

OP 050

Friday, May 18, 2012

11:30-12:30, Hall 5

Comparison of animal studies between interstitial magnetic resonance lymphography and radiocolloid SPECT/CT lymphoscintigraphy in the head and neck region

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Introduction: To comparatively assess two techniques, radiocolloid SPECT/CT lymphoscintigraphy and interstitial MR lymphography using SPIO and gadoxetate disodium, in animal models.

Methods: We used twenty one 8-week-old male nude mice of strain BALB/c Slc-nu/nu, weighing 23 g to 27 g. The 4.7-tesla MRI equipment was used to detect the SNs. T2*WI of gradient-echo sequences was acquired sequentially up to 24 h after administering SPIO, ferucarbotran. T1WI was acquired sequentially up to 80 min after administering gadoxetate disodium. ^{99m}Tc-phytate SPECT/CT lymphoscintigraphy was taken at 30 min. after the injection to detect the SNs using animal-dedicated whole-body SPECT/CT hybrid scanner. The injection was submucosally performed in the right tongue margin of each mouse. Reading performances concerning SN visualization and its quality on interstitial MR lymphogram and SPECT/CT lymphoscintigram were performed by 3 radiologists.

Results: The SN intensities were 0.43 for the right, 0.61 for the left at 30 min after ferucarbotran injection, with gradual decrease in intensity, and 1.43 for the right, 1.33 for the left at 10 min after gadoxetate disodium injection with a fast decrease in intensity. The base value of 1.0 was at pre-examination. The mean numbers of lymph nodes visualized were 4.00 nodes for on SPECT/CT lymphoscintigram and 2.0 for interstitial MR lymphogram. There was statistically significant difference in the mean scores between SPECT/CT lymphoscintigraphy and interstitial MR lymphography (two-factor mixed design with repeated measures on one factor: $p < 0.0002$).

Conclusions: In our comparative study using mice, the results of radiocolloid SPECT/CT lymphoscintigraphy were superior to those of interstitial MR lymphography, while both SPIO and gadoxetate disodium have a potential of being employed for sentinel node navigation surgery by interstitial MR lymphography in the head and neck region.

OP 051

Thursday, May 17, 2012

9:30-11:00, Hall 4

Development of image reconstruction code with collimator-detector response function compensation for a preclinical SPECTNavid Zeraatkar^{1, 2*}, Mohammad Hossein Farahani^{1, 2}, Hossein Arabi^{1, 2, 3}, Saeid Sarkar^{1, 4}, Salar Sajedi^{1, 2}, Arman Rahmim^{5, 6}, Mohammad Reza Ay^{1, 2, 4, 7}

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The small animal High Resolution SPECT (HiReSPECT) is a dedicated dual head gamma camera that recently designed and developed in our Laboratory for imaging of murine models. Each detector composed of an array of 1.2x1.2 mm² (pitch) pixelated CsI(Na) crystals. Two H8500 position-sensitive photomultiplier tubes (Hamamatsu, Japan) are coupled to each head's crystal. In

this work, we report on the resolution-recovery-embedded image reconstruction code of the system and the practical results achieved using different phantoms and mice scans.

For being utilized in the image reconstruction process, Collimator-Detector Response Functions (CDRFs) were measured by pixel-driven method using Monte Carlo simulation for some finite distances from the head within the field of view (FoV). CDRFs then fitted by independent 2-dimensional (2D) Gaussian functions. Thereafter, linear interpolation applied on *sigma* of the Gaussians to obtain the CDRF for the other distances from the head.

Rotation-based Maximum-Likelihood Expectation Maximization (MLEM) method was used for reconstruction. A novel rotation algorithm developed to rotate the image matrix according to the desired angle by means of some pre-generated rotation maps. In addition, a tune ratio was defined in the code to alter the amount of update that is supposed to be applied on the image causing better image quality resulted from the reconstruction.

The experiments showed the improvement of resolution in our resolution-recovery-embedded image reconstruction. While the radial and tangential resolution of the system in terms of Full-Width at Half-Maximum (FWHM) without resolution recovery is over 2 mm in almost all positions within the FoV and reaches around 2.5 mm at the worst case, it does not exceed 1.8 mm even at the worst case. The noise performance of the system is also acceptable showing the standard deviation value of 5.6%.

OP 052

Thursday, May 17, 2012

11:30-12:30, Hall 3

Whole body FDG-PET in elderly twin pairs; the differences and the similarities

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Introduction: Monozygotic twins have identical genes in common. Differences between monozygotic twin pairs might reflect the differences in their life-style and environmental factors. Studies for monozygotic twin pairs discordant for a disease might enable to estimate relative contribution of genetic and environmental factors of the disease.

Many studies using brain FDG-PET for Alzheimer disease or other neuronal disorders have been reported, but whole-body FDG-PET study targeted for monozygotic or dizygotic twin pairs is none. The aim of this study is to evaluate the differences and the similarities of whole-body glucose metabolism of twin pairs.

Methods: Cerebral and whole-body glucose metabolism was studied in nine twin pairs (monozygotic or dizygotic) using FDG-PET. (Zygotic assessment is under investigating.

To evaluate the extent of FDG uptake, the ROI analysis was performed for major organs such as brain, tonsil, thyroid, aortic wall, myocardium, liver, gastric wall, which could be identified by PET images alone. With regard to cerebral glucose metabolism, voxel based statistical analysis was also performed to obtain objective results.

Results: Myocardial uptake varied both inter- and intra-pairs.

SUVmean of Tonsil and liver, and SUVmax of aortic wall were similar in both inter- and intra-pairs. Gastric uptake and thyroid uptake was different in inter-pairs, but similar in intra-pairs. Statistical analysis of brain showed similarities in intra-pairs in distribution of significant lower or higher metabolic lesions.

Conclusion: There were similarities in cerebral, thyroid, and gastric uptake, but it is uncertain whether genetic factors contributed to these results. Further studies are needed.

OP 053

Friday, May 18, 2012

9:30-10:30, Hall 3

Dynamic thyroid phantom production to simulate Technetium 99m pertechnetate biodistribution in thyroid for miscellaneous nuclear medicine studies

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