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Two Cases of Gastric Cancer as Detected by Positron Emission Tomography during a Medical Checkup

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Abstract：Positron emission tomography using 2-deoxy-2-[18F] fluorodeoxyglucose (FDG-PET) has been used to detect malignancies associated with certain kinds of tumors. Data regarding the use of FDG-PET scan for evaluating gastric cancer are scarce. We herein report two cases of gastric cancer, which were detected by FDG-PET. Neither patient had any complaints and a FDP-PET examination was performed as a routine medical checkup. The first patient was a 65-year-old male. A high accumulation of FDG was observed in the gastric wall and the peripheral gastric wall. We defined gastric cancer based on an endoscopic examination and a histological examination. A total gastrectomy was performed and a histological examination showed the tumor invading proper muscular with lymph node metastasis. The second patient was a 62-year-old male. A high accumulation of FDG was observed in the gastric wall. An endoscopic examination and histological examination showed gastric cancer in the middle part of the stomach. A distal gastrectomy was performed and a histological examination showed a tumor invading the submucosal layer without any lymph node metastasis. An evaluation of tumor locality using FDG-PET, the existence of tumor and lymph node metastasis, was compatible with the final pathological findings.

Key words：**Positron emission tomography (PET), Gastric cancer**

Introduction

Positron emission tomography using 2-deoxy-2-[18F] fluorodeoxyglucose (FDG-PET) has been used to detect malignancies associated with certain kinds of tumors because of the enhanced degree of glycolysis in most cancers.[1)2)] To date, an FDG-PET scan has been shown to be useful in the follow-up evaluation of patients after surgery for colorectal cancer as well as in patients with liver metastases.[3)] Esophageal cancer has also shown a significant FDG uptake. In addition, the rate of 1.22% during a cancer checkup including FDG-PET, was higher than that of 0.05-0.15% using conventional cancer checkup methodologies.[4)] However, the data regarding the use of FDG-PET scan for evaluating gastric cancer are scarce, with few reports which we could find specifically on this topic.[5)] We would like to herein report on our experience in using FDG-PET during a medical checkup to evaluate two patients with gastric cancer.

Methods

FDG－PET was performed with the Advance (General Electric Medical Systems) whole-body

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PET scanner. The examinees consumed nothing by mouth for 6 hours before the PET scan, although water intake was encouraged. The exact time of injection 10 to 15 mCi F-18-FDG was recorded, and imaging commenced at 40 min after the injection. All subjects are asked to urinate just before the PET scan after bed rest for one hour and then they undergo an emission scan for seven bed minutes (three minutes/bed position) from the pelvis to the cervix in the right direction. All images were reconstructed using the vender provided software package and then they were formatted into transaxial, coronal, and sagital image sets. The standardized uptake value (SUV) of the abnormal sites was also recorded as follows ; SUV＝Decay corrected dose (mCi)/tumor (mL)/Injected dose (mCi)/body weight (gm). The disease progression was evaluated according to Japanese classification of gastric carcinoma.[6)]

Case Report

[**Case 1**]

A 65-year-old man underwent FDG-PEG for a medical work-up. His past histories included cerebral infarction and an appendectomy 40 years previously. His serum carcinoembryonic antigen (CEA) level had risen to 6.7 ng/ml, whereas his carbohydrate antigen (CA) 19-9 level had risen to 49 U/ml (Those become clear after a PET checkup). However, no other abnormal findings were recognized. Fig. 1 a shows the FDG-PET response assessment. An accumulation of FDG was observed in the gastric parietal wall. The SUV remarkably rose to 6.08, (delay image 8.36, Max). In addition, we recognized two thin accumulation images in the circumference near the main lesion and thus diagnosed the presence of metastatic lymph nodes (each SUV ; 3.32, 3.00). No liver metastasis was demonstrated on FDG-PET. Fig. 1 b shows the findings of an endoscopic Examination. We recognized the flat dish-shaped protruding lesion in the anterior wall of the cardia. The pathological diagnosis was well differentiated tubular adenocarcinoma. Abdominal CT was not able to point out any significant swelling of the lymph node or liver metastasis. The patient underwent a total gastrectomy with a dissection of the second level lymph nodes, a splenectomy, and a cholecystectomy. No liver metastasis or peritoneal dissemination was observed. A histological examination of the 5.0×5.5-sized-tumor showed a well differentiated tubular adenocarcinoma invading the proper muscular layer of the stomach (pT2/ ss, ly2, v 2). In addition, metastases to the right paracardial lymph node (# 1 LN) and LN along the lesser curvature (# 3 LN) were observed. The final staging grouping was Stage Ⅱ. The postoperative course was uneventful, and the patient has

