State of The Art Positron Emission Tomography and Computed Tomography (PET/CT) in Pancreatic Cancer

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Abstract: Background: The purpose of this study is the evaluation of the role PET/CT in the detection & follow up of pancreatic cancer. Is it has emerged as a promising diagnostic tool for pancreatic cancer. **Material and Methods:** A retrospective analysis of 60 patients, presenting with pathology proved or clinically suspected pancreatic lesions of pancreas, where collected from two centers (national cancer institute and Naser hospital) during the period of October 2013 till May 2017, all patients were referred for abdominal 18F-FDG PET/CT for localization of tumor. Patients fasted for 4 - 6 h before PET scanning. Each patient was injected with 0.14 mCi/kg of body weight with F-18 FDG. PET images were acquired 45-60 min after intravenous injection of FDG. At first low dose contrast CT was performed prior to PET. Five millimeter thick sections are obtained at 80 mA and 120 kVp from the xiphisternum to symphis pupis, sometimes from the skull base till the feet and in some patients late images were obtained. For PET/CT fusion images were also reconstructed transverse, coronal and sagittal slices in two sets with and without attenuation correction. **Results:** This study was performed in the Radio diagnosis & nuclear medicine departments in national cancer institute and Nasser institute hospital. The study was prospectively carried on 60 patients with pancreatic lesions. In this study, mean age at diagnosis of 57 years, with 41 male patients & 19 female patients, mean weight 76kg, mean height 162, (mean Blood sugar at diagnosis of 116. Study revealed local pancreatic lesions in 23 patients local invasion in 3 patients (about 6.7%), LNS_METS in15 patients (about. 25%), osseous deposits in 5 patients (about 8.6%) while perionteal deposite in 6 patients (about 10%) this study. **Conclusion**: FDG-PET/CT is a useful modality for detection of pancreatic cancer and monitoring metabolic response.

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1. Introduction

Pancreatic cancer, a disease characterized by abnormal growth of cells in the pancreas. Ninety-five percent of pancreatic cancers develop from the exocrine pancreas. The remaining 5 percent are often called neuroendocrine tumors or islet-cell cancers; these develop from endocrine cells (1). Fused positron emission tomography (PET)/computed tomography (CT) is a recently developed technology that couples the functional information of PET with the anatomic details of CT. Integrated PET/ CT scanners produce both PET and contrast material–enhanced CT images of the entire body in one setting. PET/CT provides an opportunity to depict pancreatic tumors and distant metastases, perform preoperative staging, and monitor response to treatment, and it has proved useful in distinguishing postoperative fibrosis from recurrence (2). Combined PET/CT scanner improves the overall sensitivity and specificity of information provided by PET or CT alone.

Aim of the Work

The aim of this work is to show the PET/CT value and role in evaluation of pancreatic cancer especially in:1-Characterisation of pancreatic lesion.2-Assesment of treatment response.3-Accurate staging.

2. Patients and Methods

Patient with age more than 18 years, Positive history suspect of pancreatic lesion, Histological proven pancreatic cancer, Positive history of operation or treatment of pancreatic cancer, Blood urea nitrogen and serum creatinine within normal range.

3. Results

The most reason for doing PET/ CT in this study is assessment of therapy response, the most common site of pancreatic cancer is head. the most common type of pathology is adenocarcinoma while the other pathologies are by far much lower as the As regarding to presence of pancreatic mass 25 patient. the PET/CT able to detect23. with Sensitivity about 91.3%. & spesifity 94,5% the calculated sensitivity of CT & PET CT in detection of recurrence were 50%,100%, specificity were 90.9%,100%, PPV were 92.3%, 100% and NPV were 45.5% and100% respectively. The calculated sensitivity of CT & PET CT in detection of organ deposites were 64.5%, 100%, specificity were

71.4%, 85.7%, PPV were71.4%, 88.6%, and NPV were 64.5%, 100% respectively. the calculated sensitivity of CT & PET /CT in detection of liver deposits were 36.8%, 94.7%, specificity were 87.8%,100%, PPV were 58.3%,100% and NPV were 75% and 97.6% respectively. The mean SUV max with present of metastasis is 8.012.

