Internal Medicine
The Japanese Society of Internal Medicine
doi: 10.2169/internalmedicine.3645-24
Intern Med 64: 705-709, 2025
http://internmed.jp

【 CASE REPORT 】

Gastric Leiomyosarcoma Completely Resected by Endoscopic Submucosal Dissection after a Precise Preoperative Diagnosis

Kazuma Yachi[1], Waku Hatta[1], Tomoyuki Koike[1], Kimiko Kayada[1], Naotaro Tanno[1], Yohei Ogata[1], Masahiro Saito[1], Xiaoyi Jin[1], Kaname Uno[1], Naoki Asano[1], Akira Imatani[1], Hirofumi Watanabe[2], Fumiyoshi Fujishima[2] and Atsushi Masamune[1]

Abstract:
A 68-year-old woman was diagnosed with leiomyosarcoma (LMS) based on preoperative biopsy of the gastric body. As tumor invasion confined to the submucosa with no breaking of the submucosal layer was confirmed on endoscopic ultrasonography (EUS), the patient underwent endoscopic submucosal dissection (ESD) for gastric LMS, resulting in complete tumor resection. No apparent recurrence was observed in the 2.5 years after treatment. This is an extremely rare case of gastric LMS that underwent ESD after a precise preoperative diagnosis, with no signs of recurrence after treatment. ESD may be an acceptable option for gastric LMS when EUS findings allow this treatment method.

Key words: leiomyosarcoma, gastric, endoscopic submucosal dissection, endoscopic ultrasonography

(Intern Med 64: 705-709, 2025)
(DOI: 10.2169/internalmedicine.3645-24)

Introduction

Discovery of the *KIT* gene mutation in 1998 (1) enabled differentiation between gastrointestinal leiomyosarcoma (LMS) and gastrointestinal stromal tumors. Although many tumors arising from mesenchymal cells were diagnosed as LMS before 1998, gastrointestinal LMS is currently recognized as a rare tumor, accounting for only 1.1% of gastrointestinal mesenchymal tumors (2). Colorectal LMS is the most common location of LMS, whereas gastric LMS is the least common (3). Furthermore, endoscopic resection of LMS has rarely been reported. In this study, we report a case of gastric leiomyosarcoma that was preoperatively diagnosed and completely resected via endoscopic submucosal dissection (ESD).

Case Report

A 68-year-old Japanese woman with no specific symptoms underwent esophagogastroduodenoscopy (EGD) during a medical checkup. EGD revealed a small submucosal tumor in the gastric body in which an atypical leiomyoma was suspected in a biopsy specimen. The patient was referred to our institution for further examination and treatment. The patient had no relevant medical or family history. She smoked 10 cigarettes per day for 35 years and drank 350 mL of beer per day (14 g ethanol equivalent). Clinical examination and laboratory studies revealed unremarkable results. Serum anti-*Helicobacter pylori* (*H. pylori*) IgG antibody (*H. pylori*-LATEX "SEIKEN," Denka Ltx, Tokyo, Japan) was negative (<3 U/mL). White light imaging at our institution showed a discolored, elevated subepithelial tumor of 15 mm in size with an uneven surface, located on the greater curvature of the gastric lower body (Fig. 1A), indicating that the endo-

[1]Division of Gastroenterology, Tohoku University Graduate School of Medicine, Japan and [2]Department of Pathology, Tohoku University Hospital, Japan
Received: February 13, 2024; Accepted: June 16, 2024; Advance Publication by J-STAGE: August 1, 2024
Correspondence to Dr. Waku Hatta, waku-style@festa.ocn.ne.jp

