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**Selected Abstracts of This Issue**

**Characteristics of cerebral glucose metabolism on 18F-FDG PET imaging in patients with Parkinson’s disease**

**Jiang Chengfeng, Ge Jingjie, Shi Xinshong, Wu Jianjun, Wang Jian, Wu Ping, Zhang Xiangsong, Zuo Chuantao, Guan Yihui**

**Objective:** To validate the reproducibility of abnormal cerebral metabolic characteristics in PD patients from different medical centers using 18F-FDG PET imaging.

**Methods:** A total of 108 subjects who were referred for resting-state brain 18F-FDG PET imaging were retrospectively reviewed. Thirty-three PD patients (15 males, 18 females, age: 38–79 years) and 33 age-matched healthy controls (15 males, 18 females, age: 40–77 years) underwent evaluation at Shanghai Huashan Hospital Affiliated to Fudan University. Seventeen PD patients (10 males, 7 females, age: 44–74 years) and 17 age-matched healthy controls (6 males, 11 females, age: 42–67 years) underwent evaluation at the First Affiliated Hospital of Sun Yat-sen University. SPM was used to investigate the cerebral metabolic characteristics of the patients with two-sample t test. Statistically significant voxels were obtained by using familywise error rate (FWE; P < 0.05). Two sets of PD patients with abnormal glucose metabolism of brain regions were obtained and the cerebral metabolic characteristics were compared.

**Results:** Regarding the PD patients from Shanghai Huashan Hospital, the features of cerebral glucose metabolism by SPM analysis were demonstrated as follows: increased metabolism was found in the region of pons, cerebellum, thalamus, putamen and pallidum, while decreased metabolism was displayed in the region of parietal lobe and occipital lobe. Increased metabolism was shown in the regions of pons, cerebellum, thalamus, putamen and pallidum, and referred to 15 573 voxels. The metabolism-decreased regions included parietal lobe, occipital lobe and frontal lobe, and referred to 3 945 voxels (P < 0.05).

**Conclusions:** 18F-FDG PET/CT imaging provides reliable evidence for the multi-center study in the differential diagnosis of PD.

**Comparison on the diagnostic values of 18F-FDG and 18F-FLT PET/CT in patients with suspicious recurrence of glioma after multimodal treatment**

**Liu Daojia, Tang Mingdeng, Lin Duanyu, Zhang Jieping, Li Shengxu, Cai Zhihua, Lyu Qinghu, Wu Junxin**

**Objective:** To compare the diagnostic values of 18F-FDG and 18F-FLT PET/CT in patients with suspicious recurrence of glioma after multimodal treatment.

**Methods:** A total of 20 patients (13 males, 7 females; age range: 12–73 years) with glioma who underwent 18F-FDG and 18F-FLT PET/CT due to abnormal enhancement on MRI from January 2012 to June 2015 were enrolled in this retrospective study. According to the pathological or follow-up results, patients were divided into therapy-related benign changes (TRBC) group and recurrent glioma group, the later was subdivided into initial low-grade glioma (LGG) group and initial high-grade glioma (HGG) group. T/NT ratio of 18F-FDG and 18F-FLT between HGG (LGG) group and TRBC group were compared using one-way analysis of variance and the least significant difference t test. ROC curve analysis was conducted to calculate the differential diagnostic efficiency of 18F-FDG and 18F-FLT PET/CT on the differential diagnosis of glioma.

**Results:** A total of 14 patients were proved as recurrent glioma and 6 patients as TRBC. The mean 18F-FDG T/NT ratio of HGG group, LGG group and TRBC group were 2.31±0.86, 1.32±0.86 and 1.32±0.64, respectively. The 18F-FDG T/NT ratio of the HGG group was significantly higher than that of the TRBC group (F=3.671, t=-2.471, P < 0.05). The mean 18F-FLT T/NT ratio of HGG group, LGG group and TRBC group were 8.94±3.14, 7.18±3.29 and 1.92±1.20, respectively (F=13.301, t=-2.360, P < 0.05). The optimal T/NT cutoff values for 18F-FDG and 18F-FLT PET/CT were 1.62 and 4.58, respectively. The sensitivity, specificity and accuracy of detecting recurrent glioma with optimal T/NT cutoff value were 11/14, 5/6 and 16/20 for 18F-FDG PET/CT, and those for 18F-FLT PET/CT were 13/14, 6/6 and 19/20, respectively. No significant difference was observed between the diagnostic efficiencies of the two imaging modalities (χ² values: 1.167, 1.091 and 2.057; all P > 0.05).