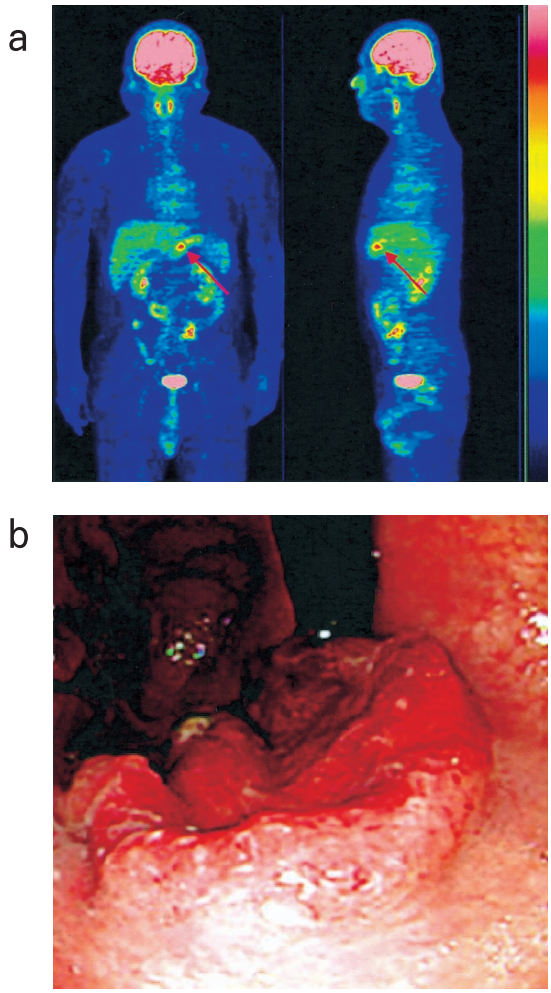

Fig. 1 a An accumulation of FDG was observed on the gastric parietal wall. The level of SUV was 6.08 (delay imaging 8.36, Max). In addition, we recognized two thin accumulation images in the circumference near the main lesion and thus diagnosed the patient to have metastatic lymph nodes (each SUV ; 3.32, 3.00)

Fig. 1 b We recognized the flat dish－shaped protruded lesion in the anterior wall of the cardia. The endoscopic diagnosis was type 2 advanced gastric cancer. The pathological diagnosis was well differentiated tubular adenocarcinoma.

done well for 20 months without any sign of tumor recurrence.

[**Case 2**]

A 62-year-old man underwent an FDG-PET examination during a medical checkup. He had a past history of diabetes mellitus. His serum CEA level was 3.6 ng/ml, whereas carbohydrate antigen (CA) 19-9 was 9 U/ml. No other particularly aberrant findings were recognized. Fig. 2 a shows the FDG-PET response assessment. An accumulation of FDG was observed in the middle gastric part, and the level of SUV was 4.68, (delay image 3.34, Max). No liver metastasis or lymph node metastases were demonstrated on FDG-PET. Fig. 2b shows the findings of an endoscopic examination. An endoscopic examination showed a protruding lesion in the anterior wall of the middle part of the stomach. The pathological diagnosis was moderately differentiated tubular adenocarcinoma. Abdominal CT showed no significant lymph node swelling or liver metastasis. The patient underwent a distal gastrectomy with a dissection of the second level lymph nodes and a cholecystectomy. The pathological findings were early gastric cancer, which was confined to the submucous layer (pT1/sm, ly2, v 0), while, metastases to # 3 LN were also recognized. The final staging grouping was Stage IB. The postoperative course was uneventful, and the patient has done well for 20 months without any sign of tumor recurrence.

