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CASE REPORT

Small gastric synovial sarcoma diagnosed and treatment by laparoscopic–endoscopic cooperative surgery: a case report

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Abstract

We report a case of small gastric synovial sarcoma (SS) finally diagnosed after laparoscopic-endoscopic cooperative surgery (LECS). A 50 year-old male underwent medical examination for a chief complaint of epigastric pain. Endoscopic examination showed a 20 mm submucosal tumor (SMT) located in the anterior wall which extended to the lesser curvature of the middle stomach. The biopsy tissue did not yield a definitive diagnosis. During 6 months of follow-up for this lesion suspected to be an inflammatory tumor, neither the shape nor the size of the tumor changed. We performed LECS for both diagnosis and treatment. Histologically, the tumor was composed of fascicles of spindle cells. Immunohistochemically, the tumor cells were focally positive for epithelial membrane antigen, cytokeratin (AE1/AE3) and S100 protein, while being negative for desmin, α-smooth muscle actin, CD34, c-kit and DOG1. The expression of INI1 was reduced. Fluorescence in situ hybridization (FISH) detected *SS18* rearrangement. The SMT was diagnosed as primary SS. A SMT measuring < 20 mm might be malignant potential tumor such as SS even if there are no typical malignant findings by endoscopy. Surgical resection should be considered for SMT measuring < 20 mm with atypical findings even in the absence of definitive high-risk features.

Keywords Gastric synovial sarcoma · Laparoscopic–endoscopic cooperative surgery · Small submucosal tumor · Laparoscopic resection · *SS18*

Introduction

Synovial sarcoma (SS) is one of the malignant soft-tissue tumors, accounting for 10% of soft tissue sarcomas [1]. There are three main histologic subtypes of synovial sarcoma: the monophasic type composed of spindle cells (50–60%), the biphasic type composed of both epithelial and spindle cells (20–30%), and the poorly differentiated type (15–20%) [2, 3]. SS is characterized by the translocation *t*(X;18) (p11;q11) and subsequent formation of the SS18:SSX fusion genes [4]. Reportedly, SS usually arises in the extremities intimately related to tendons and bursal structures of large joints [5–7]. Gastric SS is rare although some SSs originating from the digestive tract have recently been reported. There have been, to date, only 49 such cases in the English literature. We herein present a patient with a primary gastric SS followed-up under a suspected diagnosis of inflammatory tumor with periodic endoscopic inspection.

Case report

A 50 year-old male had epigastric pain. Endoscopic examination showed a 20 mm elevated lesion from the anterior wall to the lesser curvature of the middle stomach. The tumor was mostly coated with intact mucosa and there was a slight reddish depression at the top of the tumor (Fig. 1A). After tissue biopsy, tumor shrinkage was seen with a central depression (Fig. 1B). Heterogeneous lesion was observed in the third layer by endoscopic ultrasound (EUS). The tumor

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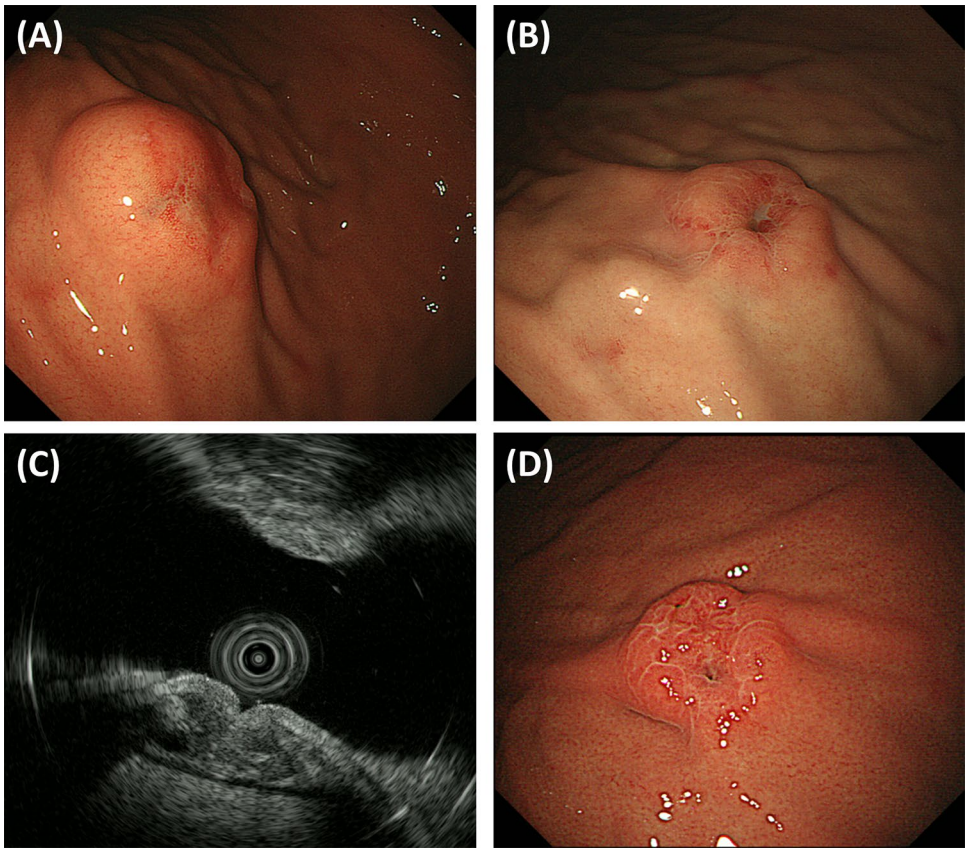