**Conclusions:** There were no statistical significances between 18F-FDG and 18F-FLT PET/CT on the differential diagnosis of glioma recurrence.
Comparison of 18F-FDG and 68Ga-DOTA-NOC PET/CT on the diagnosis of G3 neuroendocrine neoplasm

Zang Shiming, Ai Shuyue, Yao Xiaochen, Zhang Chuan, Wang Feng, Qu Wei, Qiu Fan, Shao Guoqiang, Wu Jianwei

Objective: To investigate the clinical value of 18F-FDG PET/CT in diagnosing G3 NEN and compare it with 68Ga-DOTA-NOC PET/CT. Methods: Twenty-three patients (12 males, 11 females; average age (63 ± 12) years) diagnosed of NEN between January 2006 and November 2016 were retrospectively recruited in this study: 11 patients with gastroenteropancreatic NEN (GEP-NEN), 10 with G3 NEN in lungs, 1 with malignant pheochromocytoma and 1 with G3 NEN of unknown primary site. All patients underwent 18F-FDG PET/CT for staging and evaluation of biological behavior, and 9 of them also underwent 68Ga-DOTA-NOC PET/CT within 1 week. Image interpretation was analyzed by visual and semi-quantitative analysis, and SUVmax was calculated. Results: All 23 cases showed positive results on 18F-FDG PET/CT (100%, 23/23), with primary tumor SUVmax 10.56 ± 3.94. Compared with 18F-FDG PET/CT, the positive detection rate of 68Ga-DOTA-NOC PET/CT was lower (69 vs 9/9), with primary tumor SUVmax 14.24 ± 10.00. There were 22 patients with distant metastasis. The most frequent metastatic sites associated with G3 NEN in lungs were lymph nodes and bone, while those with GEP-NEN were lymph nodes and the liver. In one patient with non-functional NEN, some metastatic lesions showed negative results on 18F-FDG PET/CT but positive results on 68Ga-DOTA-NOC PET/CT. Conclusions: 18F-FDG PET/CT has higher diagnostic ability for G3 NEN and may serve as a useful tool for evaluating biological behavior of G3 NEN. 68Ga-DOTA-NOC PET/CT is valuable as a complementary diagnostic tool in a small proportion of high differentiated G3 NEN.

A pilot study on the biodistribution pattern of 68Ga-DOTA-TATE in normal organs of adults

Hu Guilian, Wang Ling, Qiao Zhen, Zhang Jingjing, Zhang Wei, Xing Haiqun, Wang Tong, Li Fang, Huo Li

Objective: To retrospectively study the biodistribution of 68Ga-DOTA-TATE as a SSTR imaging agent in human subjects. Methods: A total of 106 patients with suspected disease were enrolled in this study. All patients were histologically proven for having either a single tumor <2 cm or without evidence of tumor during follow-up. Patients underwent PET/CT whole-body scan 17–100 min after intravenous injection of 55.2–220.0 MBq 68Ga-DOTA-TATE. ROI was drawn for measuring SUV of tracer-avid pathologies. One-way analysis of variance and two-sample t test were used for statistical analysis. Results: High 68Ga-DOTA-TATE avidity was found in pituitary, with SUVmax of 4.00 ± 1.21. Tracer was excreted mainly through urinary system resulting in highest uptake in the urinary tracts. The SUVmax of kidney cortex was 19.01 ± 5.45. Mediastinal blood pool and liver SUVmax were 0.93 ± 0.33 and 7.69 ± 2.26, respectively. Mild uptake of 68Ga-DOTA-TATE was found in the brain, cerebellum, lung and muscle, all lower than that of mediastinal blood pool. Moderate accumulation of 68Ga-DOTA-TATE (close to or slightly higher than liver) was found in adrenal gland and spleen, with SUVmax 7.61 ± 3.42 and 8.63 ± 2.31, respectively. Other organs (pituitary, salivary gland, thyroid, pancreas, small intestine, colon, uterus, prostate and bone) showed tracer uptake in the range between those of mediastinal blood pool and liver. 68Ga-DOTA-TATE distribution in pancreas was not uniform. Nine patients had focal accumulation in the uncinate process of pancreas with highest SUVmax up to 8.48. However, the SUVmax and SUVmean in the rest of pancreas (head, neck, body and tail) showed insignificant difference (F values: 0.703, 0.563, both P > 0.05). 68Ga-DOTA-TATE uptake in each organ reached equilibrium quickly after injection but with slight increase over time. The changes in SUV, however, showed insignificant difference among organs, including different parts of pancreas (t values: from -0.09 to 1.75, from -1.70 to -0.42, respectively, all P > 0.05). Conclusions: The biodistribution of 68Ga-DOTA-TATE reaches equilibrium shortly after intravenous administration and is stably maintained. The biodistribution activities are organ-specific, and characteristic to that of SSTR concentration.

