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Early gastric cancer and early colon cancer detected simultaneously by PET cancer screening incidentally

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We report a case of early gastric cancer and early colon cancer detected by positron emission tomography (PET) cancer screening. A 64-year-old male patient with an unremarkable past history except for hypertension and cerebrovascular disease underwent ^{18}F-FDG PET for cancer screening. Images revealed increased uptake in the gastric antrum and sigmoid colon. Both areas appeared suspicious for neoplasm on subsequent fluoroscopy and endoscopy, and biopsies were positive for neoplasia at both sites. The gastric lesion was treated by distal gastrectomy and D2 lymphadenectomy and the colon cancer by endoscopic mucosal resection (EMR). Both surgical specimens were positive for cancer.

Key words: F-18 fluorodeoxyglucose, positron emission tomography, screening, early diagnosis, gastrointestinal neoplasms

INTRODUCTION

SINCE the Ministry of Health, Welfare, and Labor began offering public medical insurance coverage for ^{18}F-FDG PET for malignancies in 2002, the number of PET facilities has steadily increased. Because of PET's ability to detect asymptomatic tumors, more than half of the facilities offer PET examinations for cancer screening.[1] Most cancers may be detectable by PET screening.[2] We report a case of early gastric cancer and early colon cancer detected in one patient in a PET screening examination.

CASE REPORT

A 64-year-old man presented for routine PET cancer screening in our department. He was asymptomatic. His past medical history was significant for hypertension. He had suffered a cerebral hemorrhage ten years previously. His past surgical history was significant for an appendectomy at age 20. Routine laboratory tests and tumor markers (CEA, Ca 19-9) were all within normal limits. The patient took a laxative 48 hours prior to imaging and took nothing by mouth except sugar-free liquids for four hours prior to injection. Just before injection he was hydrated with 500 m*l* green tea. Following IV injection of 240 MBq (6.51 mCi; 0.12mCi/kg) ^{18}F-FDG, he rested quietly for one hour. He then underwent scanning from skull vertex through the midthighs in an ALLEGRO PET scanner (Philips, Eindhoven, The Netherlands) with transmission attenuation correction (2 minutes 30 sec/bed position emission, 23 sec/bed position transmission). Attenuation-corrected emission images were reconstructed using 3-D RAMURA (3-D Row Action Maximum Likelihood Algorithm, Philips, Eindhoven, The Netherlands). The PET images revealed hypermetabolic foci in the gastric antrum and the sigmoid colon (Fig. 1). The maximum standardized uptake value (SUV max) was 6.9 for the antral focus and 4.9 for the sigmoid focus, both in the range suspicious for malignancy. The gastric lesion was evaluated by an upper GI series (Fig. 2A) and esophagogastric endoscopy (Fig. 2B), which revealed an irregular 3 cm mass arising from the greater curvature and involving the antrum. Endoscopic biopsy revealed a well-differentiated tubular adenocarcinoma (tub 1). An air-contrast barium enema

