The Egyptian Journal of Hospital Medicine (July 2018) Vol. 72 (11), Page 5575-5577

Role of PET/CT in Assessment of Colorectal Carcinoma

Waleed Mohamed Abd-Elhamid Hetta, Ahmed Hassan Soliman, Ahmed Mohamed Rabie*
Department of Radiology, Faculty of Medicine, Ain Shams University
*** Corresponding author:** Ahmed Mohamed Rabie, **Tel:** 01142313632, **Email:** Ahmedrabie67107@gmail.com

ABSTRACT

Background: colorectal cancer is the second most common cause of cancer in women (9.2% of diagnoses) and the third most common in men (10.0%), it is the fourth most common cause of cancer death after lung, stomach, and liver cancer. **Aim of the Work:** the goal of this study was to elucidate the role of 18F-FDG PET-CT in evaluation of colorectal cancer. **Patients and Methods:** twenty five patients with histopathologically proven colorectal primary malignancy were evaluated for suspected local recurrence and metastasis. No age predilection and both sexes were included, clinical history, image follow-up, tumor markers, and pathological reports were reviewed for gold standard. **Results:** the final diagnosis of distant metastasis and/or local recurrence in post-therapeutic cancer colon was evident in 70% of our patient population with PET/CT sensitivity of 95.6%, specificity of 91.4%, (NPV) of 88.9%, (PPV) of 96.7%, and diagnostic efficacy of 94.4% and CT sensitivity of 62.6%, specificity of 48.6, (NPV) of 33.3% (PPV) of 76.0%, and diagnostic efficacy of 58%. **Conclusion:** PET/CT is a better method to evaluate post-therapeutic colorectal cancer patients.

Keywords: Post therapeutic colorectal cancer18F-FDGPET/CTCECT.

INTRODUCTION

Colorectal cancer is a major cause of morbidity and mortality throughout the world. It accounts for over 9% of all cancer incidences. It is the third most common cancer worldwide and the fourth most common cause of death. It affects men and women almost equally[(1)]. Early detection of recurrence is clinically important and can improve the prognosis and survival of patients with cancer. CT is considered the primary method of investigation because of its low cost, widespread availability, and high-resolution of anatomic details, but may under-estimate the actual tumor burden by overlooking small tumor clusters in areas of distorted anatomy after treatment [(2)]. Accurate imaging of patients with possible recurrent colorectal cancer (CRC) is vital, as it is now clear that curative surgery is still possible for a proportion of patients with metastatic disease. Follow-up is usually performed with carcinoembryonic antigen (CEA) level, computerized tomography (CT) and other conventional imaging techniques, but in the last few years, functional imaging using integrated positron emission tomography and CT (PET/CT) is being used increasingly to identify recurrent disease [(3)].

AIM OF THE WORK

The goal of this study was to elucidate the role of 18F-FDG PET-CT in evaluation of colorectal cancer.

PATIENTS AND METHODS

Methods: PET/CT study was performed for each patient as follows: Procedures of Whole-Body PET/CT Imaging with 18F-FDG:**PET/CT** was performed on an integrated scanner (Philips 128 slice CT) that combines both CT and PET capabilities in two sequential gantries, avoiding the need for patient motion between the CT and PET components of the study giving accurate co-registration of the CT and PET data. Patients fasted for at least 6 hours before the examination, except for water and glucose free fluid. Blood glucose levels measured less than 200mg/dL. Patient's weight was measured. A dose of (0.18–0.21mCi/kg, 5-14 mCi) FDG was injected intravenously. The patients rested in aquietroom. After the 45–60-minute uptake period, the patients were asked to void just before entering the examination room. No oral or intravenous contrast agent was used for the PET-CT examination. Multi-detector CT examination from the base of the skull to the upper thighs (120 mA, 140 kVp, table speed = 13.5 mm per rotation and thickness of 4 mm) was planned. After CT acquisition, PET acquisition of the same axial range started with the patient in the same position on the table for 2–3 minutes per bed position. PET data were acquired by using a matrix of 128x128 pixels. CT-based attenuation correction of the emission images was used. After PET data acquisition was completed, the reconstructed attenuation corrected PET images. **Exclusion criteria:** Patients with the following conditions were excluded from the study: Strong history of atopic disorders, Serum creatinine level above 2mg/dl, recent surgery less than 6 weeks, radiotherapy within less than 3months, and chemotherapy within less than 3weeks. **Interpretation and image analysis:** Images were interpreted by experienced nuclear medicine physicians and radiologist. Qualitative assessment for the presence of hyper-metabolic lesions was

