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Value of 18F-FDG PET/CT in preoperative diagnosing and staging of extrahepatic cholangiocarcinoma
Yang Hui, Guan Zhiwei, Fu Liping, Xu Baixuan, Liu Yachao, Shen Zhihui, Li Can

Objective: To evaluate the value of 18F-FDG PET/CT in preoperative diagnosis and staging of suspected extrahepatic cholangiocarcinoma (EHCC). Methods: The clinical data of 116 patients (72 males, 44 females; age range 26–89 years) with suspected EHCC from January 2013 to October 2014 were retrospectively analyzed. All patients received preoperative whole body 18F-FDG PET/CT scan. The imaging results were compared with final clinical diagnosis. The diagnostic sensitivity, specificity, positive predictive value, negative predictive value and accuracy of 18F-FDG PET/CT were calculated. Two-sample t test was applied to compare lesion SUV_{max} of malignant and benign diseases. One-way analysis of variance was applied to compare SUV_{max} of highly, moderately and poorly differentiated tumors. χ² test was used to compare the difference of diagnostic sensitivities for hilar cholangiocarcinomas and common bile duct tumors. Results: All patients were confirmed by exploratory laparotomy and subsequent histologic examination. A total of 94 cases (93 adenocarcinomas and 1 squamous carcinoma) were confirmed malignant and 22 cases (11 biliary calculi, 9 cholangitis, 1 choledochal cyst, 1 tuberculosis) were confirmed benign. The diagnostic sensitivity, specificity, positive predictive value, negative predictive value and accuracy of 18F-FDG PET/CT for primary tumor were 61.7% (58/94), 77.3% (17/22), 92.1% (58/63), 32.1% (17/53), 64.7% (75/116), respectively. The diagnostic sensitivity, specificity, positive predictive value, negative predictive value and accuracy of 18F-FDG PET/CT for hilar lesions were 45.5% (15/33), 91.4% (53/58), and for those with lymph node metastasis were 3/4, 94.3% (82/87). The diagnostic sensitivity, specificity, positive predictive value, negative predictive value and accuracy of 18F-FDG PET/CT for regional lymph nodes were 48.6% (17/35) vs 69.0% (40/58), χ² = 3.827, P > 0.05. Conclusion: The value of 18F-FDG PET/CT in preoperative diagnosis and staging of EHCC is limited. It can distinguish some benign diseases from malignant tumors, but with higher false positive for cholangitis. It can help to adjust treatment strategies by detecting distant metastasis.

Detection of regional lymph metastasis with 18F-FDG PET/CT imaging in patients with rectal cancer
Kuai Yuxian, Ge Jiuyuan, Zhou Wei, Cui Bin, Zhang Wei, Gong Haiseng, Liu Qichu, Ma Jun, Liu Peng, Zuo Changjing

