Incidental Detection of Colorectal Malignancies using FDG PET-CT

Abstract:
M Fleming, M Knox, MJ Kennedy, C Johnston
St James’s Hospital, James’s St, Dublin 8

The aim of this study was to evaluate the detection rate of incidental colorectal malignancies using whole-body 18FDG-PET/CT at an Irish teaching hospital. We performed a retrospective review of the records of 800 consecutive patients undergoing PET-CT scans at our institution from January 2009 – August 2009. The radiologic reports were analysed and all scans with focal colonic FDG uptake were audited. The coloroscopic and histologic records of the patients who underwent further investigation were reviewed for cancerous and pre-cancerous histology. A total of 643 patients were included in the study. Forty-eight patients (7.5%) had scans which demonstrated focal colonic FDG uptake. Of the 21 patients who underwent further investigation with endoscopy, 14 (66.7%) had biopsies which were positive for dysplasia, this represented 2.2% of the total patients undergoing PET-CT. Eight of these fourteen patients (1.2% of the total) had biopsies demonstrating adenocarcinoma. Four of these patients (50%) had TNM stage 1 or 2 colorectal carcinoma and underwent subsequent curative surgical resection. We found a 2.2% rate of incidentally-diagnosed colorectal malignant and premalignant lesions in patients undergoing PET-CT at our institution. A 1.2% rate of adenocarcinoma was identified. This rate is higher than previously described in the literature.

Introduction
Colorectal cancer is the second leading cause of cancer-related death in the western world. Over 2,000 people are diagnosed and over 900 die of colorectal cancer in the Republic of Ireland every year. It is generally accepted that adenomas are probably the precursors of most, if not all, colorectal cancers. The detection and removal of adenomatous polyps is important in the prevention of developing colorectal carcinoma. Positron emission tomography (PET-CT) using 18 Fluoro deoxyribose glucose (18FDG) now forms the basis of radiological diagnosis and staging in many forms of malignancy, including colorectal malignancy. PET-CT like any radiological investigation, can demonstrate incidental findings. The rate of PET positive lesions concerning for a second primary malignancy has been found to be as high as 12%, however only 1.8% had second primary lesions pathologically proven. PET-CT has also been shown to be useful in the detection of premalignant as well as malignant colonic lesions. Several studies have evaluated the rate of detection of incidental unexpected colorectal carcinomas and colonic adenomas in patients undergoing PET-CT. Rates of between 0.3% and 2.3% have been found. The aim of this study was to evaluate the detection rate of incidental colorectal malignancies using whole-body 18FDG PET-CT at a large Irish academic cancer centre.

Methods
We performed a retrospective review of the records of 800 consecutive patients undergoing PET-CT scans for staging of non-colorectal malignancies at our institution between January 2009 and August 2009. All patients were scanned on a GE Discovery PET-CT 64 slice scanner (GE Healthcare,USA), and all scans were performed for known or suspected malignancy. PET-CTs were performed with a routine protocol; all patients fasted for at least 4 hours so that serum glucose levels were less than 10 mmol/dl (usually < 7 mmol/dl). Sixty minutes after injection of 330 – 450MBq of 18F-FDG, 2D emission scans were obtained from base of skull to thighs. A low dose CT was performed for attenuation correction. Oral contrast was given. PET images were reconstructed with CT derived attenuation correction using ordered subset expectation maximisation (OSEM). Images were reviewed by 1 of 3 nuclear radiologists aware of the patient’s clinical history. The radiologic reports were analysed and all scans with focal colonic FDG uptake were audited (Figure 1). The coloroscopic and histologic records of the patients who underwent further investigation were reviewed for cancerous and pre-cancerous histology. Patients with a previous history of colorectal malignancy or a PET-CT scan in the preceding year were excluded from the study. Patients with PET-CT scans demonstrating segmental uptake or obvious inflammatory findings were also excluded from the analysis.

Results
From a total of 800 scans performed, 157 patients were excluded; 84 patients had a previous history of colorectal carcinoma and 73 patients had a prior PET-CT scan in the preceding year. In all 643 patients undergoing PET-CT for staging of non-colorectal malignancies were assessed. The indication for the PET-CT scan was recorded (Table 1). The average age was 60.5 years (SD = 16). Forty-eight patients (7.5%) had scans demonstrating focal colonic 18FDG accumulation. Twenty-one of these patients (43.8%) underwent further investigation with endoscopy +/- biopsy. The remaining 27 patients did not undergo additional assessment after multi-disciplinary discussion or clinical review.

