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FDG-PET imaging in duodenal cancer

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F-18 fluorodeoxyglucose positron emission tomography (FDG-PET) imaging is a useful modality in the detection of various tumors, including colon cancer and gastric cancer. We evaluated a patient with duodenal cancer with multiple metastases including brain metastases using FDG-PET imaging. It revealed multiple tumor uptake in the brain, clavicular fossa, mediastinum, right adrenal gland and duodenum. These results suggest that FDG-PET imaging may be useful in detecting the primary and metastatic lesions of duodenal adenocarcinoma.

Key words: FDG-PET, duodenal cancer, multiple metastases, tumor imaging

INTRODUCTION

PRIMARY ADENOCARCINOMA of the duodenum, excluding that of the ampulla of Vater, is extremely uncommon, occurring in 0.019% to 0.5% of all autopsy cases.[1] Spira et al. reported that duodenal neoplasms may be more frequent than suspected and are readily diagnosed by fiberoptic esophagogastro-duodenoscopy. Fiberopic endoscopy should thus become the major diagnostic tool for this disease.[2]

F-18 fluorodeoxyglucose has been demonstrated to have affinity for a variety of malignant tumors.[3–5] Tumor uptake of ^{18}F-FDG in colorectal cancer[6] and gastric cancer[7] was reported. ^{18}F-FDG may accumulate in duodenal tumor. However, to our knowledge, tumor uptake of FDG in duodenal adenocarcinoma has not been described in detail.

In this paper we describe our attempt to detect the primary and metastatic lesions in a patient with duodenal adenocarcinoma using FDG-PET.

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CASE REPORT

An 85-year-old woman was admitted with muscle weakness of the left arm. Physical examination revealed bilateral clavicular lymph node swelling. Neurological examination showed moderately exaggerated deep reflexes of the left upper limb and positive Barre's sign. The patient was noted to have increased CEA and CA 19-9 as well. Advanced duodenal tumor was detected by fiberopic endoscopy. Well- to moderately differentiated adenocarcinoma was proven by biopsy from the duodenal tumor (Fig. 1).

To evaluate the metastatic lesions, FDG-PET was performed. We obtained PET scans with a Siemens EXACT HR+ scanner (Siemens/CTI, Knoxville, TN, USA). We asked the patient to fast for 6 h beforehand. A whole-body acquisition was started 60 min after injection of 185 MBq ^{18}F-FDG. Emission data were collected at 5 min per bed position with no attenuation correction.

FDG-PET imaging revealed tumor uptake in the bilateral clavicular fossa, mediastinum, right adrenal gland and duodenum (Fig. 2). Corresponding chest and abdominal CT showed mass lesions in the bilateral clavicular fossa, mediastinum, right adrenal gland and the duodenum. FDG-PET of the head showed tumor uptake in the brain (Fig. 3A), and enhanced MRI revealed multiple mass lesions of the brain on T1 weighted images (TR/TE: 500/12) (Fig. 3B).

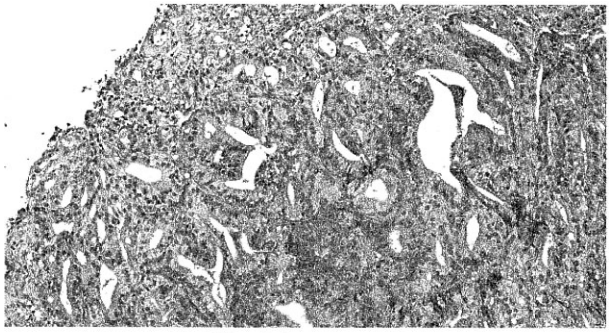

Fig 1A

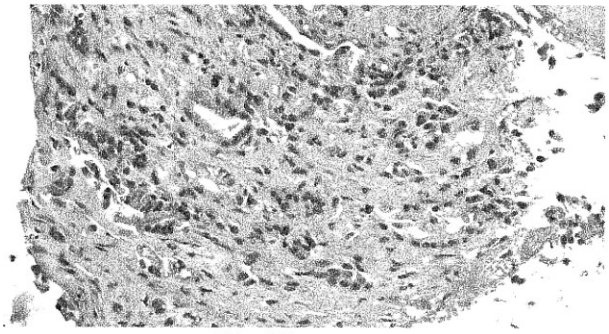

Fig 1B

Fig. 1 A: Hematoxylin-eosin stain (×20). Well to moderately differentiated adenocarcinoma. Most of the tumor cells are columnar but some are cuboidal. The tumor shows tubular pattern and some glands are dilated. B: Hematoxylin-eosin stain (×40). High-power magnification of the carcinoma infiltrating in the lamina propria mucosae.