Received:21/6/2018
Accepted:30/6/2018

evaluated on corrected PET images. Semi-quantitative evaluation was performed using the Standardized Uptake Value (SUVmax) according to the following formula: SUVmax = maximum measured activity in the volume of interest (millicuries per milliliter)/injected dose of FDG (millicuries) program of bodyweight. The standard SUVmax of 2.5 was considered a cutoff point, where lesions with SUVmax of 2.5 and above in PET/CT studies were considered positive for disease involvement while findings with SUVmax below 2.5 were considered to be insignificant of disease involvement.

RESULTS

Table (1): Diagnostic performance of PET/CT in comparison with CECT by regional lesions based analysis.

	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Diagnostic efficacy
PET – CT	95.6%	91.4%	96.7%	88.9%	94.4%

DISCUSSION

PET/CT has been reported to play an important role in early detection of post therapeutic recurrence in patients with cancer colon due to its direct evaluation of malignant cellular metabolism. Its great role appears in detection of small sized LNs, local operative bed recurrence, small supra renal metastasis, early osseous deposits and post-therapeutic evaluation of viable and non-viable malignant lesions (post chemotherapy and radiotherapy) [(2)]. Limitations of PET/CT include its inability to detect viability in sub centimetric hepatic focal lesions and pulmonary nodules as well as the evaluation of mucinous tumor deposits, particularly in hypo cellular lesions with abundant mucin, Recently using delayed regional scan is more favorable to detect these metastasis [(4)]. The final diagnosis of distant metastasis and/or local recurrence in post-therapeutic cancer colon based on lesions analysis was evident in 70% of our patient population with sensitivity of 95.6%, specificity of 91.4%, (NPV) of 88.9%, (PPV) of 96.7%, and diagnostic efficacy of 94.4%. These results agreed with results obtained in the study done by ***Metser et al.***[(5)]which included 158 patients who had a history of colorectal carcinoma, presented with increasing CEA levels and conventional imaging modalities revealed an equivocal explanation of the elevated CEA level. The sensitivities of PET/CT and MDCT were 98.1% and 66.7%, the specificities were 75% and 62.5% respectively. The specificity in ***Metser et al.***[(5)] study by PET/CT and CT was higher than the study by ***Mittal et al.***[(3)] in which he analyzed 73 patients (55 male, 18 female; age range 25 to 80 years) histopathologically proven CRC who underwent FDGPET/CT imaging for the detection of recurrence after the initial treatment. Rising CEA levels were detected in 51 patients. In 13 patients, CT was negative, whereas PET was positive (three patients with liver lesions, five patients with lymph nodes involvement, two patients with bone metastases, one patient with local recurrence in urinary bladder wall, one patient with lymphnode and liver metastases, and one patient with lymph node and bone metastases), thereby changing the management. As reported in the study done by ***Chen et al.***[(6)]and confirmed in our study, in 56 patients with recurrent and/or metastatic CRC, sensitivity of PET/CT in diagnosis CRC recurrence and/or metastasis was 94.6%, specificity was 83.3%, positive predictive value was 96.4% and negative predictive value was 76.9%. PET/CT imaging detected occult malignant lesions in eight cases where CT showed negative findings. Furthermore, it detected more lesions than CT did in 30.4% of cases (17/56). Recurrence and/or metastasis were detected by 18F-FDG PET/CT imaging in 91.7% of cases (22/24) having elevated serum CEA levels. The study results by ***Choi et al.***[(7)] to assess the value of 18F-FDG PET/CT in detecting local or distant recurrence in 269 CRC patients operated for colorectal cancer and to compare the accuracy with conventional imaging studies, showed overall sensitivity, specificity, accuracy, PPV, and NPV of 94.7%, 96.0%, 95.8%, 78.2%, and 99.2% for PET/CT, and 86.8%, 97.6%, 96.2%, 84.6%, and 98.0% for conventional imaging studies, respectively. On a region-based analysis in the study by ***Choi et al.***[(7)], PET/CT detected more lesions compared to conventional imaging studies in local recurrence (14/15vs. 13/15) and peritoneal carcinomatosis (4/4 vs. 3/4). PET/CT and conventional imaging studies detected the same number of lesions in abdominal lymph nodes (8/8) and hepatic (13/13) metastases. PET/CT additionally detected metastases to the lung (n = 5) and bone (n = 1). Both PET/CT and conventional imaging studies showed a false positive finding in a case for single spleen metastasis that was pathologically proven to be chronic inflammation. As

