COMMENTARY
Print ISSN 2234-2400 / On-line ISSN 2234-2443
Clin Endosc 2012;45:109-110
http://dx.doi.org/10.5946/ce.2012.45.2.109

Open Access

Benign Colonic ^{18}F-FDG Uptake on Whole-Body FDG-PET Scan

Byung Ik Jang

Department of Internal Medicine, Yeungnam University College of Medicine, Daegu, Korea

See "The Clinical Meaning of Benign Colon Uptake in ^{18}F-FDG PET: Comparison with Colonoscopic Findings" by Sun Hee Roh, Sung-Ae Jung, Seong-Eun Kim, et al., on page 145-150

Positron emission tomography (PET) using ^{18}F-fluoro-2-deoxy-D-glucose (FDG) is a functional imaging modality and has been widely accepted in the diagnosis and staging of various malignancies, such as lymphomas, gastrointestinal (especially, colon cancer), and pulmonary cancer.[1,2] It can measure the amount of accumulation of FDG in cells with high rates of glycolysis.[3] Most cancer cells show high rate of glycolysis and these tumors are well diagnosed by FDG-PET/CT.[4,5] There is a report of increased glucose metabolism in colorectal cancer (CRC).[6] Accordingly, FDG-PET has been carried out, even for healthy check-ups, and several cases of high colonic FDG uptake revealed colonic premalignancy or malignancy.[7-9]

CRC is the third most common cancer and the major cause of cancer-related mortality in Western countries.[10] Recently, the incidence of CRC is increasing in Korea.

Most of CRC develop from adenomatous polyps. Early detection and resection of premalignant polyp can prevent progressive malignant disease. Colonoscopy is regarded as the gold standard for the detection of colonic lesions such as adenomatous or malignant polyp. However, colonoscopy is uncomfortable and invasive procedure as a screening modality for CRC. Several studies have suggested a potential role for FDG-PET in the detection of premalignant and malignant lesions of the colon.[6,11] However, increased FDG uptake is present in benign, inflammatory, or granulomatous processes and in sites of normal, physiologic tracer distribution besides in malignant lesions.[12] Physiologic uptake within gastrointestinal tract (GIT) varies in intensity and patterns. These benign type FDG uptake may be falsely attributed to a cancerous etiology, and increased tracer activity in malignant lesions may be erroneously interpreted as unrelated to cancer.[5,12] Large intestine is a well-known site of physiologic uptake and this may interrupt the detection of adenoma or carcinoma of colon.[13] Clinical significance of incidental tracer uptake of colon and needs of further evaluation of these lesion is unclear.

In that point, study of Roh et al.[14] has a clinical significance. They investigated the clinical significance of benign colon uptake on a whole-body FDG-PET in asymptomatic adults by correlating them with colonoscopic and histologic findings. This study included only benign appearing FDG uptake cases and this is different from previous studies. They categorized FDG uptakes largely into focal, segmental and diffuse types according to their patterns as did several previous studies. Five cases among the 28 diffuse uptakes were diagnosed as adenoma, while 5 cases among the focal uptake were diagnosed as neoplastic polyps, 2 of which were revealed as malignancy. Positive predictive values were shown as 25% in the diffuse group and 47% in the focal group. According to this study, benign FDG uptake in the colon should be further evaluated by colonoscopy, especially for patients with focal FDG uptake. Drenth et al.[13] also suggested that pathologic FDG uptake in the colon was present as a clear focus without extension into the lumen and corresponded with a delayed image. It gives us best information about clinical significance of benign FDG colonic uptake in asymptomatic adults. The results of this study suggest that diffuse uptake showed lower positive predictive value for malignant or premalignant lesion of colon. This physiologic tracer activity in the GIT has been attributed to uptake by smooth muscles (mainly in the bowel), swallowed secretions, or excretion and intraluminal concentration of FDG captured by colonic bac-

Received: March 30, 2012 **Revised:** May 17, 2012
Accepted: May 17, 2012

Correspondence: Byung Ik Jang
Division of Gastroenterology, Department of Internal Medicine, Yeungnam University College of Medicine, 170 Hyeonchung-ro, Nam-gu, Daegu 705-717, Korea
Tel: +82-53-620-3831, **Fax:** +82-53-654-8386, **E-mail:** jbi@med.yu.ac.kr

teria after intravenous administration. However, several studies showed that small sized adenomas could be detected in diffuse uptake pattern.[13,15]

There are several limitations in study of Roh et al.[14] First, most of the indications of the FDG-PET were the evaluation of underlying malignancy. The result could be different if the indication for FDG-PET were only screening without underlying malignancy. Patients with prior medical history of inflammatory bowel disease or gastrointestinal malignancy, those who were taking oral hypoglycemic agents at baseline, and those who had taken antibiotics beforehand could be confounding factors and should have been excluded. And the small sample size is also limitation. There were only 43 patients with benign FDG uptake of colon.

