



Case report

Gastric schwannoma exhibiting increased fluorodeoxyglucose uptake

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Abstract

This is the first case of gastric schwannoma that exhibited increased accumulation of [(18)F] fluorodeoxyglucose (FDG) on positron emission tomography (PET) imaging. The patient was a 60-year-old woman in whom esophagogastroduodenoscopy showed a submucosal tumor, about 25 mm in size, in the upper body of the stomach, with ulceration at the top of the tumor. Endoscopic ultrasonography revealed a well-defined hypoechoic mass located in the proper muscle layer of the stomach. The specimen taken from the tumor showed only inflammatory degenerative tissue. Abdominal computed tomography revealed a tumor in the upper body of the stomach. FDG-PET showed FDG uptake (standardized uptake value [SUV] max 5.8) coincident with the tumor. Hence, the tumor was diagnosed initially as a gastrointestinal stromal tumor of the stomach. Laparoscopic partial gastrectomy was performed. Pathological examination showed that the tumor consisted of spindle cells with large nuclei, and mitosis was absent. The Ki-67 labeling index of the tumor cells was 4%. Immunohistochemically, the tumor cells showed a positive reaction for S-100 protein, whereas they were negative for KIT, CD 34, and alpha-smooth muscle actin protein. The tumor was diagnosed as a benign gastric schwannoma. Gastric schwannoma should be included in the differential diagnosis of submucosal tumors of the stomach with FDG uptake.

Key words Schwannoma · Stomach · Fluorodeoxyglucose · Positron emission tomography

Introduction

Most gastrointestinal (GI) schwannomas are benign mesenchymal tumors composed of schwann cells, which physiologically wrap around the axons of peripheral

nerves [1]. According to a recent classification, about 80% of GI mesenchymal tumors are gastrointestinal stromal tumors (GISTs) [2]. GI schwannomas have been reported to represent only 3% of all GI mesenchymal tumors [3]. GI schwannomas occur predominantly in females in their 50s. [4]. The stomach is the most common site of GI schwannomas, which constitute 0.2% of all gastric neoplasms [5]. Recently, [(18)F] fluorodeoxyglucose (FDG) positron emission tomography (PET), an evolving diagnostic modality, has been used for tumor detection, staging, therapeutic monitoring, and follow-up evaluations for various malignant tumors [6, 7]. FDG-PET has been adopted to distinguish benign tumors from malignant mesenchymal tumors, such as GISTs. We report herein the first case of benign gastric schwannoma showing increased FDG uptake on PET.

Report of a case

A 60-year-old woman received esophagogastroduodenoscopy (EGD) for stomach cancer screening. EGD showed an elevated submucosal tumor with bridging folds in the upper body of the stomach. The submucosal tumor had a central ulcer on its top (Fig. 1A). Endoscopic ultrasonography (EUS) revealed a well-circumscribed hypoechoic mass, 25 mm in size, arising from the proper muscle layer of the stomach (Fig. 1B). Histopathologically, biopsy specimens taken from the ulcerative lesion of the submucosal tumor showed degenerative tissues with infiltration of neutrocytes. Abdominal computed tomography (CT) confirmed the presence of this tumor in the upper body of the stomach (Fig. 2). FDG-PET showed high accumulation (standardized uptake value [SUV] max 5.8) coincident with the gastric tumor (Fig. 3). Consequently, GIST of the stomach was the most likely diagnosis. Laparoscopically, the tumor was located in the greater curvature of the stomach, and a wedge resection of the stomach with

