Imaging of osteolytic bone metastasis from breast cancer with new integrin $\alpha_v\beta_3$ receptor targeted radiotracer: $^{68}$Ga-DOTA-RGD$_2$

Zizheng Wang
Nanjing Medical University, China

This study was to investigate the value of integrin $\alpha_v\beta_3$ targeted microPET/CT imaging with $^{68}$Ga-DOTA-RGD$_2$ as radiotracer for the detection of breast cancer osteolytic bone metastases. We prepared $^{68}$Ga-DOTA-RGD$_2$ 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-RGD$_2$ 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-RGD$_2$. $^{68}$Ga-DOTA-RGD$_2$ 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-RGD$_2$ 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-RGD$_2$ 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-RGD$_2$ 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-RGD$_2$ 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-RGD$_2$ 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-RGD$_2$ 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 get patents and tried his best to transform it into clinic. He has published more than 5 papers in reputed journals.

zzwang136@aliyun.com