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Imaging of osteolytic bone metastasis from breast cancer with new integrin $\alpha_v\beta_3$ receptor targeted radiotracer: ^{68}Ga -DOTA-RGD₂

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This study was to investigate the value of integrin $\alpha_v\beta_3$ targeted microPET/CT imaging with ^{68}Ga -DOTA-RGD₂ as radiotracer for the detection of breast cancer osteolytic bone metastases. We prepared ^{68}Ga -DOTA-RGD₂ via one-step method. Animal model with Parathyroid hormone (PTH)-induced osteolysis in the calvarium was established and served as PTH Group (BP). Biodistribution study of ^{68}Ga -DOTA-RGD₂ was carried out in BP. Animals with injection of same volume of saline instead of PTH was served as Control group (BC). Integrin receptor block study was done with pre-injection of high dose of DOTA-RGD₂. ^{68}Ga -DOTA-RGD₂ and ^{18}F -NaF microPET/CT imaging were performed respectively and radiotracer distribution were compared between BP and BC. Breast cancer osteolytic bone metastases was established via intracardial injection of breast cancer cells (MDA-MB 231). ^{68}Ga -DOTA-RGD₂ microPET/CT imaging were performed for the detection of breast cancer osteolytic bone metastases. Animals were sacrificed and bone lesions were harvested for pathological examination. We found that ^{68}Ga -DOTA-RGD₂ was stable *in vitro* and its radiopurity was as high as (96.4±2.1)% 3h after its preparation. Its blood elimination was fast while its uptake by the liver and kidneys were relatively low. It was discharged soon after its intravenous injection. In the BP group, regional uptake of ^{68}Ga -DOTA-RGD₂ in osteolytic lesion of calvarium (%ID/g) reached peak (5.14±0.65) 60 min after tail vein injection. It was significantly more than that in BC group (2.06±0.35, $t=7.81$, $P<0.05$). Bone radiotracer uptake ratio of osteolytic lesion to normal calvarium (O/N) was compared based microPET/CT imaging. Bone O/N of ^{68}Ga -DOTA-RGD₂ was (6.1±0.97), significantly greater than that of ^{18}F -NaF (1.2±0.33, $t=10.17$, $P<0.05$). ^{68}Ga -DOTA-RGD₂ microPET/CT imaging was able to demonstrate the osteolytic bone metastasis in calvarium, thoracic vertebrae and lung metastasis. They were confirmed by pathology results. According to our results, ^{68}Ga -DOTA-RGD₂ as new integrin $\alpha_v\beta_3$ receptor targeting radiotracer, was potential for positive imaging and early detection of osteolytic lesion or breast cancer osteolytic bone metastasis.

Biography

Zizheng Wang has completed his MD at the age of 35 years from Nanjing Medical University. He is the Director of Nanjing Nuclear Medicine Center, affiliated to Nanjing Medical University. His research was focused on receptor targeted tumor imaging and therapy with specific radiotracers such as radiolabelling NOTA-OC, DOTA-OC (somatostatin), RGD peptides (integrin $\alpha_v\beta_3$), folate analogue or derivants (folate), PSMA targeting peptides (prostate specific membrane antigen). He has got patents and tried his best to transform it into clinic. He has published more than 5 papers in reputed journals.

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