There was no significant correlation between the size of lesions and FDG uptake of colon in study of Roh et al.[14] Yasuda et al.[6] revealed that larger adenomas could be detected by FDG-PET, but not smaller ones. The spatial resolution (full width at half maximum) of their PET machine was 6.0 mm in the axial plane, and for lesions less than twice this length, FDG uptake was underestimated because of the partial-volume effect. FDG uptake above 13 mm had 90% positive rate of colonic adenoma.[6]

Roh et al.[14] compared the maximum standardized uptake value (SUVmax) of benign and malignant uptake to evaluate their clinical significance and found that the cellular differentiation was well correlated with the amount of SUVmax. One limitation of FDG-PET is difficulty of differentiation between malignant and inflammatory lesions because they all demonstrate increased FDG activity. Evaluating the semiquantitative SUV measurements have been suggested as a tool to differentiate potential etiologies of FDG foci in the GIT. Israel et al.[2] showed SUVmax for 34 foci with increased ^{18}F-FDG uptake in the GIT ranged from 4.5 to 40.3. Mean SUVmax was 17.3 for the malignant lesions, 14.0 for the premalignant lesions, 18.0 for the benign lesions, and 11.1 for the sites of physiologic activity. There was no statistically significant difference in the intensity of FDG uptake among the 4 subgroups. In this series, a similar but wide range of FDG uptake values were found across benign uptake subgroups. Several other studies revealed colonic adenoma and carcinoma may not be differentiated by PET.[16-18]

Neoplastic lesion of colon such as adenoma has the potential for malignant transformation, and most of them can be curatively resected. Hence, it is important to recognize the fact that adenomatous polyps can be found incidentally with PET. To confirm the discrimination of benign FDG colonic uptake between pathologic and physiologic lesions, we need further studies with larger number of patients.

Conflicts of Interest

The author has no financial conflicts of interest.

REFERENCES

1. Choi YY. Clinical Application of F-18 FDG PET/PET-CT in gastrointestinal tumors. Hanyang Med Rev 2007;28:28-36.
2. Israel O, Yefremov N, Bar-Shalom R, et al. PET/CT detection of unexpected gastrointestinal foci of 18F-FDG uptake: incidence, localization patterns, and clinical significance. J Nucl Med 2005;46:758-762.
3. Gallagher BM, Fowler JS, Gutterson NI, MacGregor RR, Wan CN, Wolf AP. Metabolic trapping as a principle of oradiopharmaceutical design: some factors resposible for the biodistribution of [18F] 2-deoxy-2-fluoro-D-glucose. J Nucl Med 1978;19:1154-1161.
4. Bar-Shalom R, Valdivia AY, Blaufox MD. PET imaging in oncology. Semin Nucl Med 2000;30:150-185.
5. Rigo P, Paulus P, Kaschten BJ, et al. Oncological applications of positron emission tomography with fluorine-18 fluorodeoxyglucose. Eur J Nucl Med 1996;23:1641-1674.
6. Yasuda S, Fujii H, Nakahara T, et al. 18F-FDG PET detection of colonic adenomas. J Nucl Med 2001;42:989-992.
7. Shin SJ, Choi JW, Lee SK, Choi CH, Kim TI, Kim WH. A case of multiple colonic adenomas which were found incidentally in FDG-PET. Korean J Med 2004;66:639-643.
8. Patrikeos AP, Mackay JR, Hicks RJ. Detection of synchronous adenocarcinomas and multiple dysplastic polyps with F-18 FDG positron emission tomography in a case of nonfamilial polyposis. Clin Nucl Med 2003;28:487-488.
9. Okuno T, Fu KI, Sano Y, et al. Early colon cancers detected by FDG-pet: a report of two cases with immunohistochemical investigation. Hepatogastroenterology 2004;51:1323-1325.
10. Jemal A, Siegel R, Ward E, Hao Y, Xu J, Thun MJ. Cancer statistics, 2009. CA Cancer J Clin 2009;59:225-249.
11. Kang MK, Hong SP, Lee JE, et al. The usefulness of F18-FDG PET/CT in detection of colonic neoplasm. Intest Res 2010;8:18-23.
12. Cook GJ, Fogelman I, Maisey MN. Normal physiological and benign pathological variants of 18-fluoro-2-deoxyglucose positron-emission tomography scanning: potential for error in interpretation. Semin Nucl Med 1996;26:308-314.
13. 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.
14. Roh SH, Jung SA, Kim SE, et al. The clinical meaning of benign colon uptake in ^{18}F-FDG PET: comparison with colonoscopic findings. Clin Endosc 2012;45:145-150.
15. Kim S, Chung JK, Kim BT, et al. Relationship between gastrointestinal F-18-fluorodeoxyglucose accumulation and gastrointestinal symptoms in whole-body PET. Clin Positron Imaging 1999;2:273-279.
16. Keogan MT, Lowe VJ, Baker ME, McDermott VG, Lyerly HK, Coleman RE. Local recurrence of rectal cancer: evaluation with F-18 fluorodeoxyglucose PET imaging. Abdom Imaging 1997;22:332-337.
17. Strauss LG, Klippel S, Pan L, Schönleben K, Haberkorn U, Dimitrakopoulou-Strauss A. Assessment of quantitative FDG PET data in primary colorectal tumours: which parameters are important with respect to tumour detection? Eur J Nucl Med Mol Imaging 2007;34:868-877.
18. Weston BR, Iyer RB, Qiao W, Lee JH, Bresalier RS, Ross WA. Ability of integrated positron emission and computed tomography to detect significant colonic pathology: the experience of a tertiary cancer center. Cancer 2010;116:1454-1461.