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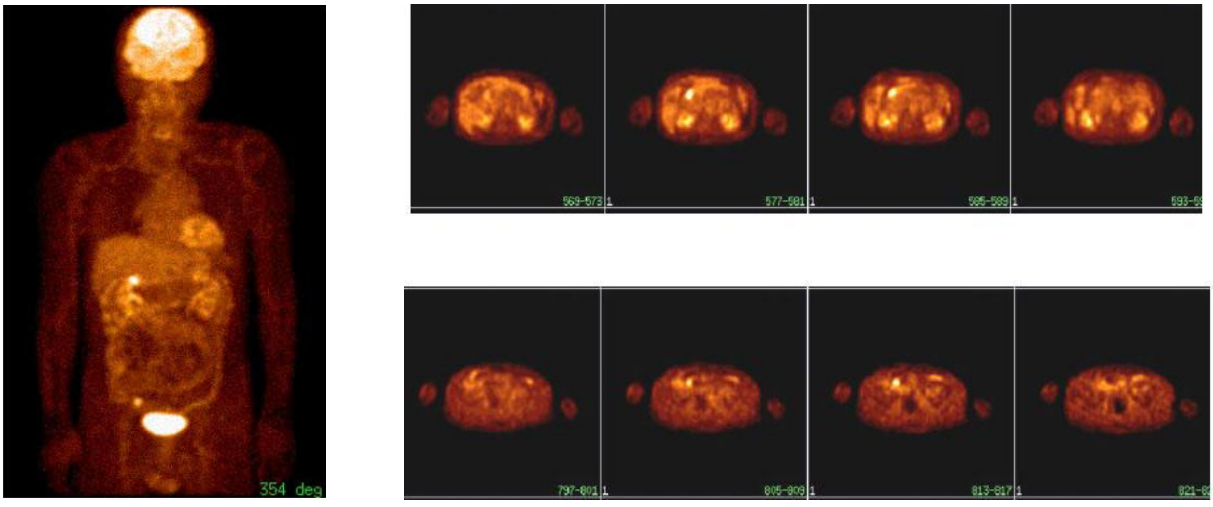
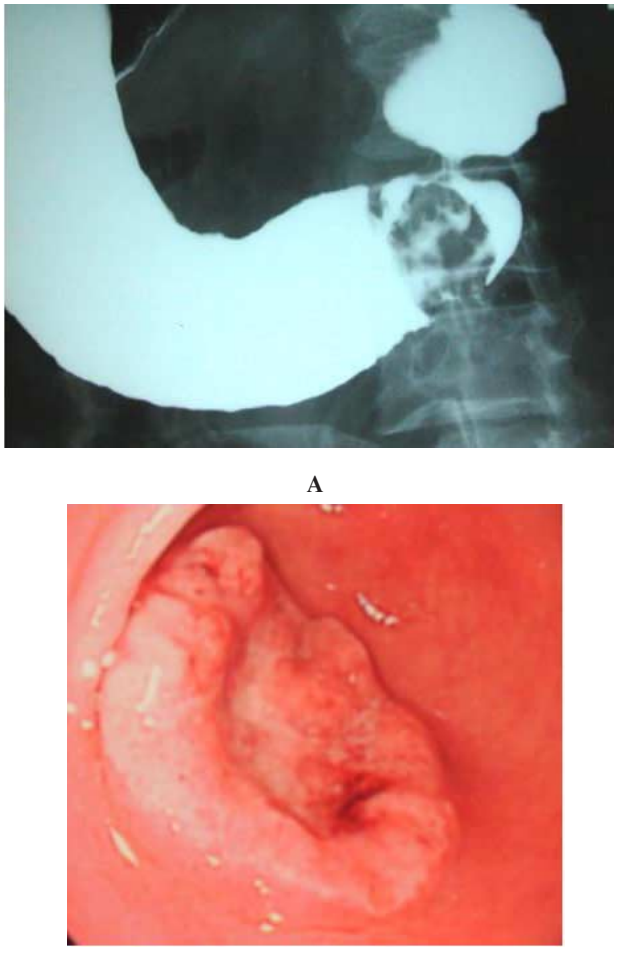


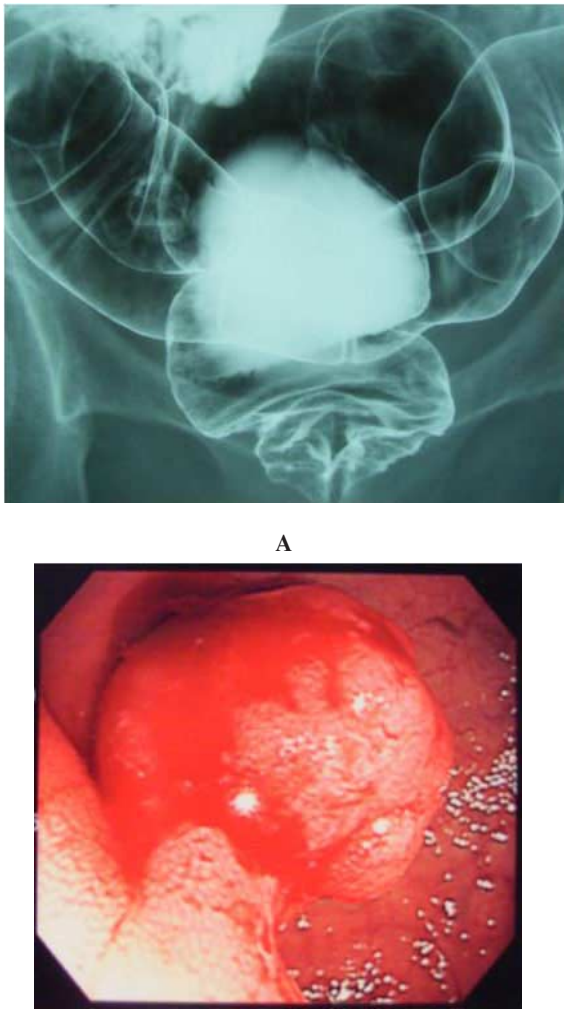
Fig. 1 The ^{18}F-FDG-PET MIP image (Maximum Intensity Projection Image) shows FDG uptake at the right lateral and lower abdomen. ^{18}F-FDG accumulated in both the antrum of the stomach and sigmoid colon on the ^{18}F-FDG PET axial image. The maximum standardized uptake values of FDG (SUV max) were 6.9 (antrum) and 4.9 (sigmoid colon).