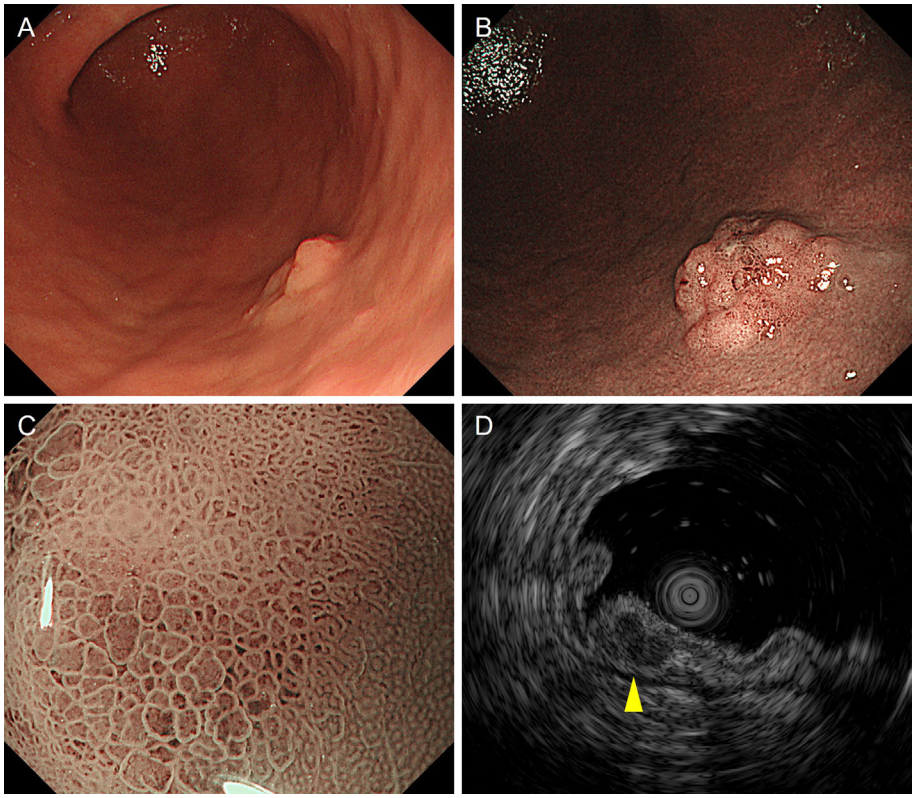

Figure 1. Endoscopic images of the case with gastric LMS. White light imaging and NBI with and without magnification showed a discolored, elevated subepithelial tumor with an uneven surface on the greater curvature of the gastric lower body (A-C). EUS with a 20 MHz miniprobe showed a homogeneous hypoechoic mass (yellow arrowhead) in the second and third sonographic layers. However, the third sonographic layer was not broken (D). LMS: leiomyosarcoma, NBI: narrow band imaging, EUS: endoscopic ultrasonography

scopic features of this tumor were different from those of other subepithelial tumors, including typical leiomyomas or gastrointestinal tract tumors (4). The borderline of the lesion was relatively clear on narrow-band imaging (NBI) (Fig. 1B), and magnifying endoscopy with NBI revealed small and large glandular structures without an irregular microvascular pattern (Fig. 1C). Endoscopic ultrasonography (EUS) with a 20 MHz miniprobe showed a homogeneous hypoechoic mass in the second and third sonographic layers; however, the third sonographic layer, corresponding to the submucosa, was not broken (Fig. 1D). Biopsy from the top of the tumor revealed bundle-like proliferation of pleomorphic spindle cells with high-grade nuclear atypia on Hematoxylin and Eosin (H&E) staining (Fig. 2A, B). These cells were positive for α-smooth muscle actin (Fig. 2C), desmin (weakly positive) (Fig. 2D), and h-caldesmon (weakly positive), but negative for CD34, c-kit, DOG-1, and MyoD1. Furthermore, the Ki-67 labeling index was estimated to be 30-40%. Based on these findings, the tumor was preoperatively diagnosed as a gastric LMS extending from the mucosa to the submucosa. Enhanced computed tomography (CT) and positron emission tomography-CT revealed no metastases. Since lymph node dissection is not recommended for gastric mesenchymal tumors due to the low incidence of regional lymph node metastasis (5), we decided to perform ESD for local resection of gastric LMS.

The tumor was resected en bloc without complications in ESD, and macroscopically, the tumor measured 15×14 mm in size (Fig. 3A-C). The ESD specimens were cut into longitudinal slices of 2 mm in width after fixation in 10% buffered formalin. In H&E staining (Fig. 4A-F), the tumor included 2 areas: 1) an area consisting of spindle cells showing smooth muscle differentiation and pleomorphic cells with severe atypia that extended from the mucosa to the submucosa (Fig. 4B, E); and 2) an area consisting of spindle cells differentiating for smooth muscle that extended to the mucosa with no destruction of the muscularis mucosa (Fig. 4C, F). Representative images of immunostaining are shown in Fig. 5A-I. The tumor cells were positive for α-smooth muscle actin (Fig. 5B), weakly positive for desmin (Fig. 5E), and weakly positive for h-caldesmon in the former area, whereas they were strongly positive for α-smooth muscle actin (Fig. 5C), positive for desmin (Fig. 5F), and weakly positive for h-caldesmon in the latter area. The tumor cells were negative for S-100, CD34, c-kit, DOG-1, and MyoD1 in both the areas. The Ki-67 labeling index was 50% (Fig. 5G-I) and the mitotic index was 7 per 10 high-power fields. Based on these findings, the diagnosis of gastric LMS was confirmed. The tumor was considered to have originated from the muscularis mucosa. No vessel invasion