Effect of postoperative thyrotropin suppression on bone mineral density in postmenopausal women with differentiated thyroid carcinoma

Huo Yanlei, Wang Danyang, Wu Shuqi, Wang Hui, Ma Chao

Objective: To investigate the effect of postoperative TSH suppression on bone mineral density (BMD) in postmenopausal women with DTC. Methods: Postmenopausal women with postoperative DTC underwent thyroid residual ablation or 131I treatment for metastases at Xinhua Hospital between September 2009 and December 2014 were enrolled and followed for 2 years. They were divided into suppressive TSH group (median TSH < 0.30 mU/L; group 1) and non-suppressive group (median TSH ≥ 0.30 mU/L; group 2). Lumber 1–4 BMD levels (T scores) were measured by a dual energy X-ray absorptiometry bone densitometer at baseline, 1 year and 2 years after treatment. All patients had calcium and vitamin D supplementation after TSH suppression. The T scores were compared with Mann-Whitney u test and Kruskal-Wallis test. Results: A total of 126 patients were enrolled and followed up for 2 years, including 65 with average age (57.65 ± 6.65) years in group 1 and 61 with average age (56.19 ± 7.17) years in group 2. The T scores in group 1 and group 2 at baseline were -1.70 (-2.30, 5.45). Mediastinal blood pool and liver SUVmax were 0.93 ± 0.33 and 7.69 ± 2.26, respectively. Mild uptake of 68Ga-DOTA-TATE was found in the brain, cerebellum, lung and muscle, all lower than that of mediastinal blood pool. Moderate accumulation of 68Ga-DOTA-TATE (close to or slightly higher than liver) was found in adrenal gland and spleen, with SUVmax 7.61 ± 3.42 and 8.63 ± 2.31, respectively. Other organs (pituitary, salivary gland, thyroid, pancreas, small intestine, colon, uterus, prostate and bone) showed tracer uptake in the range between those of mediastinal blood pool and liver. 68Ga-DOTA-TATE distribution in pancreas was not uniform. Nine patients had focal accumulation in the uncinate process of pancreas with highest SUVmax up to 8.48. However, the SUVmax and SUVmean in the rest of pancreas (head, neck, body and tail) showed insignificant difference (F values: 0.703, 0.563, both P > 0.05). 68Ga-DOTA-TATE uptake in each organ reached equilibrium quickly after injection but with slight increase over time. The changes in SUV, however, showed insignificant difference among organs, including different parts of pancreas (t values: from -0.09 to 1.75, from -1.70 to -0.42, respectively, all P > 0.05). Conclusions: The biodistribution of 68Ga-DOTA-TATE reaches equilibrium shortly after intravenous administration and is stably maintained. The biodistribution activities are organ-specific, and characteristic to that of SSTR concentration.
Assessment of effects of 7, 8-dihydroxyflavone on the striatum in normal cynomolgus monkeys with $^{99}$Tc$^+$-TRODAT-1 SPECT/CT imaging
Zhu Gaohong, Yan Yulin, Chen Lilin, Wang Xuehong, He Rui