A

B

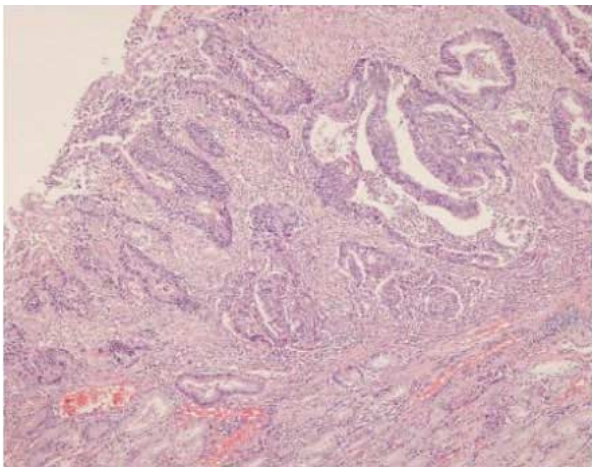
Fig. 2 Upper GI series (A) and esophagogastric endoscopy (B) revealed an irregular tumor 3 cm in diameter from the antrum to the greater curvature of the stomach. Type 2 advanced gastric cancer was suspected.



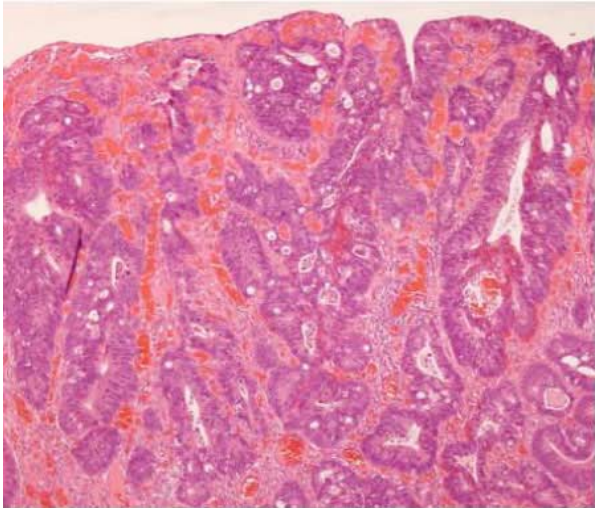
A

B

Fig. 3 An air-contrast barium enema (A) and colonoscopy (B) revealed a polypoid lesion 2 cm in diameter at the sigmoid colon.



A



B

Fig. 4 A: reveals the pathological preparation of gastric cancer. The postoperative histopathological findings indicated well-differentiated tubular adenocarcinoma (tub1). B: shows the pathological preparation of colon cancer. The histopathological finding was carcinoma with an adenoma component.

(Fig. 3A) and colonoscopy (Fig. 3B) revealed a 2 cm polypoid lesion in the sigmoid. Biopsy was positive for well-differentiated adenocarcinoma. The gastric lesion was treated with a distal gastrectomy and D2 lymph node dissection. Histology of the resected specimen (Fig. 4A) revealed invasion of the submucosal layer (sm3). The postoperative staging was early gastric cancer (IIa + IIc) pT1 N0 M0. The colonic lesion was treated with endoscopic mucosal resection (EMR). The resected specimen (Fig. 4B) showed carcinoma with adenoma component (depth:m, v0, ly0). Thus far, after one year, there has been no evidence of tumor recurrence at either site.

DISCUSSION

It is well known that ^{18}F-FDG PET can be used to detect malignant tumors.[2] In the case under discussion, both early gastric and early sigmoid colon cancer were detected in the same patient on a single scan. As there have been fewer reports of gastric cancer research undertaken with PET than reports of other malignancies, it has not been clear whether ^{18}F-FDG PET is useful in the evaluation of gastric neoplasms. The sensitivity of PET in gastric cancer has been reported to be in the range of 60–90%,[3–7] which is lower than for malignancy at other sites. ^{18}F-FDG uptake has been reported to be relatively low in "signet ring" and other mucinous tumors.[3,6,7] Yoshioka et al. have reported finding greater uptake in well-differentiated adenocarcinomas than in poorly differentiated and signet-ring cell adenocarcinomas.[6] The histopathology in our case was well-differentiated tubular adenocarcinoma. The positive ^{18}F-FDG uptake is consistent with the results of Yoshioka et al.[6] Recently, Mochki et al. compared ^{18}F-FDG PET with CT in lymph node metastasis detection, and reported the sensitivity of PET and CT to be 65% and 23.3%, respectively.[5] In the present case, both PET and histopathology revealed no evidence of nodal spread. The sensitivity for colorectal cancer of ^{18}F-FDG PET has been reported to be 95–100%.[8–12] ^{18}F-FDG PET has been reported to be of value in detecting premalignant lesions.[13,14] Yasuda et al. have reported the sensitivity to be 90% in adenomas over 1 cm.[14] Comparing ^{18}F-FDG PET with colonoscopy, Drenth et al. report the sensitivity, specificity, and positive predictive value of ^{18}F-FDG PET to be 74%, 84%, and 78%, respectively.[15] As evidenced by the uptake in a carcinomatous lesion with an adenomatous component, our findings in this case are consistent with those of previous reports. The first center for PET cancer screening opened at the Hidemic Imaging Center at Lake Yamanaka, Japan in 1994. Since that time, the number of PET screening facilities has steadily increased. It has been reported that the detection rate of cancer by PET screening of asymptomatic individuals is approximately 0.6–1.1%.[1] This detection rate, higher than the rates for other modalities, suggests that PET may be potentially useful in cancer screening.[1] Before PET screening is implemented over wide population groups, the effect on morbidity and mortality, as well as the sensitivity and specificity, will need to be determined. These issues are under investigation. We have reported a case of simultaneous early gastric and early colon cancers detected by PET screening. Tumors of these types can also be detected by conventional imaging, and early gastric cancers are often false negative on PET. We have seen no other cases of simultaneous gastric and colon tumor detection. Given PET's accuracy in detecting head and neck cancer, lymphoma, and malignant neoplasms of the small intestine, we feel that regular screening with PET has the potential to increase the detectability of cancers.