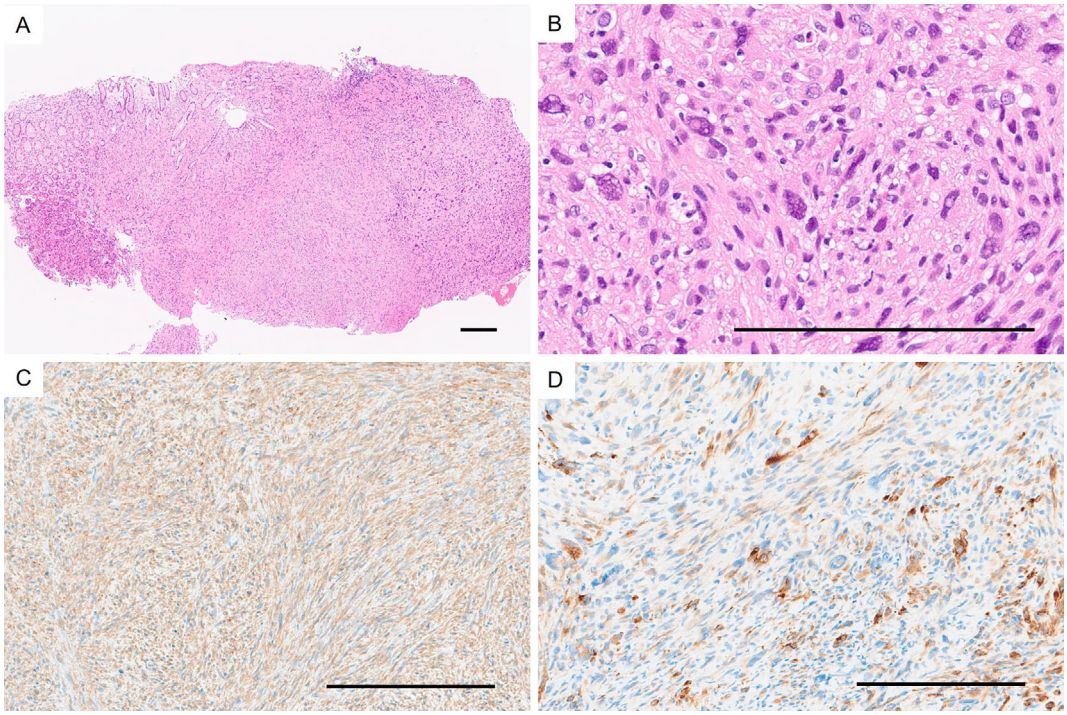

Figure 2. **Pathological findings of the preoperative endoscopic biopsy specimen. Hematoxylin and Eosin staining showed bundle-like proliferation of pleomorphic spindle cells with high-grade nuclear atypia (A and B). Immunostaining showed that the tumor cells were positive for α-smooth muscle actin (C) and weakly positive for desmin (D). Bar=200 μm.**

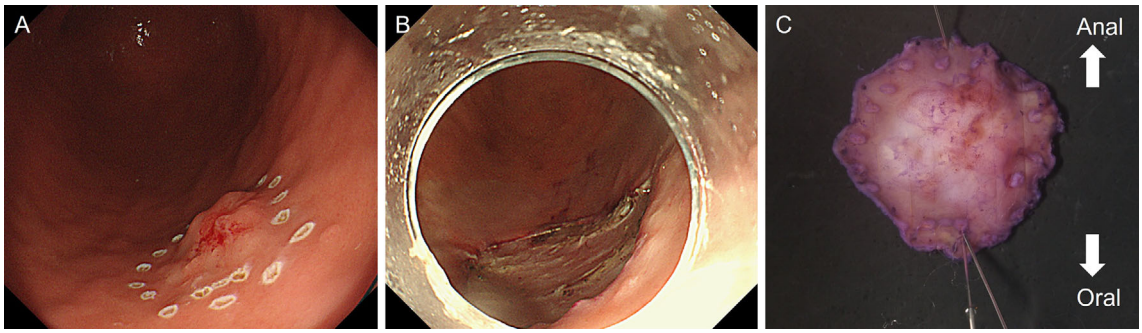

Figure 3. **ESD for gastric LMS. ESD was performed for gastric LMS (A, B) and no complications occurred. Macroscopically, the tumor had a maximum diameter of 15 mm (C). ESD: endoscopic submucosal dissection, LMS: leiomyosarcoma**

