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Gastric Schwannoma Mimicking Malignant Gastrointestinal Stromal Tumor Exhibiting Increased Fluorodeoxyglucose Uptake

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Key Words
Stomach · Schwannoma · Fluorodeoxyglucose positron emission computed tomography

Abstract
A schwannoma is a kind of neurogenic tumor that rarely occurs in the gastrointestinal tract. Gastric schwannomas make up 0.2% of all gastric neoplasms. Gastrointestinal stromal tumors (GIST) are the most common mesenchymal tumors and up to 60–70% of GIST occur in the stomach. Schwannoma and GIST are similar in clinical features, so they are difficult to differentiate preoperatively. Differential diagnosis of these two submucosal tumors is important because of the malignant potential of GIST and the relatively benign course of gastric schwannomas. We report a 49-year-old woman who was diagnosed after operation with a gastric schwannoma, which was suspected a malignant GIST by fluorine-18-fluorodeoxyglucose positron emission computed tomography imaging.

Introduction

Schwannomas are neurogenic tumors that originate from many different organs throughout the body. Gastric schwannomas represent 0.2% of all gastric neoplasms [1]. Mesenchymal tumors of the gastrointestinal tract are mainly spindle cell tumors, which include gastrointestinal stromal tumors (GIST), leiomyoma or leiomyosarcoma, and schwannomas. Among these tumors, GIST is the most commonly (60–70%) occurring in the stomach [2]. Gastric schwannomas are usually benign but in some cases they are malignant [1, 2].

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Esophagogastroduodenoscopy (EGD) and endoscopic ultrasonography are the principal tools used for diagnosis of gastric schwannoma. However, unlike mucosal tumors, making pathologic differential diagnosis of schwannoma from GIST is very difficult preoperatively. Definite diagnosis of gastric schwannoma is often established by pathological and immunohistochemical examination of resected surgical specimens. Gastric schwannomas occur predominantly in females in their fifties [3, 4]. We report here a 49-year-old woman with gastric mass who underwent radical gastric partial resection under the suspicion of malignant gastric neoplasm that was confirmed postoperatively as benign gastric schwannoma.

Case Report

A 49-year-old woman was referred to the surgical department owing to a gastric mass. She suffered from epigastric discomfort, and EGD revealed a submucosal tumor with central ulceration at the lesser curvature of the gastric body. Biopsy specimens from EGD yielded only nonspecific inflammatory cells without evidence of malignancy. Routine chest radiography showed no active lung lesions. Tumor markers of AFP, CA19-9, and CEA were all within normal limits. A contrast-enhanced stomach computerized tomography (CT) scan showed a homogenous exophytic mass measuring 9.6 cm at the lesser curvature of the gastric low body to the antrum with central ulceration abutting the pancreas head (fig. 1a). Fluorine-18-fluorodeoxyglucose (^{18}F-FDG) positron emission tomography/CT (PET/CT) scan showed an obvious FDG-avid lesion measuring 9 cm in the gastric midbody with a high accumulation (maximum standardized uptake value = 7.10) coincident with gastric malignant neoplasm and lymphadenopathy in the left gastric, aortocaval, left paraaortic, and left supraclavicular areas (fig. 1b). These findings highly suggested malignant GIST with metastatic lymphadenopathy. Fine-needle aspiration biopsy of the left supraclavicular lymph node was done and the pathologic report was negative for malignancy, suggestive of reactive hyperplasia. Endoscopic ultrasonography-guided biopsy was done to confirm the diagnosis of GIST, but the pathologic report showed only a few clusters of small round to spindle shaped stromal cells with a negative result for c-Kit. We therefore decided to perform gastric resection after obtaining informed consent from the patient. On abdominal exploration, the stomach was mobilized by opening the gastro-hepatic ligament and gastro-colic ligament, and a 9 cm sized large exophytic mass was clearly identified at the midbody of the lesser curvature of the stomach with lymph node enlargement (fig. 2a). The gastric mass was easily separated from the pancreatic head. Because no preoperative pathologic diagnosis was made, we performed subtotal gastrectomy with D-2 lymph node dissection in the consumption of malignancy. During operation, frozen biopsy of the enlarged number eight lymph node was done with a negative result for malignant cells. After operation, the patient recovered without any complications and was discharged on the 15th postoperative day. The final pathologic report revealed gastric schwannoma located at the midbody of the lesser curvature of the stomach with 8.5 × 7.5 × 5 cm in size, extending from the submucosa to the subserosa (fig. 2b). No cancer cells were identified out of 66 resected lymph nodes. The neoplastic cells had immunoreactivity with S100 protein but no immunoreactivity with c-Kit, smooth-muscle actin CD34, and DOG-1. Up to 3% of tumor cells were positive for Ki-67 (fig. 3a, b).