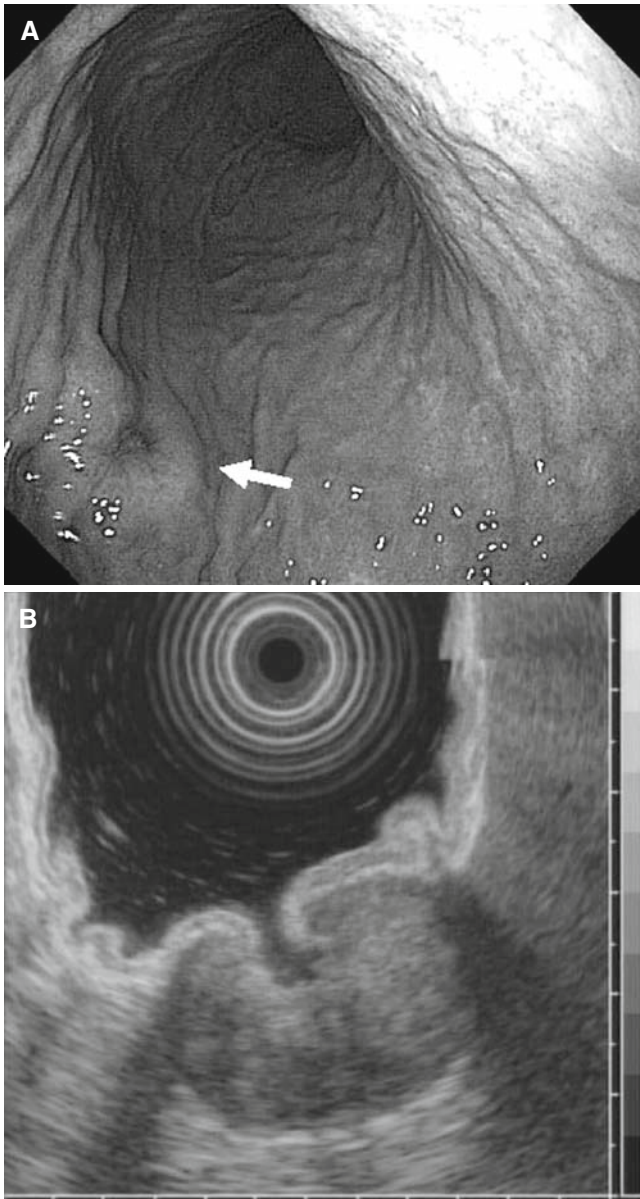


Fig. 1A,B. Endoscopic findings. **A** The *arrow* indicates a submucosal tumor with a central ulceration on its top in the anterior wall of the upper body of the stomach. **B** Endoscopic ultrasonography showed a well-circumscribed hypoechoic mass, 25 mm in size, arising from the proper muscle layer of the stomach

adjacent lymph nodes was performed. Macroscopically, the removed tumor was well circumscribed and measured 25 × 25 × 15 mm, with a 5-mm ulceration at the center of the tumor. The cut surface of the tumor appeared yellowish-white and solid (Fig. 4). Histopathologically, the tumor was located mainly in the proper muscle layer of the stomach, and consisted of spindle cells with large nuclei and vague nuclear palisading (Fig. 5A). Mitoses, necrosis, and bleeding were absent. The resected lymph nodes showed no metastasis. The Ki-67

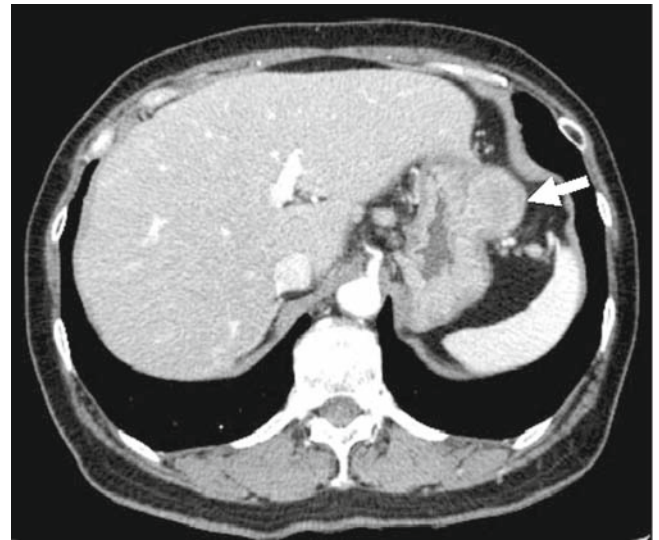


Fig. 2. Computed tomography (CT) findings. Contrast-enhanced CT shows a discrete and homogeneous mass in the upper body of the stomach (*arrow*)