was confirmed by CD34 or Elastica-Masson staining. Since the resection margin was negative with a vertical residual distance of 80 μm (Fig. 4D) and complete tumor elimination was achieved, no additional treatment was performed after ESD, and the follow-up examinations of enhanced CT and EGD were scheduled at an interval of 0.5 years for 5 years. No apparent recurrence was observed in the 2.5 years after treatment.

Discussion

Gastrointestinal LMS is rare among gastrointestinal mesenchymal tumors, and gastric LMS is extremely rare (2, 3). To our knowledge, only 24 cases of gastric LMS have been reported worldwide, including our own case.

To date, only 2 cases have undergone endoscopic resection for primary gastric LMS; furthermore, the preoperative diagnosis of LMS was not acquired in any of these cases (6, 7). Thus, this is the first case of endoscopic resection after the preoperative diagnosis of gastric LMS. Although there is no consensus on the treatment of this tumor, surgical resection is now considered the standard treatment for gastric LMS (8, 9). However, as lymph node metastasis rarely occurs in gastrointestinal mesenchymal tumors, including LMS, lymph node dissection is not recommended for such tumors (5). Thus, this treatment method may be acceptable for gastric LMS when complete tumor elimination can be achieved with ESD. Such an LMS has to be confined

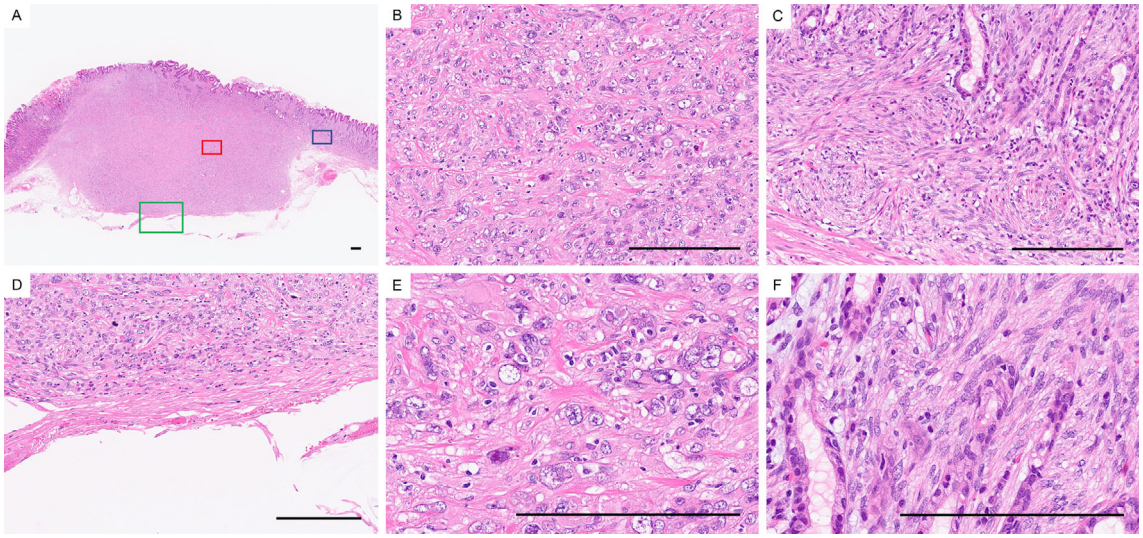

Figure 4. **Hematoxylin and Eosin staining of the ESD specimen. The tumor included 2 areas: 1) an area consisting of spindle cells showing smooth muscle differentiation and pleomorphic cells with severe atypia that extended from the mucosa to the submucosa (B, E); and 2) an area consisting of spindle cells differentiating into smooth muscle that extended to the mucosa with no destruction of the muscularis mucosa (C, F). The vertical resection margin was negative (D). B and E, C and F, and D are magnified images of the red, blue, and green squares, respectively, in A. Bar=200 μm. ESD: endoscopic submucosal dissection**