4. Discussion

Pancreatic cancer is one of the most lethal human cancers and it continues to be a major unsolved health problem worldwide. In surgery for pancreatic cancer, a great deal of effort has been made to expand the resection with an extended lymphadenectomy in order to improve the outcome. However, only patients with localized disease and a tumor size less than 2 cm with no lymph node metastases can expect long-term survival after surgery Therefore, increased efforts should be focusing not only on diagnosing the early stage disease, but also on staging and predicting prognosis so that unnecessary surgical exploration may be avoided (3).

A meta-analysis conducted by Tang et al showed a pooled sensitivity of 90.1%, with an specificity (SP) of 80.1%. Another meta-analysis by Wu et al revealed PET imaging. similar results with a pooled sensitivity SE of 87% and an specificity SP of 83%. The possible reason for the relatively low SP may be misdiagnosis of mass forming pancreatitis as tumors on PET imaging (4).

Our findings also correlate with those of previous reports, in which the sensitivity of FDG-PET, has been reported to be 91, 3%, & spesifity 94.5% respectively.

Pancreatic carcinoma tends to transfer to lymph nodes at an early stage. The reported SE sensitivity of FDG-PET/CT for detecting metastatic lymph nodes ranges from 21%-38 % (4). Maemura et al. reported an SE of 50% for para-aortic lymph node. The low metabolic state and partial volume effect may be the reasons. In our study SE sensitivity up to100%. this is due to the report of case was done by two professors, due to use of contrast enhanced CT, also the small number of patient in study (5).

As a whole body exam, PET/CT possesses the unparalleled advantage in M staging. The reported SP is as high as 91%-100%. Strobel et al (6) reported an SE of 100% for detecting lung and bone metastases. Kitajima et al. (7) reported three pancreatic cancer patients with ovarian metastases detected only by FDG-PET/CT. In the study by Strobel et al. (6), unenhanced and enhanced PET/ CT had accuracies of 60% and 80% for detecting peritoneal implantation. Farma et al. (4) also reported two peritoneal metastases found by PET/CT alone. our finding also correlate with those of previous reports, in which SE & SP of PET CT in detection organ deposits of100% & SP of 85%respectively.

According to the previous reports (8), the sensitivity of FDG-PET for detecting hepatic metastases is about 70%, while that of this study was 52.6%. In particular, small lesions less than 1 cm could not be detected. It has also been reported that the sensitivity for lesions less than or greater than 1 cm is 43% and 97%, respectively.

Nakata et al (3) showed that in patients with unrespectable disease, a high SUV correlated with a shorter survival. Maemura et al (5) reported that pancreatic tumors with distant metastasis showed significantly higher SUV levels than tumors without metastasis. Sperti et al also demonstrated that a high SUV (> 4.0) was associated with shorter survival. On the other hand, the increased glycolytic activity of the tumor detected by the SUV may represent tumor growth and also resemble the tumor's biological behavior (3). our finding also correlate with those of previous reports, in which pancreatic tumors with distant metastasis showed significantly higher SUV levels than tumors without metastasis.

PET/CT in tumor recurrence detection and metabolic response monitoring

For patients who underwent surgery, PET/CT is able to detect recurrence early during the follow-up. Ruf et al. conducted study patients with suspected recurrence after surgery the detection rate of FDG-PET was 42%, while that of CT/MRI was 96%. FDG-PET/CT's ability to detect the metabolic change before morphological changes has been proven by in vivo studies (9). our finding also correlate with those of previous reports, in which detection rate of recurrence up to 100%. It has been successfully utilized in monitoring the metabolic changes during chemotherapy and/or radiation therapy.

Chang et al reported that PET-CT was a more effective method for evaluating tumor response than conventional CT after radiotherapy for unrespectable pancreatic cancer (4).