Discussion

Schwannomas, in other words, neuromas or neurilemomas, are rare stromal tumors of spindle cells of the Schwann cells of the nerve sheath of Auerbach's plexus within the gastrointestinal tract wall. The stomach is the most common site of gastrointestinal schwannomas with 0.2% incidence of gastric neoplasms [3, 4]. These tumors usually occur in middle-aged women with a median age of 52.7 years [4]. Most are benign and have no symptoms, but malignant potentiality does exist and is related to the size of the tumor. The patients may present with symptoms of abdominal pain owing to frequent central ulceration of the tumor with an incidence ranging from 20 to 50% [5]. About 50% of GIST recur or metastasize, but malignant transformation of solitary gastric schwannomas is rare; after incomplete resection, recurrence might occur [3, 4].

Immunohistochemical staining can differentiate various spindle cell tumors. Schwannomas can be distinguished from other spindle cell tumors of the stomach by S100 protein. Tumor cells that are positive for S100 protein and negative for smooth muscle actin, c-Kit, and CD34 confirm the diagnosis of schwannoma. S100 protein and glial fibrillary acidic protein positivity is evidence of nerve sheath differentiation [5]. Before the recognition of S100 protein and c-Kit protein in GIST, these neoplasms were most often classified as leiomyomas, leiomyosarcomas, or gastrointestinal autonomic tumors [4]. Typical histopathologic features of gastric schwannomas are focally atypical spindle cells arranged in a microtrabecular-microfascicular pattern and peritumoral lymphoid cuff with germinal centers [6]. Gastric schwannomas seem to have good prognosis with no recurrence, but in the case of mitotic rates greater than 10/50 high-power fields in malignant schwannomas, regular follow-up might be needed, as with other malignant neoplasms of the stomach [3].

In advanced cases of schwannoma, the tumor might metastasize to the liver and disseminate to the peritoneum. However, the tumor does not metastasize to the lymph nodes [3, 6]. In our case, because no preoperative histopathologic diagnosis was made and multiple lymph node enlargements were noted at the operative fields, we performed D-2 node dissection and no cancer cells were noted out of 66 resected lymph nodes.

With regard to the diagnostic modality of gastric schwannoma preoperatively, it is very difficult to make differential diagnosis with malignant GIST. FDG-PET/CT is a very useful metabolic imaging tool for the evaluation of malignancy of various tumors. In the evaluation of bioactivity and malignant potentiality of gastric GIST, FDG-PET scan is the most reliable diagnostic tool in the aspect of significant correlation between FDG uptake and Ki-67 index and the mitotic index of GIST [7]. However, in the diagnosis of schwannomas, some benign tumors show high FDG uptake, so the evaluation of the malignant potential of schwannomas with FDG-PET scan might be insufficient. Fluorine-18-alpha-methyltyrosine PET/CT scan may be the most reliable method for the differentiation of benign schwannomas from other malignancies [8], but the reason for high ^{18}F-FDG uptake in benign tumors like schwannomas is unclear. Beaulieu et al. [9] reported that the high uptake of FDG in schwannomas may result from the activity of Schwann cells to transport glucose for axonal repolarization. The patient in this case showed a high standardized uptake value-FDG-accumulated lesion in the gastric midbody and lymph nodes coinciding with the malignant neoplasm of the stomach and perigastric lymph nodes, which did not provide differential diagnosis before operation. Our case suggested that ^{18}F-FDG PET/CT has only a limited role in making preoperative differential diagnosis between benign schwannoma and malignant GIST [10].