Objective: To evaluate the diagnostic value of 18F-FDG PET/CT imaging in detection of regional lymph node metastasis in patients with rectal cancer. Methods: A total of 48 patients (37 males, 11 females; average age 59.7 years) with rectal cancer who underwent preoperative PET/CT examination from May 2013 to May 2015 were enrolled. The long diameter, short diameter and SUV_{max} of lymph nodes on axial images were recorded. Metastatic lymph nodes (MLN) and non-metastatic lymph nodes (NMLN) were confirmed by postoperative pathology. Two-sample t test was used to compare the diameters and SUV_{max} between 2 groups; ROC curve was drawn to determine the optimal cutoff value and to assess the sensitivity, specificity, and accuracy of each index for differentiating MLN from NMLN. Results: A total of 739 lymph nodes were resected, 204 lymph nodes (88 MLN and 116 NMLN) were matched with those on PET/CT images. The long diameters of NMLN and MLN were (6.13 ± 1.94) mm and (8.49 ± 3.78) mm, respectively, and the short diameters were (4.73 ± 1.51) mm and (6.37 ± 2.57) mm, respectively (t = −5.788, −5.691, both P < 0.01). The SUV_{max} of NMLN and MLN were 1.13 ± 0.74 and 2.54 ± 1.76, respectively (t = −7.775, P < 0.01). For long diameter, short diameter and SUV_{max}, the ROC AUCs were 0.709, 0.731 and 0.851 respectively, the optimal cutoff values were 7.50 mm, 5.05 mm and 1.45 respectively, with the corresponding sensitivities of 54.5% (48/88), 67.0% (59/88) and 68.2% (60/88), specificities of 86.2% (100/116), 85.3% (99/116) and 87.9% (102/116), accuracies of 72.5% (148/204), 77.5% (158/204) and 79.4% (162/204). When a lymph node with SUV_{max} ≥ 1.45 or short diameter ≥ 5.05 mm was considered malignant, the sensitivity, specificity and accuracy were 84.1% (74/88), 83.6% (97/116) and 83.8% (171/204), respectively. Conclusion: 18F-FDG PET/CT imaging has significant value in detection of regional lymph node metastasis in patients with rectal cancer. The SUV_{max} ≥ 1.45 showed better diagnostic value than short diameter ≥ 5.05 mm and long diameter ≥ 7.50 mm. The highest diagnostic accuracy could be achieved, if SUV_{max} ≥ 1.45 or
Objective: To evaluate the clinical value of $^{18}$F-FDG PET/CT in preoperative assessment for endometrial cancer. Methods: A retrospective study was performed in 51 patients (average age $(59 \pm 12)$ years) with confirmed or suspicious diagnosis of endometrial cancer from February 2013 to December 2015. Thirty-three patients underwent curettage surgery at least 1 week before PET/CT imaging. With SUV$_{max}$ as the statistical variable, comparison was made between the pathologically confirmed benign and malignant groups, and in case of the latter, the extent of infiltration, histologic grade and subtype of primary tumor, lymph node and distant metastases were also analyzed. Two-sample $t$-test was used to analyze the data, and diagnostic efficacy of PET/CT for metastasis was calculated. Results: There were 43 patients with endometrial cancer and 8 patients with benign uterine tumor. SUV$_{max}$ was found to significantly correlate with histopathology classification (benign: $3.4 \pm 1.2$, malignant: $12.8 \pm 6.5$) and depth of myometrial invasion ($\geq 1/2$: $17.7 \pm 5.4$, $<1/2$: $10.9 \pm 5.9$, $t=8.7$ and 3.2, both $P<0.05$), but not with cervical stromal invasion, histologic grade or histologic subtype ($t=1.8$, $-1.9$, 1.5, all $P>0.05$). The sensitivity, specificity, accuracy, positive predictive value (PPV) and negative predictive value (NPV) of PET/CT for the detection of lymph node metastases on a lesion basis were $85.7\%$ ($18/21$), $98.2\%$ ($271/276$), $97.3\%$ ($289/297$), $78.3\%$ ($18/23$), $98.9\%$ ($271/274$), respectively, and on a patient basis were $6/6$, $97.3\%$ ($36/37$), $97.7\%$ ($42/43$), $6/7$, $100\%$ ($36/36$), respectively. The sensitivity and PPV of PET/CT for the detection of other metastases on a lesion basis were both $11/12$. Conclusions: SUV$_{max}$ could be a clinically valuable tool for preoperative evaluation of the presence of deep myometrial invasion, lymph node metastases and other metastases in patients with endometrial cancer, particularly in specificity and NPV.

Diagnostic efficiency of pulmonary V/Q SPECT imaging in evaluation of sub-segmental pulmonary embolism

Han Jie, Meng Jingjing, Mi Hongchi, Wang Qian, Lu Xia, Su Hang, Zhang Ying, Ding Jian, Lu Yao, Bai Jiang

Objective: To explore the diagnostic efficiency of pulmonary V/Q SPECT imaging and CTPA in evaluation of sub-segmental PE. Methods: A total of 571 patients (265 males, 306 females, age range: 24–91 years) with suspected PE between December 2013 and December 2014 underwent pulmonary V/Q SPECT imaging for the first time in Beijing Anzhen Hospital. The of V/Q SPECT were classified as definite PE, no PE and uncertain diagnosis based on V/Q SPECT diagnostic criteria set by the European Association of Nuclear Medicine (EANM). The V/Q SPECT results were compared with the clinical final diagnosis which was concluded from comprehensive analysis of clinical probability, laboratory examination, other imaging examinations and follow-up. ROC curve was used to evaluate the diagnostic efficiency. Imaging results of 77 cases that underwent both pulmonary V/Q SPECT imaging and CTPA were compared to clinical final diagnosis. Kappa test was used to analyze the consistency of the two imaging methods. Fisher exact test was used to compare the diagnosis of the two methods. AUC and 95% CI in ROC curve were calculated and compared. Results: Ninety-four patients were diagnosed as PE by V/Q SPECT imaging, including 8 multiple sub-segmental PE; 427 had no PE, and 50 with uncertain diagnosis. Clinical final diagnosis showed that 93 cases were confirmed PE, including 8 multiple sub-segmental PE; 478 cases were excluded. The diagnostic evaluation indexes of pulmonary V/Q SPECT imaging on PE were as follows: PPV 93.62\% ($88/94$), NPV 99.77\% ($426/427$), Se 98.66\% ($514/521$), Sp 98.61\% ($426/432$). The proportion of uncertain diagnosis was 8.76\% ($50/571$). AUC of ROC curve was 0.985 and 95\% CI was 0.971–1.000. In 77 cases who underwent pulmonary V/Q SPECT imaging and CTPA, V/Q mismatch was found in 52 pulmonary sub-segments and 1 sub-segment pulmonary artery was detected with CTPA. The PPV, NPV, Ac, Se, Sp of pulmonary V/Q SPECT imaging were $81.48\%$ ($22/27$), $97.83\%$ ($45/46$), $91.78\%$ ($67/73$), $95.65\%$ ($22/23$), $90.00\%$ ($45/50$) and those of CTPA were $10/13$, $81.97\%$ ($50/61$), $81.08\%$ ($60/74$), $47.62\%$ ($10/21$), $94.34\%$ ($50/53$). The proportion of uncertain diagnosis of the two examinations were $5.19\%$ ($4/77$) and $3.90\%$ ($3/77$), respectively ($Kappa=0.330$, $P<0.05$). Compared with CTPA, V/Q SPECT imaging was more valuable for PE diagnosis (Fisher exact test, $P<0.05$). AUC and 95\% CI of pulmonary V/Q SPECT imaging in ROC curve were 0.930 and 0.863–0.998, and those of CTPA were 0.725 and 0.588–0.863. There was no overlapping area. Conclusion: Compared to CTPA, pulmonary V/Q SPECT imaging has higher PPV, NPV and Ac in the diagnosis of PE. It could reduce the proportion of uncertain diagnosis and has a higher diagnostic efficacy in PE, especially in sub-segmental PE.

