery.

3. Methods

Following the granting of approval for the study by the local Ethics Committee, all cases of gastric mesenchymal tumors identified in the pathological database of Başakşehir Çam and Sakura City Hospital, Turkey, who presented to the center between August 2020 and August 2022 were included in the study. Tumors studied immunohistochemically were included in this retrospective, descriptive, and single-centered study, while lesions other than mesenchymal tumors and all assumed mesenchymal tumors with no immunohistochemical staining were excluded from the analysis.

Data were collected from the medical case notes, electronic patient records, and pathology reports of individual patients. Analysis was conducted on the demographic data of the study patients, including age and gender, American Society of Anesthesiologists (ASA) score, preoperative hemoglobin (Hb) and albumin values, tumor markers, the status of neoadjuvant treatment, the applied surgical treatments, the duration of surgery, the status of intraoperative complications, reoperation, 30-day mortality, 90-day unplanned readmission to the hospital (as the postoperative quality markers), tumor localization, tumor diameter, tumor type, mitotic activity, Ki-67 index, the results of immunohistochemistry staining, the number of dissected lymph nodes, and the status of adjuvant treatment.

The severity of surgical morbidity was graded according to the Clavien-Dindo classification. Complications that had been treated under general anesthesia were those classified as higher than 3, and those without general anesthesia were the ones classified as 3 or lower (7). Mitotic activity was assessed by counting the number of cells undergoing mitosis under $\times 50$ high-power fields. Patients were seen in the first week and the first month after surgery to assess early postoperative outcomes. A long-term follow-up was planned according to the National Comprehensive Cancer Network (NCCN) guidelines (8). In addition, as an adjuvant treatment, the patients who had tumors greater than 5 cm received imatinib therapy, according to the NCCN guideline (8).

3.1. Surgical Technique

The open or minimally invasive approach was chosen by the surgeons, according to their own experiences. An upper midline incision was used in the open approach, and four horizontal laparoscopic trocar configurations were used through the upper abdominal wall in the minimally invasive approach. The greater omentum and adjacent organs were divided from the gastric wall, if necessary, using bipolar sealing energy devices. Afterward, the gastric wall, including the tumor,

was excised in a wedge shaped by surgical stapling devices. No planned lymph node dissection was made.

3.2. Statistical Analysis

The IBM SPSS Statistics for Windows (Version 24.0, Armonk, NY: IBM Corp.) was used for the statistical analysis of the data. Categorical data were expressed in numbers and percentages, and continuous data as mean and standard deviation (also median and minimum-maximum values, where required).

4. Results

The study included 14 patients with a mean age of 59.7 ± 9.3 years, 8 (57%) of whom were male. The most common ASA score was ASA 2 in 10 (72%) patients, and the mean Hb was 12 ± 1.9 g/dl. Demographic values are presented in Table 1. None of the patients received neoadjuvant treatment.

All patients underwent wedge resection, 5 (35.7%) of which were by the minimally invasive approach. The mean operation duration was 98.9 ± 29.4 min, with no intraoperative complications, conversions, or postoperative mortality. The mean duration of the hospital stay was 6.2 ± 3.2 days. One patient developed a cerebrovascular event in the postoperative period; none of them needed reoperation, and one made an unplanned re-admission to the hospital due to inadequate oral intake. Three patients who had tumors greater than 5 cm received imatinib therapy. The findings from the intraoperative and postoperative periods are presented in Table 2.

Table 1. Characteristics of patients

	N (%)
Age mean\pmSD (min-max)	59.7 \pm 9.3 (48-82)
Gender	
Male	8 (57)
Female	6 (43)
ASA score	
1	1 (7)
2	10 (72)
3	3 (21)
Hemoglobin g/dl mean\pmSD (min-max)	12 \pm 1.9 (8.5-15.2)
Albumin g/l mean\pmSD (min-max)	41.3 \pm 5.3 (31-51)
CEA mean\pmSD (min-max)	2.13 \pm 0.9 (0.9-3)
CA19.9 median (min-max)	9.8+7.1 (3.4-20.6)

ASA: American Society of Anesthesiologists; CEA: Carcinoembryonic Antigen; CA: Carbohydrate Antigen

The tumor location was most frequently the corpus in 5 (36%) patients, with a mean tumor diameter of 62 ± 35.2 mm, and stromal tumors were the most common type in 10 (72%) patients. The median and maximum Ki-67 index were 3 and 80, respectively, and the median and maximum mitotic index were 3 and 18, respectively. Although lymph node dissection is not routinely performed in mesenchymal tumors, the number of dissected lymph nodes was nine in one patient and five in another.

The surgical margin was positive in one patient. None of the patients had a perforated tumor. The GIST was the most common histological type in 10 (72%) patients, and the other histological types were leiomyoma in 3 (21%) and pancreatoblastoma in 1 (7%) patient. The characteristics of tumors are shown in Table 3.