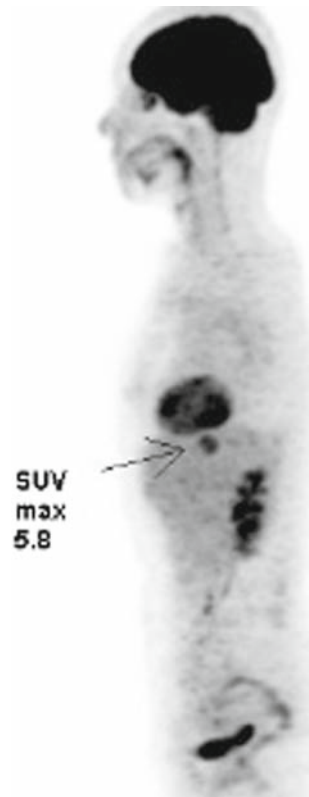


Fig. 3. Positron emission tomography (PET) findings. [(18)F] Fluorodeoxyglucose (FDG)-PET shows high accumulation (standardized uptake value [SUV] max 5.8) coincident with the gastric tumor

labeling index of the tumor cells was 4%. Immunohistochemical staining showed that the cytoplasm of the tumor cells was diffusely positive for S-100 protein (Fig. 5B), whereas the tumor cells were negative for KIT, CD



Fig. 4. The gross appearance of the resected specimen. A well-demarcated submucosal tumor is observed in the stomach. The cut surface of the tumor appears solid and yellowish-white

34, and alpha-smooth muscle actin protein. Furthermore, a cuff-like lymphoid aggregate was recognized around the tumor (Fig. 5C). The tumor was diagnosed as a benign gastric schwannoma. Ten months after the surgery, the patient is well without any evidence of recurrent disease.

Discussion

Schwannomas have a predilection for the head, neck, and flexor surfaces of the limbs, but they can occur anywhere in the body [1]. Although schwannomas can also arise throughout the GI tract, they are most commonly found in the stomach [5]. Patients with gastric schwannoma are usually asymptomatic, and therefore most of these tumors are discovered incidentally [5]. Gastric schwannomas are most commonly intramural (65%), but they can be intraluminal or subserosal as well. The tumors arise most commonly from the body of the stomach (50%) with fewer developing in the antrum (32%) or the fundus (18%) [8]. Unlike GISTs, gastric schwannomas are benign; malignant transformation is extremely rare [9]. EGD is commonly used as a diagnostic tool for several types of gastric tumors. Endoscopically, gastric schwannomas appeared as elevated submucosal masses [10]. A central ulcer was seen in 25%–50% of gastric schwannomas [10, 11]. False-negative results of endoscopic biopsy diagnosis would be encountered, because the normal mucosa frequently overlies gastric schwannomas [12]. As shown in our case and other cases [13, 14], endoscopic biopsy revealed only chronic inflammation without any malignant cells.