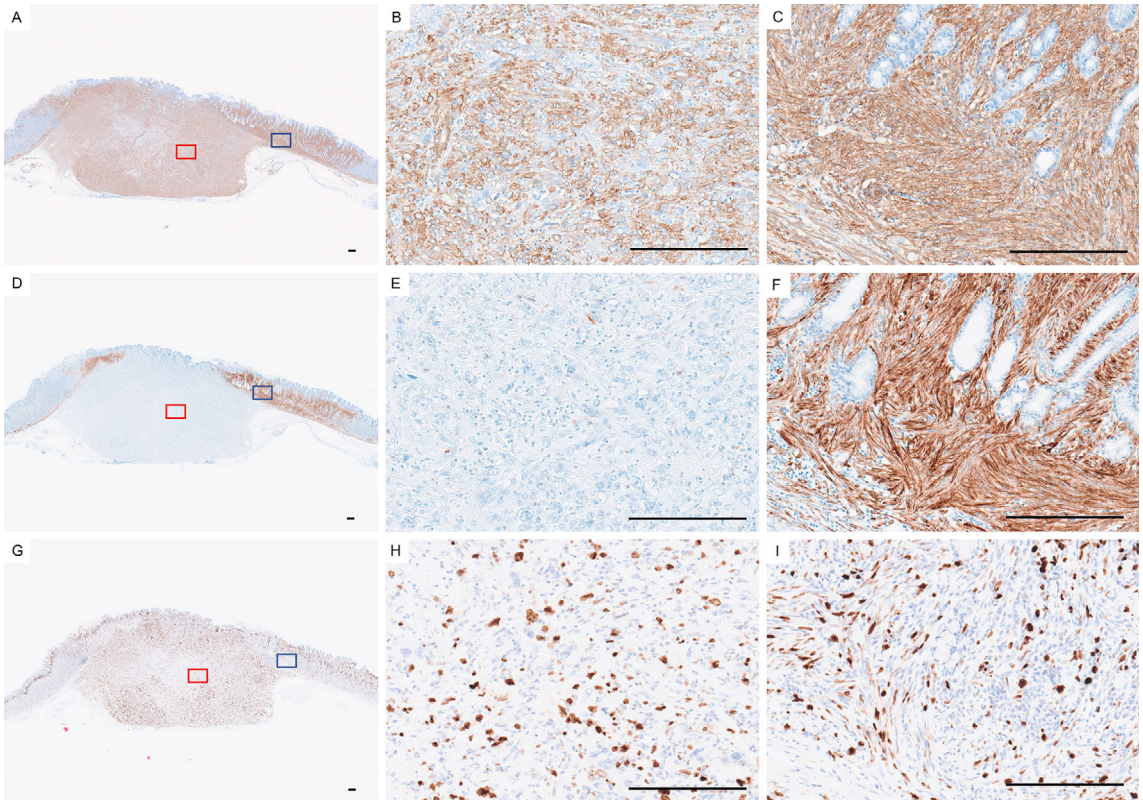

Figure 5. **Immunostaining in the ESD specimen. A-C, α-smooth muscle actin; D-F, desmin; G-I, Ki-67 index. B, E, and H are magnified images of the red squares in A, D, and G, respectively. C, F, and I are magnified images of the blue squares in A, D, and G, respectively. Tumor cells were positive (B) or strongly positive (C) for α-smooth muscle actin and weakly positive (E) or positive (F) for desmin. The Ki-67 labeling index was 50% (G-I). Bar=200 μm. ESD: endoscopic submucosal dissection**

to the submucosa; furthermore, it must be confirmed preoperatively that the tumor has not broken the submucosal layer. In this regard, EUS is mandatory to decide whether to perform ESD for gastric LMS. In the present case, the tumor was confined to the submucosa, and the submucosal layer was not broken on EUS. Therefore, we performed ESD, which resulted in complete resection of the tumor.

Careful follow-up is required after complete elimination of the tumor. According to a previous report that analyzed primary LMS of the gastrointestinal tract (10), approximately 50% of cases that underwent R0 surgical resection developed recurrence after treatment. Furthermore, a report from Japan also showed recurrence after treatment in approximately 50% of cases with gastrointestinal LMS (11). However, it should be noted that these reports included patients with large tumors. A report from Japan showed that tumor size of ≥5 cm was a prognostic factor for gastrointestinal LMS (11). Therefore, cases involving small tumors, such as the present case, may involve a lower risk of recurrence after local resection. Furthermore, the time to recurrence in cases of recurrent LMS is important when performing follow-up examinations. These 2 reports showed that recurrence occurred within 2.5 years after treatment in most cases (10, 11). Thus, careful follow-up examinations, especially until 2.5 years after treatment, may be required. In the present case, enhanced CT and EGD with a follow-up interval of 0.5 years was scheduled for 5 years, and there were no signs of recurrence at 2.5 years after treatment.