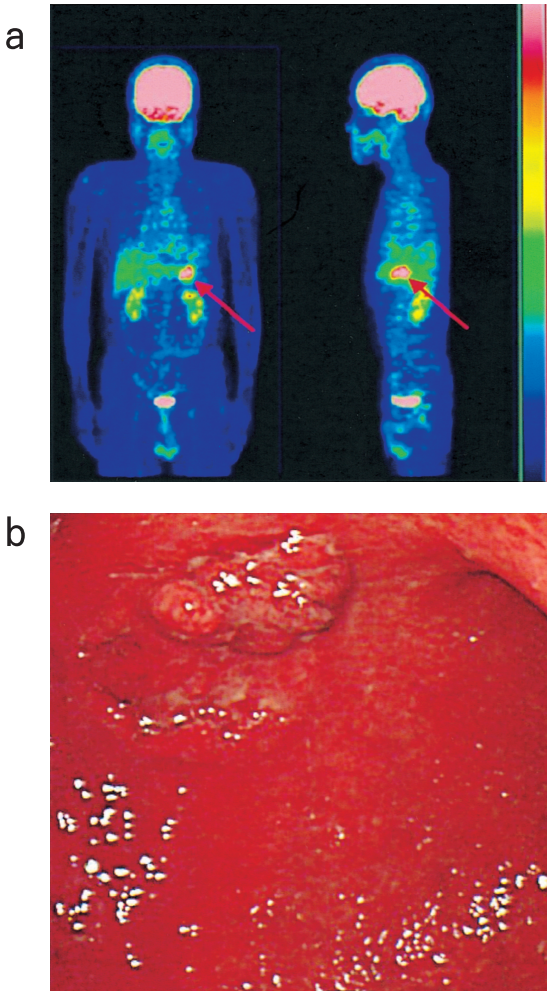

Fig. 2 a An accumulation of FDG was observed in the middle gastric part, and the level of SUV was 4.68 (delayed imaging 3.34, Max).

Fig. 2 b An endoscopic examination showed a protruding tumor in the anterior wall of the middle part of the stomach. The tumor was composed of advanced gastric cancer of type 1 and advanced cancer simulating early cancer of type 0-IIc. The pathological diagnosis was moderately differentiated tubular adenocarcinoma.

Discussion

We herein report two cases of gastric cancer which was detected during an FDG-PET medical checkup and both patients underwent successful surgical treatment. In the two presented cases, high accumulations of FDG to the stomach were recognized. Because we strongly suspected gastric cancer, a gastrointestinal endoscopic examination was performed and a diagnosis was made based on biopsy findings. As the matter of course, an FDG-PET scan does not play an important role in either the primary diagnosis or screening of gastric cancer. A diagnosis of gastric cancer using an FDG-PET scan was not found to be superior to an endoscopic examination. Furthermore, the FDG-PET scan was not able to detect small mucosal lesions that are readily seen on endoscopy. On the other hand, the few available published reports on gastric cancer suggest that FDG-PET scanning is highly sensitive for detecting primary tumors and metastases in the liver and other sites.[7] The high sensitivity of FDG-PET scanning from the primary lesion of the gastric cancer may be partly due to the tumor size, as only patients with locally advanced disease were referred for an evaluation by FDG-PET scanning.

The lymph node status, which is widely regarded to be an important prognostic indicator, may be difficult to predict pre-operatively. In case 1, we were not able to identify any metastasis in the regional lymph node on CT. In the meantime, FDG-PET imaging showed an accumulation image of the gastric parietal circumferential lymph nodes with metastases. Delbek et al reported that an FDG-PET checkup was able to evaluate metastases to the lymph nodes in fifty-two percent of 21 cases with gastric cancer.[8] Tian J and his colleagues also reported that FDG-PET correctly diagnosed 83.3% of the primary malignant and benign lesions of 38 cases with suspected gastric tumors. Furthermore, the primaries were false-negative in a quantitative analysis, quantitative PET readings revealed positive lymph nodes, thereby providing a correct diagnosis.[9] However, an evaluation of metastases to the regional lymph nodes using FDG-PET scanning requires the accumulation of further cases before any definitive conclusions can be made. Essentially, an FDG-PET study showed significant advantages, regarding the point of the detection for various malignant tumors of all organs.[10] Stahl A and his colleagues reported that intestinal type and non-mucus-containing tumors were detected by FDG-PET.[11] In these cases, we happened to recognize a high FDG accumulation in the stomach during an FDG-PET whole body medical checkup. In addition, the maximal advantage of a cancer checkup using an FDG-PET scan is its ability to simultaneously detect the existence of additional tumors, and any metastases to the lymph nodes and/or other organs. Kinkel and his colleagues perform a meta-analysis to compare current noninvasive imaging methods (US, CT, MRI, FDG-PET) for detecting hepatic metastasis from colorectal, gastric, and esophageal cancers. As a result, at an equivalent specificity, FGD-PET is thus considered to be the most sensitive noninvasive imaging modality for the diagnosis of hepatic metastases.[12] In our hospital, more than 15,000 FDG-PET examinations have been performed over the past 3 years. At this moment in time, the detection rate of malignant diseases in a FDG-PET survey has been reported to be about 2.0%. Because the rate is about 20 times higher than that of conventional cancer surveys which range from 0.1 to 0.3%, the FDG-PET survey thus seems to be a useful diagnostic modality during a cancer work-up.

Above all, an FDG-PET medical checkup is a non-invasive diagnostic modality. From now on, we have to accumulate more cancer patients undergoing a checkup using FDG-PET scans, and further review the usefulness of an FDG-PET survey for detecting carcinoma in various organs.

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