Objective: To assess the effects of 7,8-dihydroxyflavone (7,8-DHF) on the striatum (ST) in normal cynomolgus monkeys using $^{99}$Tc$^+$-TRODAT-1 imaging. Methods: A total of six healthy female cynomolgus monkeys were included in this study. Three of them were fed with normal food (control group), and the other three were given oral administration of 7, 8-DHF in addition to normal food (experimental group). The SPECT/CT imaging was performed at different time after $^{99}$Tc$^+$-TRODAT-1 injection. The ROI of ST was drawn on images of consecutive transverse slices that could be visualized best. The cerebellum (CB) was taken as the background reference area. The radioactivity uptake ratios of ST/CB at 1, 3, 4 and 5 h were calculated respectively. Paired-t test was used to analyze the data. Results: ST radioactivity uptake ratios showed continuing increase on the delay images. ST/CB uptake ratios of the control group at 1, 3, 4 and 5 h were 1.43±0.04, 1.82±0.06, 2.04±0.12, 2.42±0.23, respectively, and those of the experimental group were 1.35±0.08, 2.40±0.09, 2.74±0.13 and 3.25±0.15 respectively. There was no significant difference between the two groups at 1 h ($t=2.57$, $P>0.05$), while ST/CB uptake ratios of the experimental group at 3, 4 and 5 h were significantly higher ($t$ values: 2.77, 2.87 and 2.92, all $P<0.05$). Conclusions: $^{99}$Tc$^+$-TRODAT-1 SPECT/CT imaging can be used to assess the DAT activation effect by 7, 8-DHF on ST of cynomolgus monkeys.

Optimal scan time of MRI with alpha-methyl-L-tryptophan superparamagnetic iron oxide nanoparticles for temporal lobe epilepsy
Fu Tingting, Kong Qingxia, Sheng Huaqiang, Gao Lingyun

Objective: To investigate the optimal scan time of MRI using the imaging probe alpha-methyl-L-tryptophan(α-MTrp)-superparamagnetic iron oxide nanoparticles (SPIONs) for localizing temporal lobe epilepsy (TLE) foci. Methods: α-MTrp-SPIONs were injected into rat models of TLE through the tail vein during the acute and chronic stages (72 h and 8 weeks after status epilepticus, respectively). MRI was performed before and 1, 2, 4, 8, 24 h after the injection in all animals, and the T2 values of the epileptogenic regions were measured. One-way repeated measures analysis of variance was used for data analysis. Results: Compared with the T2 values before the injection of α-MTrp-SPIONs, the T2 signal of epileptogenic regions after the injection had a negative increased change. The T2 values before and 1, 2, 4, 8, 24 h after the injection in acute stage were 112.08±5.85, 107.83±6.59, 105.08±6.79, 95.58±5.14, 100.92±5.81, 105.17±6.31 respectively, and those in chronic stage were 112.08±7.53, 107.75±7.10, 102.75±5.50, 96.17±5.01, 97.75±4.37, 102.92±4.74. The T2 values after the injection were significantly different from those before the injection (both $P<0.01$). The T2 value at 4 h after the injection decreased mostly. Conclusions: α-MTrp-SPIONs can precisely localize epileptogenic regions of TLE on MRI. The optimal scan time is 4 h after the injection.

Development of PET agent for cardiac sympathetic nervous system
He Yulin, Zhang Jinming

Abstract: Many cardiac sympathetic changes occur before clinical symptoms being found in heart disease. PET/CT imaging can sensitively detect abnormal cardiac sympathetic nerve function. The recent development of several $^{11}$C and $^{18}$F labeled cardiac sympathetic imaging agents is reviewed in this paper. $^{11}$C-meta-hydroxyephedrine ($^{11}$C-HED) and $^{18}$F-fluorodopamine ($^{18}$F-FDA) have been comprehensively studied already. $^{11}$C-CH3-dopamine ($^{11}$C-MDA) and $^{18}$F-fluoroproxy-5-(3-bromo-4-((3-$^{18}$F-fluoropropoxy)-benzyl)-guanidine ($^{18}$F-LMI1195) are novel imaging agents with potential for clinical application.

Development of Cerenkov signal enhancement by fluorescence excitation effect
Tan Lingshan, Qu Yawei, Liu Haihong

Abstract: Cerenkov luminescence imaging (CLI) is a new method of optical molecular imaging, which has been successfully applied in early clinical trials. However, weak signal intensity and limited ability in tissue penetration have impeded its clinical application. Cerenkov radiation energy transfer imaging and radiation excitation fluorescence imaging were adopted to solve these problems by enabling transformation of some of the blue-weighted Cerenkov luminescence (CL) spectra to red-shifted emissions, or by exciting rare earth particles to emit visible and near infrared light. This article reviews the development of Cerenkov signal enhancement by fluorescence excitation effect.