Fig. 1 Endoscopic findings. **A** Endoscopic examination showed a 20 mm submucosal tumor. The tumor was mostly coated with intact mucosa and had a slightly reddish depression at the top. **B** After tissue biopsy, tumor shrinkage was seen with a central depression. **C** Endoscopic ultrasound images of the stomach wall showed a heterogeneous lesion in the third layer. The tumor was mainly hypo-echoic in appearance, 11 × 5 mm in size, and had a slender but distorted shape. **D** The follow-up endoscopy 6 months after the initial endoscopy revealed essentially no changes in the form or the size of the tumor

had a mainly hypo-echoic appearance and was 11 × 5 mm in size, with a slender but distorted shape (Fig. 1C). Abdominal computed tomography demonstrated a high-attenuating nodule confined to the area from the anterior wall to the lesser curvature of the middle stomach. There were no findings of metastasis nor any evidence of another possible primary site. There were no relevant findings resulted from endoscopy or other examinations. Endoscopic biopsy revealed a small number of non-pleomorphic spindle cells. Immunohistochemically, the tumor cells were focally positive for epithelial membrane antigen (EMA) and negative for cytokeratin (AE1/AE3), S100 protein, desmin, α-smooth muscle actin (SMA), CD34, c-kit and DOG1. The findings were not considered to be diagnostic of malignancy, including gastrointestinal stromal tumors; however, the biopsy tissue did not yield a definitive diagnosis. The patient was closely followed-up under a suspected diagnosis of inflammatory tumor with repeated endoscopy every 3 months. Six months after the initial endoscopy, the biopsy scar at the tumor site was covered with regenerated epithelium. There were essentially no changes in the form or the size of the tumor (Fig. 1D). We decided to perform LECS both for diagnosis and treatment.

A total of 5 ports were placed in the abdominal wall. On entering the peritoneal cavity, the tumor did not show any macroscopic serosal change. By endoscopic procedure, the marking dots were made around the tumor with the distal tip of a needle knife. Next, a small initial incision was made with a needle knife and the tip of the insulation-tipped diathermic electrosurgical (IT) knife was inserted into the submucosal layer. Then, a semicircular incision was made using the IT knife and an artificial perforation was created with the needle knife. Finally, the full-thickness incision was made laparoscopically including the marking points. The defect of the gastric wall was closed with the linear stapler.

A flat elevated lesion was observed in the resected specimen. The tumor was 12 × 8 × 2 mm in size (Fig. 2). Histologically, the tumor was composed of intersecting fascicles of long spindle cells. These cells were monotonous with indistinct cytoplasm and fusiform to ovoid nucleus (Fig. 3A). Immunohistochemically, the tumor cells were focally positive for EMA (Fig. 3B), cytokeratin (AE1/AE3) and S100 protein. They were negative for desmin, αSMA, CD34, c-kit and DOG1. The expression of INI1 was reduced (Fig. 3C). Fluorescence in situ hybridization (FISH) detected *SS18* rearrangement (Fig. 3D). The final diagnosis of SS was confirmed based on these findings.

