Contribution ID: **46** Type: **not specified**

Comparison of 68Ga-NOTA-Bisphophonate with 99mTc-MDP in 34 patients with skeletal metastases in various type of cancers

Tuesday, 29 October 2019 23:44 (15 minutes)

Background

There is an increasing preference of PET-CT over SPECT for evaluation of metastasis as the former is able to identify more lesions thanks to the higher resolution. Bisphosphonate ligands conjugated to chelates and labelled with 68Ga are good choice as radiopharamceuticals for PET-CT imaging in patients suffering from metastatic cancer. We present the comparison of 68Ga-NOTA-Bisphosphonate (NOTA-BP) with 99mTc-MDP in 34 patients suffering from different types of cancer.

Methodology

68Ga-NOTA-BP was prepared by adding 4 ml of 68Ga (555- 925 MBq) in 0.01 M HCl to 50 ⍰g of NOTA-BP dissolved in 1 ml of 0.25 M sodium acetate buffer and heating at 95℃ for 10 minutes. The product is passed through a 0.22 micron Millipore filter and radiochemical purity was estimated by TLC in 0.1 M trisodium citrate buffer.
Thirty four patients suspected to be suffering from metastatic bone cancer were administered with 68Ga-NOTA-BP (185-260 MBq) in saline. Imaging was done one hour post injection in a Siemens Biograph PET-CT machine. A low dose CT from head to toe was acquired prior to PET. PET images were done in 2 min per bed. 99mTc-MDP image was acquired in a GE SPECT-CT camera post 3 hour injection of ˜740 MBq of activity. A visual comparison of the PET-CT and SPECT images were done.

Results and discussion

Direct comparison was performed between both the scans which were interpreted by a nuclear medicine physician and a detailed analysis was done qualitatively regarding the number of lesions and quality of the images. The number of lesions detected by 68Ga-NOTA-BP PET-CT was significantly higher when compared to the 99mTc-MDP bone scan. Tracer accumulation was seen both in lytic lesions as well as in sclerotic lesions with latter being higher. The uptake of 99mTc-MDP was less in lytic lesions making them difficult to identify. The 2D planar acquisition gathered less information and decreased the specificity especially in suspicious vertebral and rib lesions, which required SPECT-CT acquisition and further clarification. This process made it more time consuming and tedious, whereas 68Ga-NOTA-BP PET-CT obviated the need for it. The image quality of PET-CT was far more superior compared to the planar bone scan. The low dose diagnostic CT for anatomical correlation and attenuation correction which was performed increased the specificity of the study. Better lesion characterization and overall lesion detection was noted in the 68Ga-NOTA-BP scan. Patients could be imaged within 50 to 60 minutes after injection significantly lower than Tc bone scan proving to be more pleasant to the patient.

Conclusion

PET-CT imaging using 68Ga-NOTA-BP is superior to 99mTc-MDP for evaluation of metastatic bone cancer. PET-CT identified significantly more number of lesions as compared to 99mTc-MDP. Routine clinical use of 68Ga based tracers for bone imaging will help in enhancing the utility of 68Ge/68Ga generator.

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