Table 2. Intraoperative and postoperative outcomes

	N (%)
Duration of operation (min)	98.9±29.4 (60-155)
Intraoperative complications	0
Postoperative mortality	0
Type of operation (Wedge resection)	Laparoscopic 5 (35.7) Conventional 9 (64.3)
Conversion	0
Length of postoperative hospital stay (days)	6.2±3.2 (4,2)
Reoperation	0
Clavien-Dindo degree of complication	1 12 (86) 2 1 (7) 4 1 (7)
Ninety-day readmission to the hospital	Impaired oral intake 1 (7)

5. Discussion

Mesenchymal tumors of the GI system are rare, with the most common histological type being GIST. The diagnosis is guided by a standard pathological examination and immunohistochemistry. Patients diagnosed with gastric mesenchymal tumors in a two-year period at a newly established clinic were evaluated. The vast majority of patients had stromal tumors and were managed with wedge resection, with a low morbidity rate.

No significant difference in gender was reported in gastric GIST cases, which have been reported most frequently in older adults in the literature. The mean age was 60.0±68.8 years (9-11). The distribution between genders and the mean age at diagnosis in this study resembled the findings in the literature. Surgery remains the main potentially curative treatment for localized and resectable primary diseases in mesenchymal tumors. The goal of surgery is to achieve a macroscopic resection with a microscopically negative margin (R0) and to avoid tumor rupture (R2). Tumor resection with the preservation of the related organ (namely, the stomach or intestine) is generally sufficient. In general, wedge resection of the stomach is adequate for gastric mesenchymal tumors, although total or subtotal gastrectomy has been applied in some cases in the literature. The diameter of the tumor can guide the surgical approach and contribute to prognosis determination and risk stratification in cases with mesenchymal tumors of the stomach. The localization of the tumor may sometimes preclude the application of the desired approach due to anatomical challenges (12-14). All patients in the series were treated with wedge resection. The localization and diameter of the

Table 3. Characteristics of tumor

	N (%)	
Tumor localization	Antrum	1 (7)
	Cardia	4 (28.5)
	Corpus	5 (36)
	Fundus	4 (28.5)
Tumor Diameter mm	62±35.2 (25-160)	
Histology of the Tumor	GIST	10 (72)
	Leiomyoma	3 (21)
	Pancreatoblastoma	1 (7)
Ki67 index median (min-max)	3 (1-80)	
Mitotic index median (min-max)	3 (0-18)	
Cd117 (+)(Total)	12 (13)	
Cd34 (+)(Total)	12 (13)	
Desmin (+)(Total)	2 (13)	
S100 (+)(Total)	1 (12)	
SMA (+)(Total)	4 (12)	
Dog1 (+)(Total)	11 (13)	

GIST: Gastro Intestinal Stromal Tumor; Cd: Cluster of Differentiation; S100: Serum 100; SMA: Smooth Muscle Actin; Dog: Discovered on GIST

tumor, as well as the experience of the surgeons, contributed to the selection of the least invasive surgical approach to the mesenchymal tumors, and a partial colectomy was added to the operation due to colonic invasion in the case of a pancreatoblastoma. Malignancy risk stratification, which is determined by such factors as the diameter of the tumor and the mitotic index, can serve as a guide for prognosis in cases with GIST (15,16). The case series in the present study comprised patients with relatively low mitotic and Ki-67 indexes, compared to the findings in the literature. Pancreatoblastoma had increased the mean tumor diameter.

Immunohistochemical markers, such as CD117, CD34, and Discovered on GIST-1, are used to differentiate GISTs from other GIT tumors, such as leiomyoma (17), while the Ki-67 index is used to determine the proliferative index. Nevertheless, staining with all the antibodies may have negative results in some poorly differentiated mesenchymal tumors that are considered to have high malignancy potential (18). Immunohistochemical markers can guide the typing of mesenchymal tumors, and the immunohistochemical properties of the pancreatoblastoma in the present series differed from those of stromal tumors and leiomyomas.

True leiomyomas of the stomach are rare. In previous studies, GISTs were referred to as leiomyomas; however, staining with c-KIT is negative, and with desmin and smooth muscle actin, it is powerfully and widely positive in true leiomyomas (19). Differentiating between GISTs and leiomyomas is clinically important since leiomyomas are benign, while GISTs may undergo variable progression. In the present series, three cases had leiomyomas with a small tumor diameter, and one of these had

pancreatoblastoma, being a primary neoplasm of the pancreas. In rare cases, they can also occur in extra-pancreatic organs. As it originated in the stomach, we opted to include this case in the study.

Surgical treatment is considered adequate in patients with low-risk GIST; however, treatment with imatinib has long been recommended by the European Society for Medical Oncology and the NCCN in cases with metastatic disease, recurrence, or tumor rupture (20,21). Three patients in the present study were prescribed imatinib based on the positive surgical margin and the diameter of the tumor.

This study has some limitations, including the limited number of patients and the single-center retrospective design. The inclusion of only gastric mesenchymal tumors, however, resulted in a homogeneous patient group.

6. Conclusion

Gastric mesenchymal tumors can be safely treated with wedge resection, with low postoperative morbidity and mortality. Extensive organ-specific patient series are required to further clarify this subject. The evaluation of the results of rare cancers, such as mesenchymal tumors, can be cumbersome; however, we believe the present study makes some important points that will help determine future trends.

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Footnotes

Conflicts of Interest: The authors declare no conflicts of interest.

Author Contribution: SY wrote the paper and reviewed the literature. UT and YN collected data and drafted tables. IC and EK collected and interpreted the data. EE, ZT, and HB made final revisions and gave the final style to the paper. HB and UT conceived and designed the study. All authors have approved the final version of the manuscript.

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