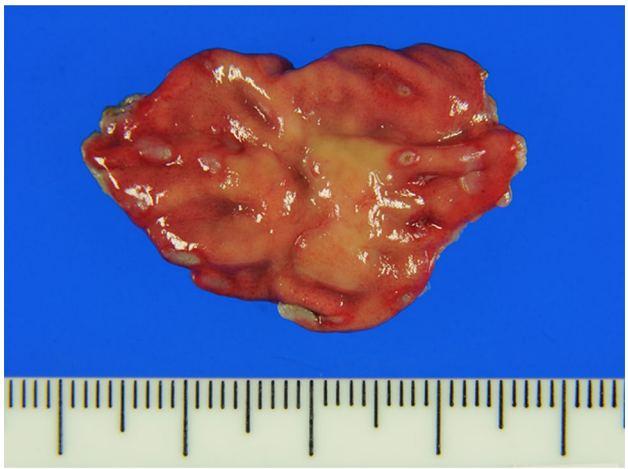

Fig. 2 Macroscopic findings of the resected specimen. A flat elevated lesion was observed in the resected specimen. The tumor was 12 × 8 × 2 mm in size

Discussion

SMT measuring < 20 mm could be followed up by endoscopy or EUS once or twice a year if there are no high-risk features [8]. In this case, size of the tumor was just 20 mm and no remarkable high-risk features were observed by initial endoscopy. On biopsy, we could not confirm the diagnosis of sarcoma because the number of sampled tumor cells on initial biopsy showed relatively bland nuclei and lacked significant atypia, necrosis or mitotic activity. However, we did not deny malignant tumor completely because a sufficient amount of specimen could not be secured. Therefore, we decided to have a close follow-up of every three months. Although the lesion had been suspected to be an inflammatory tumor, the tumor did not morphologically alter and shrinkage of the tumor was not observed half a year later. We decided to perform tumor resection by LECS for purpose of diagnosis and treatment. Gastric SMT < 20 mm with high-risk features including irregular borders, ulceration and/or growth during endoscopic follow up are encouraged to undergo surgical resection because of a potential of high-risk GIST and/or malignant SMT [9]. Gastric SS is likely to involve the mucosal and submucosal layers [10]. The infiltrating pattern of SS in the mucosa is supposed to be different from that of GIST [11]. In previous report, even a 6 mm SS showed ulceration on the surface of the tumor [12]. Other specific endoscopic findings of gastric SS are polypoid [13] or central depression [14]. SMT measuring < 20 mm with atypical findings such as polypoid or central depression has a potential of SS. Therefore, surgical resection should