More cases such as our need to be accumulated to aid in the assessment of PET's role in cancer screening.

REFERENCES

1. Yasuda S, Ide M. PET and cancer screening. *Ann Nucl Med* 2005; 19: 167–177.
2. Yasuda S, Shohtsu A. Cancer screening with whole-body ^{18}F-fluorodeoxyglucose positron-emission tomography. *Lancet* 1997; 350: 1819.
3. Dehdashti F, Siegel BA. Neoplasms of the esophagus and stomach. *Semin Nucl Med* 2004; 34: 198–208.
4. Yeung HW, Macapinlac H, Karpeh M, Finn RD, Larson SM. Accuracy of FDG-PET in gastric cancer: preliminary experience. *Clin Positron Imaging* 1998; 4: 213–221.
5. Mochiki E, Kuwano H, Katoh H, Asao T, Oriuchi N, Endo K. Evaluation of ^{18}F-2-deoxy-2-fluoro-D-glucose positron emission tomography for gastric cancer. *World J Surg* 2004; 28: 247–253.
6. Yoshioka T, Yamaguchi K, Kubota K, Saginoya T, Yamazaki T, Ido T, et al. Evaluation of ^{18}F-FDG PET in patients with a, metastatic, or recurrent gastric cancer. *J Nucl Med* 2003; 44: 690–699.
7. Stahl A, Ott K, Weber WA, Becker K, Link T, Siewert JR, et al. FDG PET imaging of locally advanced gastric carcinomas: correlation with endoscopic and histopathological findings. *Eur J Nucl Med Mol Imaging* 2003; 30: 288–295.
8. Falk PM, Gupta NC, Thorson AG, Frick MP, Boman BM, Christensen MA, et al. Positron emission tomography for preoperative staging of colorectal carcinoma. *Dis Colon Rectum* 1994; 37: 153–156.
9. Abdei-Nabi H, Doerr RJ, Lamonica DM, Cronin VR, Galantowicz PJ, Carbone GM, et al. Staging of primary colorectal carcinoma with fluorine-18 fluorodeoxyglucose whole body PET: correlation with histopathologic and CT findings. *Radiology* 1998; 206: 755–760.
10. Mukai M, Sadahiro S, Yasuda S, Ishida H, Tokunaga N, Tajima T, et al. Preoperative evaluation by whole-body ^{18}F-fluorodeoxyglucose positron emission tomography in patients with primary colorectal cancer. *Oncol Rep* 2000; 7: 85–87.
11. Oku S, Nakagawa K, Momose T, Kumakura Y, Abe A, Watanabe T, et al. FDG-PET after radiotherapy is a good prognostic indicator of rectal cancer. *Ann Nucl Med* 2002; 16: 409–416.
12. Kantoroval I, Lipska L, Belohlavek O, Visokai V, Trubae M, Schneiderova M. Routine ^{18}F-FDG PET preoperative staging of colorectal cancer; comparison with conventional staging and its impact on treatment decision making. *J Nucl Med* 2003; 44: 1784–1788.
13. Chen YK, Kao CH, Liao AC, Shen YY, Su CT. Colorectal cancer screening in asymptomatic adults: the role of FDG PET scan. *Anticancer Res* 2003; 23: 4357–4361.
14. Yasuda S, Fujii H, Nakahara T, Nishiumi N, Takahashi W, Ide M, et al. ^{18}F-FDG PET detection of colonic adenomas. *J Nucl Med* 2001; 42: 989–992.
15. Drenth JP, Nagengast FM, Oyen WJ. Evaluation of (pre-) malignant colonic abnormalities: endoscopic validation of FDG-PET findings. *Eur J Nucl Med* 2001; 28: 1766–1769.