In conclusion, benign gastric schwannoma could not be differentiated from malignant GIST preoperatively by FDG uptake. The final diagnosis of benign gastric schwannoma was

made pathologically only after radical gastrectomy with lymph node dissection in the assumption of gastric malignancy.

Statement of Ethics

Written informed consent for the publication of this paper was obtained from the patient.

Disclosure Statement

The authors have nothing to declare.

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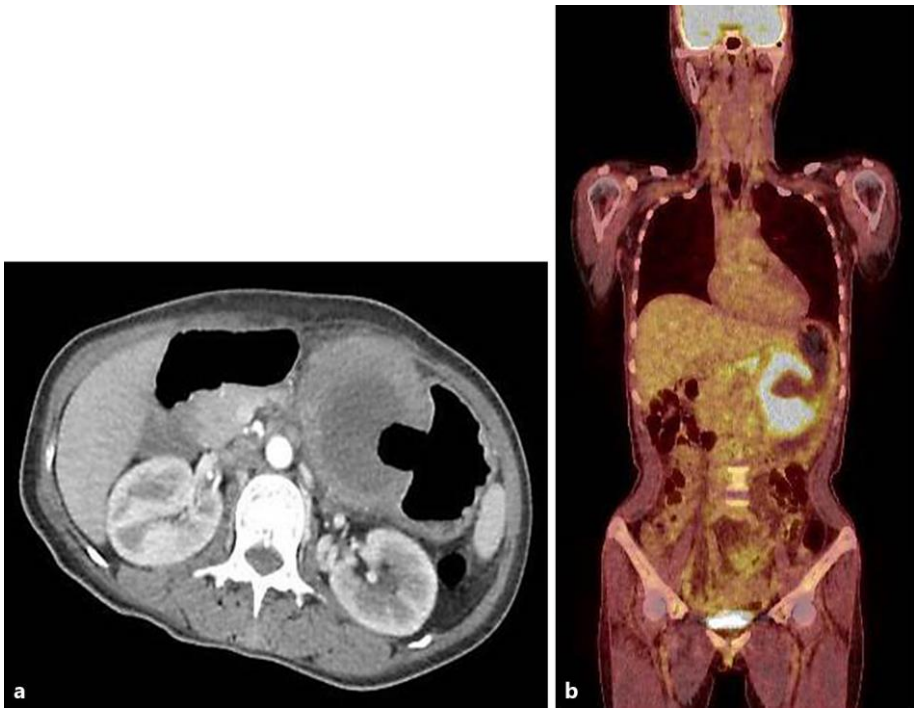

Fig. 1. **a** Stomach CT demonstrated a 9.6-cm subepithelial mass with internal necrosis ulcer abutting the gastric lesser curvature. **b** ^{18}F-FDG PET/CT showed a 9.6-cm FDG-avid lesion in the gastric midbody and FDG-avid lymph nodes in the left gastric, aortocaval, left paraaortic and left supraclavicular areas.