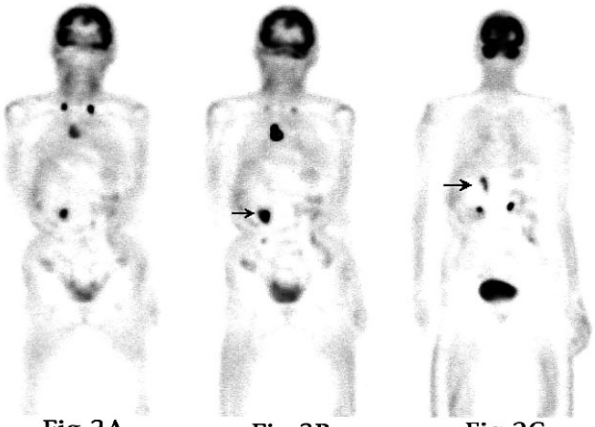

Fig 2A Fig 2B Fig 2C

Fig 2D Fig 2E

Fig. 2 A–C: Coronal images of ^{18}F-FDG PET reveal tumor uptake in the bilateral clavicular fossa, mediastinum, right adrenal gland (*black arrow* in C) and duodenum (*black arrow* in B). D, E: Axial images show increased uptake in the right adrenal gland (*black arrow* in D) and duodenum (*black arrow* in E). Physiological uptake of the liver (*arrowheads* in D) and the right kidney including the renal pelvis (*arrowheads* in E) was shown.

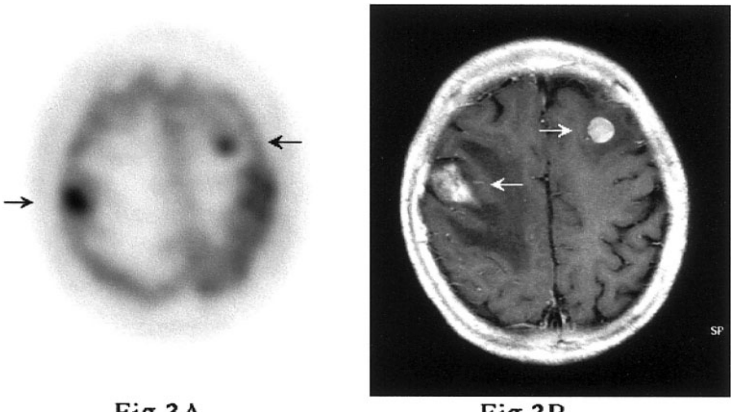

Fig 3A Fig 3B

Fig. 3 A: Axial images of ^{18}F-FDG PET reveal tumor uptake in the brain (*black arrows*). B: Enhanced MRI (TR/TE: 500/12) shows enhanced mass lesions in the bilateral frontal lobes (*white arrows*).

DISCUSSION

Arai et al. reported that microscopically, well- or moderately differentiated adenocarcinomas of the duodenum are the most common. Poorly differentiated adenocarcinoma is often observed in the filtrating area of the tumor. Other carcinomas, including signet ring cell carcinoma and mucinous adenocarcinoma have also been reported.[8] In our case, well- to moderately differentiated adenocarcinoma of the second duodenal portion was proven in an 85-year-old patient.

FDG-PET has been reported to provide increased

accuracy compared with the conventional modalities for the diagnosis for primary and recurrent gastrointestinal tumors, including gastric cancer[7,9] and colorectal cancer.[6] Stahl et al. reported the correlation of FDG uptake in gastric carcinoma with endoscopic and histopathological findings. Only 25% of the signet ring cell adenocarcinomas and 67% of the mucinous adenocarcinoma were detected. In contrast, all other adenocarcinomas were detected by PET imaging.[10] Kawamura investigated expression of glucose transporter-1 (Glut1) in gastric cancer *in vitro*. Glut1 was negative in signet ring cell carcinoma and mucinous adenocarcinoma, whereas Glut1 was variably positive in other adenocarcinomas.[11] Previous work has shown that Glut1 has a significant role in the glucose metabolism of pancreatic tumors and may contribute to the increased uptake of FDG in PET imaging.[12] Thus, it was suggested that FDG may accumulate in gastrointestinal adenocarcinoma excluding signet ring cell carcinoma and mucinous adenocarcinoma. Until now, tumor accumulation of FDG in duodenal adenocarcinoma has not been described extensively.

FDG-PET imaging was performed in a patient with duodenal adenocarcinoma with suspected multiple metastases on CT or MRI. FDG imaging showed abnormal increased uptake not only in the primary well- to moderately differentiated adenocarcinoma of the duodenum but also in suspected multiple metastatic lesions. Jeong et al. reported the usefulness of FDG-PET in patients with suspected metastatic brain tumors particularly from lung cancer.[13] However, only in one of two cases of gastric cancer could FDG-PET detect brain metastasis. These cases did not include any with duodenal adenocarcinoma. Recently Rohren reported that the detection of small metastatic lesions in the brain was difficult using FDG-PET.[14] The usefulness of FDG-PET in the detection of metastatic brain tumors is still controversial. In our case, FDG-PET showed abnormal increased uptake in the cerebral lesions, which were suspected brain metastases on enhanced MRI. However, biopsy from the cerebral lesions was not performed. FDG-PET imaging may detect brain metastases from the primary duodenal adenocarcinoma.

We demonstrated abnormal increased uptake of duodenal adenocarcinoma with suspected multiple metastases using FDG-PET imaging. These results suggested that FDG-PET may be a useful imaging modality for detecting the primary and metastatic lesions of duodenal adenocarcinoma.

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