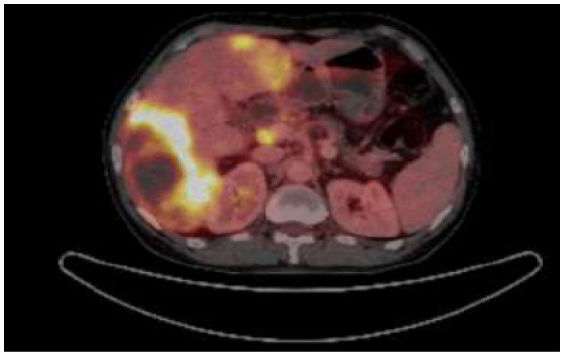

Fig: Axial image showing polypoidal mass at the right lateral wall and trigone

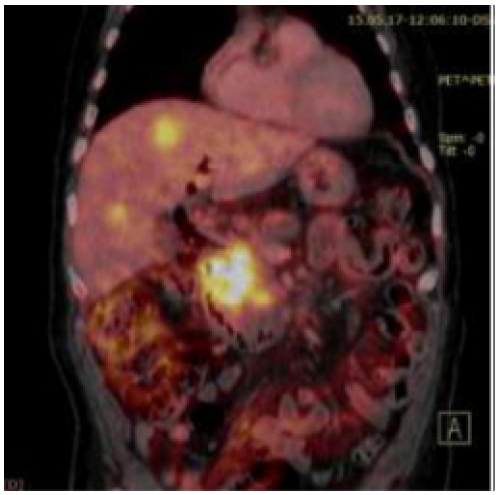

Fig: Virtual image showin polypoidal mass, M: mass and F: foley's catheter

Conclusion

FDG-PET/CT is a useful modality for detection of pancreatic cancer. its use in tumor staging extra information about nodal & distant metastasis is vital enough to change clinical management. FDG-PET/CT has the advantage in monitoring metabolic response, making it optimal in evaluation of different kinds of treatments. It is also a valuable tool to detect suspected recurrence. The correlation between SUV and presence of metastasis is also help to select patients suitable for surgery. Many efforts have been made to improve diagnostic efficacy of PET/CT.

References

1. Jordan M. W, Anirban M, and Charles J. Genetics and pathology of pancreatic cancer, journal List HPB 2006; 8(5): 324–336.
2. 10. Dushyan VS, Pitro AB, et al, State of art PET/CTof the pancrease: current role & emerging indications. Radio Graphics 2012; 32:1133–1158.
3. Wakabayashi H, Nishiyama Y, Otani T, Sano T, Yachida S, Okano K, Izuishi K, Suzuki Y. Role of 18F-fluorodeoxyglucose positron emission tomography imaging in surgery for pancreatic cancer. World J Gastroenterol 2008; 14(1): 64-69.
4. Wang XY, Yang F, Jin C, Fu DL. Utility of PET/CT in diagnosis, staging, assessment of resectability and metabolic response of pancreatic cancer. World J Gastroenterol 2014; 20(42): 15580-1558.
5. Maemura K, Takao S, Shinchi H, Noma H, Mataki Y, Kurahara H, Jinnouchi S, Aikou T. Role of positron emission tomography in decisions on treatment strategies for pancreatic cancer. J Hepatobiliary Pancreat Surg 2006; 13: 435-441.
6. Strobel K, Heinrich S, Bhure U, Soyka J, Veit-Haibach P, Pestalozzi BC, Clavien PA, Hany TF. Contrast-enhanced 18FFDG PET/CT: 1-stop-shop imaging for assessing the resectability of pancreatic cancer. J Nucl Med 2008; 49(9): 1408-1413.
7. Kitajima K, Suzuki K, Senda M, Kita M, Onishi Y, Maeda T, Yoshikawa T, Ohno Y, Sugimura K. FDG PET/CT features of ovarian metastasis. Clin Radiol 2011; 66: 264-268.
8. A.P. Rijkers a, R. Valkema b, H.J. Duivenvoorden a, C.H.J. van Eijck a. Usefulness of F-18-fluorodeoxyglucose positron emission tomography to confirm suspected pancreatic cancer: A meta-analysis EJSO 40 (2014) 794-804.
9. Priyanka Jha and Bijan Bijan. PET/CT for Pancreatic Malignancy: Potential and Pitfalls. J Nucl Med Technol 2015; 43:92–97.

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