reported previously and confirmed by our study ***Chiewvit et al.***[8]have shown that 18F-FDG PET/CT is a useful method inpostoperative evaluation of patients with suspected recurrent colorectal cancerous lesions and a normal CEA level. When conventional imaging methods have shown equivocal findings, 18F-FDG PET/CT is effective and helpful to distinguish local recurrences or metastases from postoperative changes or benign disease findings that may not be meaningful. Previous studies as described above have shown the role of PET/CT in the detection of post therapeutic cancer colon recurrence with better sensitivity and specificity when compared to that of CT scan. By using PET/CT, studies demonstrated more information and lesion characterization. Comparing PET/CT to CT, the present study also shows comparable overall sensitivity, specificity and diagnostic efficacy.

CONCLUSION

PET/CT is a better method to evaluate post-therapeutic colorectal cancer patients with suspected tumor recurrence or distant metastasis than enhanced CT with significantly higher specificity and sensitivity.

CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCES

1. **Haggar FA and Boushey RP (2009):** Colorectal cancer epidemiology: incidence, mortality, survival, and risk factors. Clinics in Colon and Rectal Surgery, 22(4): 191-197.
2. **Israel O and Kuten A (2007):** Early Detection of Cancer Recurrence: 18F-FDGPET/CT Can Make a Difference in Diagnosis and Patient Care. Nuclear Medicine, 48(1):28-35.
3. **Mittal BR, Senthil R, Kashyap R*et al.* (2011):** 18F-FDG PET-CT in evaluation of postoperative colorectal cancer patients with rising CEA level.Nucl Med Commun., 32(9):789-793.
4. **Lee JW, Kim SK, Lee SM *et al.* (2011):** Detection of Hepatic Metastases Using Dual-Time-Point FDG PET/CT Scans in Patients with Colorectal Cancer. Molecular Imaging and Biology, 13(1):565-572.
5. **Metser U, You J, McSweeney S *et al.* (2010):** Assessment of tumor recurrence in patients with colorectal cancer and elevated carcinoembryonic antigen level: FDG PET/CT AJR Am J Roentgenol., 194(2): 766-771.
6. **Chen LB, Tong JL, Song HZ *et al.* (2007):** (18)F-DG PET/CT in detection of recurrence and metastasis of colorectal cancer. World J Gastroenterol., 13(1): 5025-5029.
7. **Choi EK, Yoo LR, Han EJ et al. (2010):** Value of surveillance F-18 FDG PET/CT in colorectal cancer: comparison with conventional imaging studies. J Nucl Med., 51 (1): 1208.
8. **Chiewvit S, Jiranantanakorn T, Apisarnthanarak P *et al.* (2013):** Detection of Recurrent Colorectal Cancer by 18F-FDG PET/CT Comparison with Contrast Enhanced CT Scan. Journal of the Medical Association of Thailand, 96 (6): 703-708.