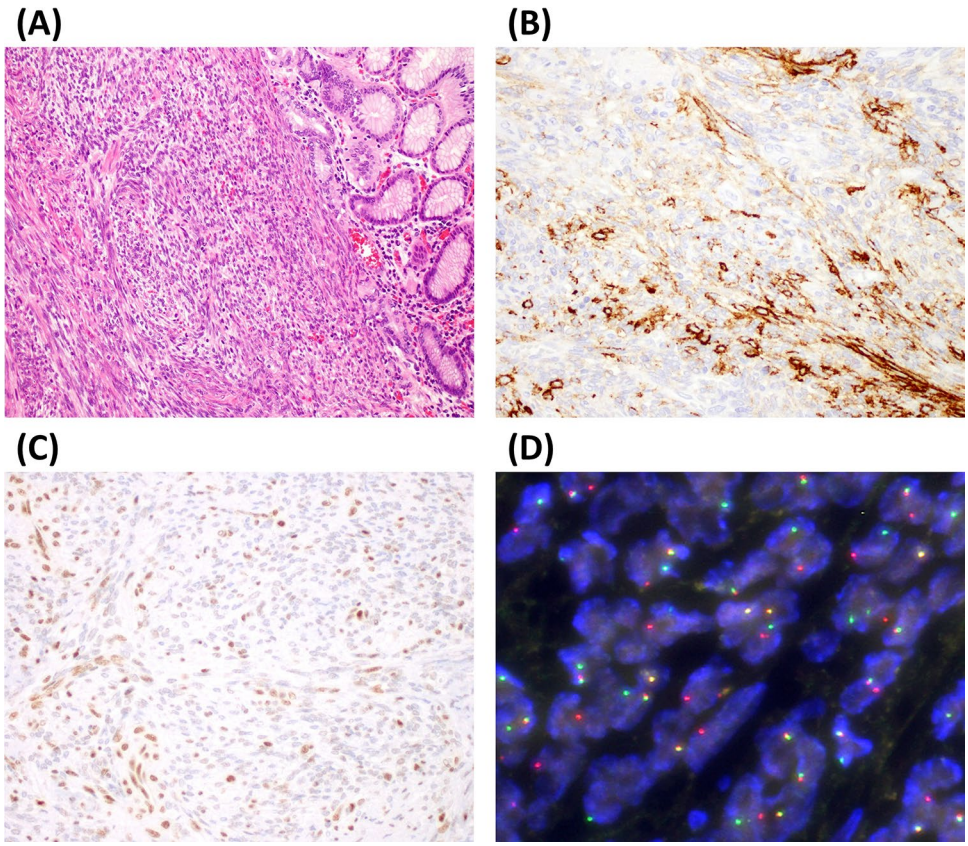

Fig. 3 Histological features of the resected tumor. **A** The tumor was composed of fascicles of spindle cells. The tumor cells were monotonous with indistinct cytoplasm and fusiform to ovoid nucleus. (hematoxylin and eosin staining × 200). **B** Tumor cells were focally positive for EMA (× 400). **C** The expression of INI1 was reduced in tumor cells (× 400, intact staining in endothelial and inflammatory cells serves as an internal positive control). **D** SS18 rearrangement was detected as separations of the red and green signals via SS18 break-apart fluorescence in situ hybridization assay

be considered even in the absence of definitive high-risk features. The tumor was confirmed as SS based on histological analysis. In this case, no typical high-risk features were seen by initial endoscopy. The findings of depression at the top of the tumor would be a prodromal finding of high-risk features in consideration of the result of pathologic diagnosis. Primary gastric SS often involves the mucosal layer and exposes to the mucosal surface. On the other hand, GIST is often a well-circumscribed lesion and rarely infiltrates into the lamina propria [15].

In the resected specimen, intersecting fascicular proliferation of monotonous spindle cells in the present case was typical of monophasic SS. The immunophenotype was also classic, including EMA reactivity [16] and reduced expression of INI1. The latter finding is reported to be highly sensitive and specific for SS [17]. It is noteworthy that the immunonegativities for c-kit and DOG1 in the present case were not consistent with GIST. Molecular analysis is useful for the diagnosis of SS, because *SS18-SSX* fusion is pathognomonic of SS [18, 19]. For the detection of this fusion, FISH or reverse-transcription-polymerase chain reaction is frequently applied to paraffin sections [20]. In this case, we identified *SS18* rearrangement by FISH.

There is no consensus on the optimal therapeutic strategy for primary gastric SS. Surgical strategies, including the surgical approach and extent of lymph node dissection (LND) or the necessity for subsequent chemotherapy, are still under debate. In this case, the SS was relatively smaller than those described in previous studies [21, 22] and no lymph node metastasis was observed on preoperative computed tomography. Therefore, we performed wedge resection by LECS without LND. Almost all of the recurrences have occurred to patients with large tumors of 50 mm or more [21–25]. However, a 49 year-old male underwent segmental gastrectomy for a 20-mm gastric SS and developed omental metastasis 13 months later and died in 29 months after the surgery [21]. Even a small tumor may have a risk of recurrence in patients with primary gastric SS. In the resected specimen, the gastric SS was 12 mm in size. The SS was relatively small and completely resected by LECS. We did not consider additional surgery for lymphadenectomy after LECS, although the role of lymphadenectomy in the treatment of soft tissue sarcoma has been debated. SS is characterized by less lymph node metastasis than other soft tissue sarcomas. The proportion of patients with nodal metastasis among the patients with SS was 4.2% based on the SEER database [26]. In our case, the size of the tumor was small and enlarged lymph nodes were not observed in preoperative CT and intraoperative findings. Our patient received closed follow-up without adjuvant chemotherapy and had no recurrence after 5 year-follow up.

In conclusion, a SMT measuring < 20 mm might be malignant potential tumor such as SS even if there were no typical high-risk features by endoscopy. Surgical resection should be considered for SMT measuring < 20 mm with atypical findings even in the absence of definitive high-risk features.

Declarations

Conflict of interest The authors declare no conflicts of interest for this article.

Human rights All procedures followed have been performed in accordance with the ethical standards of the 1964 Declaration of Helsinki and its later amendments.

Informed consent This study does not contain identifying information about the patients.

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