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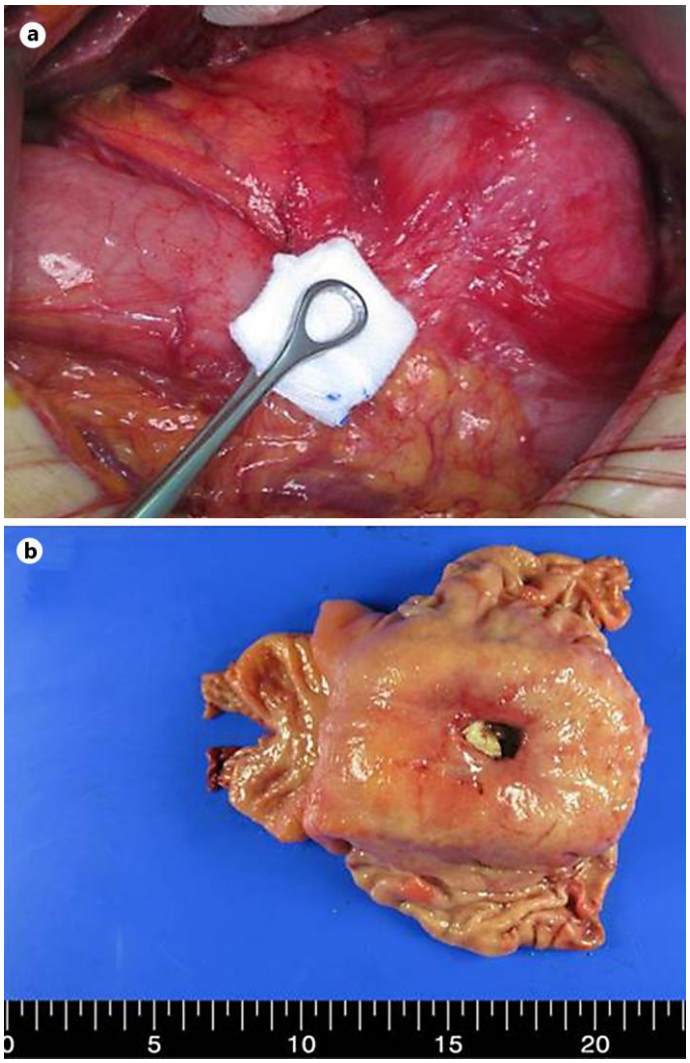

Fig. 2. **a** A 9 cm sized large exophytic mass was clearly identified at the midbody of the lesser curvature of the stomach with lymph node enlargement. **b** Close-up view of the mass with central ulceration.

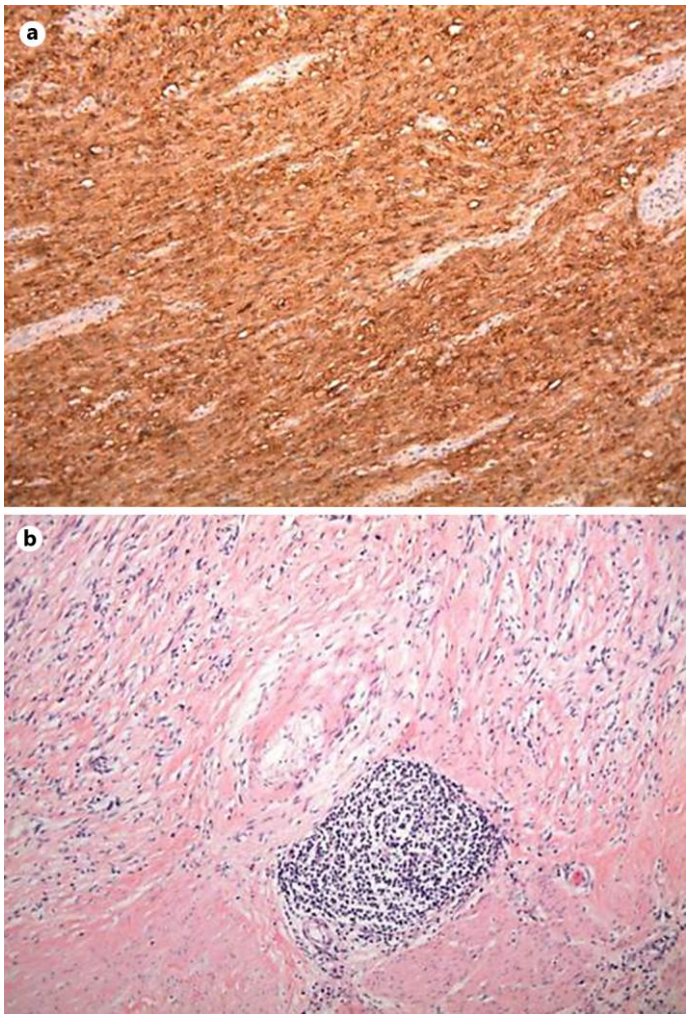

Fig. 3. Histopathological findings. **a** Immunohistochemical staining. The spindle tumor cells show a positive reaction for S100 protein. **b** A cuff-like lymphoid aggregate was recognized around the tumor.