The preoperative diagnosis of gastric LMS is often difficult. Indeed, according to a prior review of 19 cases of gastric LMS, there were only 3 cases in which it was clearly stated that a preoperative diagnosis of LMS was made (9). Although EUS-fine needle aspiration is considered more accurate than endoscopic biopsy because of sampling from the deeper layer (9), this method was also demonstrated to be inaccurate in a previous case, the preoperative diagnosis of which was leiomyoma (7). In our case, the tumor extended to the surface of the mucosa; thus, large samples of the tumor could be acquired in endoscopic biopsy, which contributed to the preoperative diagnosis of LMS.

The present case included 2 areas with different tumor characteristics. In particular, mucosal extension of the tumor cells with no destruction of the muscularis mucosa was a specific finding in this case. In this area, immunohistochemical staining, especially desmin staining, showed different characteristics from the area with submucosal invasion. To the best of our knowledge, no previous studies have reported LMS cases with such characteristics. It is unclear why this tumor had 2 such components, but this case suggests that gastric LMS may display mucosal extension in rare cases, suggesting the need for caution when performing local resection (e.g., endoscopic resection) for such tumors.

In conclusion, we describe an extremely rare case of gastric LMS in which ESD was performed after a precise preoperative diagnosis. There were no signs of recurrence after treatment. When tumor invasion confined to the submucosa with no breaking of the submucosal layer is confirmed using EUS, ESD may be an acceptable option for gastric LMS.

The authors state that they have no Conflict of Interest (COI).

References

1. Hirota S, Isozaki K, Moriyama Y, et al. Gain-of-function mutations of c-kit in human gastrointestinal stromal tumors. Science **279**: 577-580, 1998.
2. Agaimy A, Wunsch PH. True smooth muscle neoplasms of the gastrointestinal tract: morphological spectrum and classification in a series of 85 cases from a single institute. Langenbecks Arch Surg **392**: 75-81, 2007.
3. Miettinen M, Fetsch JF. Evaluation of biological potential of smooth muscle tumours. Histopathology **48**: 97-105, 2006.
4. Deprez PH, Moons LMG, O'Toole D, et al. Endoscopic management of subepithelial lesions including neuroendocrine neoplasms: European Society of Gastrointestinal Endoscopy (ESGE) Guideline. Endoscopy **54**: 412-429, 2022.
5. Matsuda T, Nunobe S, Kosuga T, et al.; Society for the Study of Laparoscopy and Endoscopy Cooperative Surgery. Laparoscopic and luminal endoscopic cooperative surgery can be a standard treatment for submucosal tumors of the stomach: a retrospective multicenter study. Endoscopy **49**: 476-483, 2017.
6. Pauser U, Grimm H. Intramucosal leiomyosarcoma of the stomach following hereditary retinoblastoma in childhood - a case report and review of the literature. World J Surg Oncol **6**: 131, 2008.
7. Sato T, Akahoshi K, Tomoeda N, et al. Leiomyosarcoma of the stomach treated by endoscopic submucosal dissection. Clin J Gastroenterol **11**: 291-296, 2018.
8. Soufi M, Errougani A, Chekkof RM. Primary gastric leiomyosarcoma in young revealed by a massive hematemesis. J Gastrointest Cancer **40**: 69-72, 2009.
9. Takagi T, Saito S, Yokota S, et al. Laparoscopic and endoscopic cooperative surgery for leiomyosarcoma of the stomach: a case report with a review of the literature. Surg Case Rep **7**: 146, 2021.
10. Smrke A, Benson C, Strauss DC, et al. Gastrointestinal leiomyosarcoma demonstrate a predilection for distant recurrence and poor response to systemic treatments. Eur J Surg Oncol **47**: 2595-2601, 2021.
11. Yamamoto H, Handa M, Tobo T, et al. Clinicopathological features of primary leiomyosarcoma of the gastrointestinal tract following recognition of gastrointestinal stromal tumours. Histopathology **63**: 194-207, 2013.