Contribution ID: **47** Type: **Poster**

Quantitative evaluation of the Mediso high resolution PET/CT-system LFER-150

Tuesday, 22 May 2018 16:15 (1h 30m)

Background
The Mediso LFER-150 is currently the only commercially available high resolution PET/CT-system mainly dedicated for non-human primate (NHP) imaging. The gantry bore diameter of the system is 26 cm. The transaxial and axial fields of view are 15 cm and 20 cm respectively. Resolution at the center of field of view, in images reconstructed with full detector modelling, is 1 mm . These characteristic make the LFER-150 particularly suitable for use in NHP brain imaging or for whole body imaging of NHPs of small size.

Objective
The main objective of this study was to compare the LFER imaging capabilities with that of the current gold standard system for high-resolution PET, the Siemens HRRT system, after optimizing the LFER-150 reconstruction parameters, using the improved CT-based three component (air, tissue, bone) attenuation correction. Specific goals where to compare results from the two systems by using the same NHP's and calculate binding potential for small areas in the brain using radioligands for the dopamine D2/D3 receptor - [11C]Raclopride - and for the dopamine transporter - [18F]FE-PE2I.

Method
For the experiments, two cynomolgus monkeys (Macaca fascicularis) were used. The NHPs were anesthetized, using ketamine hydrochloride. Each NHP underwent two PET measurements with [11C]Raclopride and [18F]FE-PE2I. The PET measurements were performed first using the LFER-150 ([11C]Raclopride: 94 MBq, [18F]FE-PE2I: 90 MBq) and later the HRRT system ([11C]Raclopride: 147 MBq, [18F]FE-PE2I: 139 MBq). PET data was collected in list mode for 95 minutes. List mode data was reconstructed into 38 frames (10 s × 9, 15 s × 2, 20 s × 3, 30 s × 4, 60 s × 4, 180 s × 4, 360 s × 12). Data acquired with the LFER-150 were reconstructed using the latest Tera-Tomo 3D algorithm (10 iterations, 9 subsets), with high regularization, median and spike filter turned on and with detector modeling corrections and three component material map (air, tissue, bone) attenuation correction. List mode data acquired with the HRRT system were reconstructed using the 3D-OSEM algorithm (10 iterations, 16 subsets) with PSF correction applied.
The reconstructed images were coregistered to the MRI of the NHP and regional VOIs were manually delineated onto the MRI images and applied to each PET data. Binding potential, BPND, was estimated using the simplified reference tissue model and the cerebellum as reference region. D2/D3 receptor availability was measured in the caudate and putamen, whereas dopamine transporter availability was measured in the caudate, putamen and substantia nigra.

Results
Reconstructed images of [11C]Raclopride and [18F]FE-PE2I obtained using the LFER-150 were similar to those obtained using the HRRT (Figure 1). Time-activity curves (TACs) obtained with [11C]Raclopride and [18F]FE-PE2I using the LFER-150 system were similar to those obtained using the HRRT system (Figure 2).

`Figure 1. Summation images (0-93 minutes) of [18F]FE-PE2I.`

Figure 2. Representative regional time-activity curves of [18F]FE-PE2I obtained from data acquired using the LFER-150 and the HRRT systems.

The BPND values estimated from data acquired with the LFER-150 system were in close agreement with the BPND values estimated from data acquired with the HRRT system (Table 1).

Table 1. BPND values for the caudate, putamen and substantia nigra, from image data acquired with the LFER-150 and the HRRT systems

Conclusions
The findings of this study indicate that the quantitative performance of the LFER-150 PET/CT system, for imaging the dopaminergic system in the brain of NHPs, is similar to the quantitative performance of the HRRT system. From the visual inspection of the TACs, the signal-to-noise ratio of data acquired with the LFER-150 seems to be lower than the signal-to-noise ratio of data acquired with the HRRT system, which may be due to lower amount of injected radioactivity (30-35%). Additional PET studies are ongoing to evaluate whether the signal-to-noise ratio can be improved by acquiring data after injection of higher amount of radioactivity. Other radioligands, such as [11C]Flumazenil and [18F]FDG, having a more uniform distribution in the brain,

are currently being evaluated. Preliminary data from this study suggest that the LFER-150 is a PET-CT system for high-resolution imaging of the brain in NHPs.

Primary author: ROSENQVIST, Göran (Karolinska Institute)

Co-authors: Prof. VARRON, Andrea (Karolinska Institute); Prof. HALLDIN, Christer (Karolinska Institute); Dr NEMETH, Gabor (Mediso); Mr NAGY, Kalman (Mediso); Dr TÓTH, Miklós (Karolinska Institute); Dr ARAKAWA, Ryosuke (Karolinska Institute); Mr SARNAYI, Zsolt (Karolinska Institute)

Presenter: ROSENQVIST, Göran (Karolinska Institute)

Session Classification: Session 8 - Poster Session I