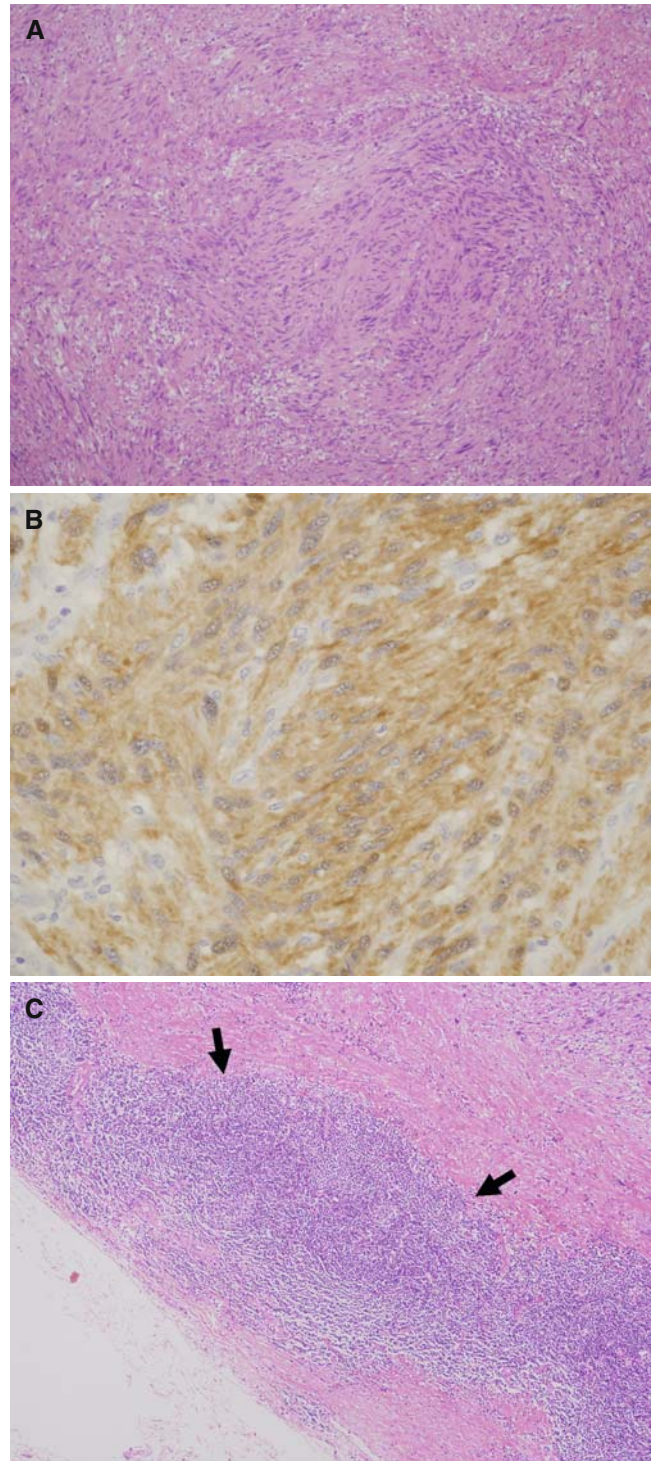


Fig. 5A–C. Histopathological findings. **A** The tumor consists of spindled cells with large nuclei and vague nuclear palisading. **B** Immunohistochemical staining. The spindle tumor cells show a positive reaction for S-100 protein. **C** A cuff-like lymphoid aggregate was recognized around the tumor (arrows). **A** and **C** H&E, $\times 25$; **B** $\times 100$

CT shows that gastric schwannomas are well-defined, round, mural masses with homogeneous attenuation. Schwannomas may appear exophytic or project intraluminally, and they may exhibit an ulcer crater. Of note, gastric schwannomas typically, as in the present case, show no evidence of necrosis, hemorrhage, or cystic change on CT. In contrast, these CT findings are common in GISTs [13].

The preoperative differential diagnosis of a gastric submucosal tumor includes GIST, leiomyoma or leiomyosarcoma, and schwannoma. Histologically, GIST may especially mimic a schwannoma and consist of spindle cells with nuclear palisading. The definitive diagnosis of GI schwannomas is made by immunohistochemistry. Schwannomas show diffuse cytoplasmic immunoreactivity for S-100 protein. Mitotic figures are rare or absent [3]. Recently, FDG-PET has been accepted as a powerful and noninvasive metabolic imaging modality for evaluating various tumors, including their detection, distinguishing their malignant potential preoperatively, and staging and monitoring therapeutic response [6, 7]. Ahmed et al. [15] reported FDG uptake in 22 benign schwannomas of the extremities, and several authors have previously reported schwannomas in the retroperitoneum [16] and in the esophagus [17] with increased FDG uptake. To our best knowledge, there has been no previous report of gastric schwannoma with increased FDG uptake in the English-language literature.

It has not been clarified why benign schwannomas show increased FDG uptake on PET. The large accumulation of FDG in schwannomas may result the potential ability of schwann cells to transport glucose for axonal repolarization [18]. Additionally, in 97% of gastric schwannomas, cuff-like lymphoid aggregates were recognized around the tumors [19], as occurred in the present case. Kawabe et al. [20] reported that FDG accumulated in inflammatory tissue involving lymphocyte proliferation in chronic tonsillitis. Although further studies are necessary to elucidate this mechanism.

In conclusion, we have reported the first case of gastric schwannoma with increased FDG uptake. Gastric schwannomas cannot be differentiated from GISTs by the presence of FDG accumulation, so the evaluation of whether the tumors are benign or malignant should be made by histological diagnosis.

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