Figure 1: Coronal PET maximum intensity projection image demonstrating the known FDG avid squamous cell carcinoma in the left lung (blue arrow) and an incidental FDG avid lesion in the caecum (yellow arrow), a biopsy proven adenocarcinoma
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All lesions identified at endoscopy were biopsied or removed by polypectomy. Of the 21 patients who underwent endoscopy, 14 (66.7%) had lesions identified which were biopsy-positive for adenomatous polyps or colorectal adenocarcinoma. This is comparable to rates seen in other studies (44-76%), however given our high incidence of carcinoma, a hyperplastic poly and another patient had a biopsy of a visible lesion performed however no abnormal histologic findings were found. Five patients had endoscopy which did not demonstrate an abnormality.

Several studies have attempted to correlate the intensity of FDG uptake with endoscopy findings. We did not assess the FDG avidity or the size of the lesion on the PET-CT scan or at endoscopy or resection. The average age of patients with incidentally diagnosed colorectal adenocarcinoma and dysplastic polyps was 75.4 years and 66.5 years respectively. In all of the patients with incidental colorectal carcinomas identified the indication for the PET-CT scan was a primary cancer of the aero-digestive tract. Four patients had a known diagnosis of primary squamous cell carcinoma of the head and neck, 2 patients had oesophageal carcinoma and two patients had primary lung carcinoma. Four out of these eight patients (50%) had early stage (TNM stage 1 or 2) colorectal carcinoma and underwent subsequent curative surgical resection. The remaining cancers were at a more advanced stage.

Discussion

Overall 2.2% of patients who underwent PET-CT scan had biopsy proven incidental colonic lesions. Only one other study has shown a comparable rate. Farquharson et al demonstrated a 2.3% rate of incidentally detected colonic lesions. Other similar published studies which have shown a 0.9 - 1.2 % detection rate for incidental colonic lesions, demonstrated a high rate of adenocarcinoma compared with that found in the published studies, 1.2% compared to 0.2- 0.45%. One possible reason for this may be that Ireland has a high incidence of colorectal carcinoma, ranking 8th highest of 30 European countries for the incidence of colorectal carcinoma. The lack of a formalised screening programme for colorectal cancer may also have an impact on the rate of incidental diagnosis. The rate of incidentally detected colonic adenoma was 0.9%, this is comparable to most of the other studies with rates of 0.8 -1.2%. Farquharson et al demonstrated a higher rate of 2.0%. A potential reason for this is that the mean age of patients in the Farquharson et al study was 70.5 years compared to 60.5 years in our study and the incidence of colorectal malignancy has been shown to increase with advancing age. Another reason for our lower adenoma rate compared to the highest was that we had relatively low 43.6% of patients undergoing investigation with endoscopy. This is comparable to rates seen in other studies (44-76%), however given our high incidence of carcinoma detection the lower adenoma rate may be related to our relatively low endoscopy rate.

A total of 27 patients were not evaluated due to either physician or patient decision. One limitation of our study was that the reasons for this were unassessed, however the primary reason the patient has may have been a contributing factor. Farquharson et al noted that it is likely that the management dilemma encountered with incidental PET-CT findings will become a frequent issue in the Multidisciplinary Team framework. It should also be noted that while a patient may not undergo further investigation with endoscopy, they may be having regular cross-sectional imaging as part of their ongoing oncology treatment. The radiological reports of patients with focal colonic FDG uptake advised either endoscopy or clinical correlation, this was at the discretion of the reporting radiologist. Of those patients who underwent endoscopy, 66.7% had lesions identified which were biopsy-positive for either premalignant adenomas or adenocarcinomas. This implies that colonoscopy is a justified next step in the diagnostic workup of a positive PET/CT study.

Unexpected colorectal FDG uptake on PET-CT is increasingly common with the availability and expanding use of the technology, especially in oncology. We found a 2.2% rate of incidentally-diagnosed colorectal malignant and premalignant lesions ingluited undergoing PET-CT at our institution. This is higher than that seen in most other published studies and similar to the rate described by Farquharson et al. We demonstrated a 1.2% rate of incidental colorectal carcinoma, which is higher than the rates in the published literature (0.2-0.45%). With incidentally diagnosed colorectal adenocarcinoma had TNM stage I and II tumours and these patients went on to have curative surgical resection. Early identification of both cancerous and pre-cancerous occult lesions with PET-CT has a major impact on patient treatment and long-term outcome.

Correspondence: M Fleming
The Adelaide and Meath Hospital, Tallaght, Dublin 24
Email: michelle.fleming@amchc.ie

References

8. This represented 28.6% of the patients who underwent further investigation and 0.9% of all the patients included in the study. Of the remaining seven patients, one patient had a biopsy which revealed a hyperplastic poly and another patient had a biopsy of a visible lesion performed however no abnormal histologic findings were found. Five patients had endoscopy which did not demonstrate an abnormality.