In vitro imaging study of E-selectin receptor-targeting ultrasound contrast agent


Objective: To develop a vulnerable plaque targeting nuclear medicine.
ultrasound contrast agent (UCA) and to evaluate its affinity and imaging performance in vitro. 

**Methods:** E-selectin receptor-targeting UCA, which conjugated with monoclonal antibody of E-selectin, was prepared with filming-rehydration method and biotin-avidin linkage. The size and distribution of UCA were measured with particle size analyzer, the connectivity condition of microbubbles with E-selectin antibody was also detected with fluorescence analysis. The cytotoxicity from microbubble and ultrasound irradiation was evaluated through cell counting kit-8 (CCK8) assay. The adhesion effect of UCA was assessed after co-incubated with activated mouse endothelial cells (bEnd.3) and compared with that of free antibody intervention group and control group. The imaging performance of UCA at different time points was observed on an ultrasound equipment with a high-frequency transducer. Two-sample t test and one-way analysis of variance were performed to analyze the data. 

**Results:** E-selectin receptor-targeting UCA was successfully prepared. The cytotoxicity result with CCK8 assay demonstrated the favorable biocompatibility of UCA. The connection amount of UCA on activated bEnd.3 cells ((6.23±0.45) bubbles/cell) was significantly higher than that of the free antibody intervention group ((1.57±0.34) bubbles/cell) and control group ((0.07±0.03) bubbles/cell; \( F = 291.43, P < 0.01 \)). The performance of in vitro ultrasonography at the same time points showed no obvious difference between targeting UCA and control UCA (all \( t < 0.51 \), all \( P > 0.05 \)). 

**Conclusion:** The prepared E-selectin receptor-targeting UCA has favorable targeting and imaging capabilities. It might be a potentially ultrasound molecular imaging agent for early detection and prognosis evaluation of vulnerable plaque.

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**Application of \(^{18}\)F-NaF PET/CT in patients with bone metastasis from prostate cancer**

*Huang He, Chen Yue*

There has been a growing number of prostate cancer patients in our country, and most of the patients suffer with bone metastases. Although more and more new drugs are reported for the treatment of prostate cancer, tumor local recurrence or metastasis occur within the 10 years after treatment. The diagnostic sensitivity of \(^{18}\)F-NaF PET/CT for bone metastases from prostate cancer is high. \(^{18}\)F-NaF PET/CT not only can locate the lesion precisely, evaluate the drug efficacy quantitatively, but also can be used to follow up prostate cancer patients. This review is focused on the application of \(^{18}\)F-NaF PET/CT in bone metastases from prostate cancer.

**Application of \(^{18}\)F-FDG PET/CT in rheumatoid diseases**

*Ren Limin, Zhang Liyun, Ma Dan*

Rheumatoid diseases (RD) are a group of diseases affecting bones, joints, and the surrounding soft tissues, such as muscle, synovial membrane, tendons, fascia, nerves. The etiology and pathogenesis are complicated. Since most RD are systemic diseases, traditional imaging techniques have limited value for the diagnosis and treatment monitoring of RD. \(^{18}\)F-FDG PET/CT can display morphologic and metabolic information simultaneously, and is considered as a potential tool for the diagnosis of RD. This review summarizes the application of \(^{18}\)F-FDG PET/CT in RD, such as systemic vasculitis, relapsing polychondritis and rheumatoid arthritis.