= 12 cm) with a rotating Cs-137 point source. Source location (inside and outside the scanner) and the axial table increment (1-3 cm) were varied. Data were acquired using all possible lines of response (LORs) and with a restricted axial acceptance angle. Data were processed using rebinning (single-slice or Fourier) followed by 2D iterative reconstruction for transmission data or iterative 3D reconstruction using the measured LORs directly. Transmission data were acquired before and after injection to examine the impact of emission contamination (and subtraction). Transmission image quality was compared for the various methods before and after segmentation. The impact of accuracy, noise, and artifacts in the transmission image on attenuation correction and emission accuracy were determined. **Results:** Measured transmission data have the highest image quality (low noise, high spatial resolution, lack of artifact) when the source is located inside the scanner with a 1-cm axial increment and a 3D reconstruction is performed. Rebinning prior to 2D reconstruction, while faster than 3D reconstruction, leads to axial blurring and decreased contrast. Larger axial table increments speed acquisition and reconstruction but with higher noise and axial artifacts in the transmission images. Placing the transmission source outside the scanner permits better access to the animal and allows for a larger transverse FOV but at the cost of decreased (although still acceptable) image quality. Lungs, trachea, and large gastric bubbles are clearly visible in rat transmission and emission images; these areas of lower attenuation would not be properly accounted for with calculated attenuation correction. **Conclusions:** The level of accuracy required of the attenuation correction dictates the quality of the transmission image needed.

No. 456

TRANSMISSION TEMPLATE-GUIDED ATTENUATION CORRECTION IN 3D BRAIN PET. M. L. Montandon, T. Ruest, H. Zaidi*, Nuclear Medicine, Geneva University Hospital, Geneva, Geneva, Switzerland; Nuclear Medicine, Geneva University Hospital, Geneva, Geneva, Switzerland; Nuclear Medicine, Geneva University Hospital, Geneva, Geneva, Switzerland. (652405)

Objectives: The common procedure for attenuation correction in cerebral 3D PET requires the acquisition of a pre-injection transmission scan to build a non-uniform attenuation map. This study investigates the implementation and applicability of transmission atlas-guided attenuation correction in a clinical setting. **Methods:** Patient-specific attenuation map was derived by non-linear warping of a transmission template supplied with SPM2k software package obtained by scanning 12 normal subjects in resting condition. This template is coregistered to a specially designed ^{18}F-[FDG] template constructed by scanning 17 normal subjects in resting condition during tracer uptake in a dark room. This template was coregistered and spatially normalized to patient images. The resulting transformation matrices were recorded and re-applied to the transmission template, which after adjustment of the zoom factor matches quite well the usual measured transmission image obtained using ^{137}Cs single-photon sources on the ECAT ART scanner. The derived attenuation map was then forward projected to generate attenuation correction factors to be used for correcting the PET data. Ten cerebral clinical studies were used for evaluation of the developed attenuation correction technique as compared to the transmission-based method. Several image quality parameters were compared including absolute and relative quantification indexes and correlation between them checked. **Results:** The qualitative evaluation indicated comparable and no noticeable differences in terms of image quality. There was an excellent correlation in mean regional cerebral glucose metabolism (rCGM) values with respect to the gold standard. Nevertheless, ANOVA results showed statistically significant differences between atlas-guided and transmission-based attenuation correction methods for some regions of the brain. **Conclusions:** A new attenuation correction method for brain PET has been proposed. The method is suitable for clinical routine application in 3D brain PET imaging when a transmission scan is not available. Atlas-guided attenuation correction results in reduced radiation dose to staff and patients and makes a dramatic difference in acquisition time allowing increased patient throughput and could be applied to other functional brain imaging modalities such as SPECT.

No. 457

COMPARISON OF CESIUM-137 AND CT-BASED ATTENUATION CORRECTION OF FDG PET BODY STUDIES. S. U. Berlangieri*, A. M. Poon, A. J. Tauro, K. Pathmaraj, G. J. O'Keefe, C. C. Rowe, A. M. Scott, Centre for PET, Austin Hospital, Melbourne, Victoria, Australia; Ludwig Institute for Cancer Research, Austin Hospital, Melbourne, Victoria, Australia. (650803)

Objectives: Hybrid PET/CT scanners allow the acquisition of a CT scan both for correlative anatomy and attenuation correction of the emission scan. The physical and temporal characteristics of CT can produce artefacts in the attenuation map that propagate to the emission scan. The aim of this study is to determine the diagnostic impact of CT attenuation correction by directly comparing CT to cesium-137 (Cs) corrected FDG-PET body scans. **Methods:** Ninety-seven consecutive oncology patients underwent FDG-PET/CT on a Philips Gemini scanner using our standard patient preparation protocol. Low-dose, non-contrast CT (30mAs, 140kVp) and a transmission scan using a single 20mCi Cs rotating point source were followed by emission scanning at 3 mins/bed position. The emission scans were corrected using both Cs and CT attenuation maps. FDG PET scans were interpreted blinded to the attenuation correction method, clinical history and correlative CT. Metabolic abnormalities were scored on a 5-point scale both for intensity and the confidence of disease being present. **Results:** Of the metabolic sites recorded on Cs- and CT-corrected scans, 102/145(70%) and 104/155(67%), respectively, were considered to have disease. Twenty-six discrepant readings were recorded between the Cs- and CT-corrected studies. In 16/26 discrepancies (59%), direct comparison of Cs- and CT-corrected images revealed the same abnormality on both studies. Three lesions were outside the field-of-view on the truncated CT-corrected emission scans. Prominent bone marrow uptake was recorded on 4 CT-corrected scans. Diaphragmatic artefact resulted in one equivocal reading on a Cs-corrected scan. True discrepancies occurred in 2 cases, both small pulmonary nodules on the anatomical CT, not detected on the Cs-corrected but visible on the CT-corrected emission scan. **Conclusions:** Both Cs- and CT-corrected FDG PET scans result in studies of comparable diagnostic quality. CT attenuation correction did not result in false interpretations due to artefacts. CT-corrected scans proved more sensitive than Cs-corrected scans in detection of small pulmonary nodules. Bone marrow activity was considered more prominent on CT-corrected studies than the corresponding Cs-corrected scan.

No. 458

PERFORMANCE OF THE LOG LIKELIHOOD FUNCTION FOR DISCRIMINATING ARTIFACTUAL FROM ARTIFACT-FREE PET ATTENUATION CORRECTION IMAGES. C. M. Laymon*, J. E. Bowsher, Radiology, University of Pittsburgh, Pittsburgh, PA; Radiology, Duke University, Durham, NC. (651238)

Objectives: In PET-CT, CT data can be used for attenuation correction if it is converted to values appropriate for 511 keV. Localized regions of artifactually high attenuation in the converted image can arise when contrast agent is used to enhance the CT scan. We are developing methods to identify and correct these localized regions in an attenuation image by using the attenuation information carried by the acquired emission data. In one class of proposed methods the log likelihood function (LLF) is used. A prerequisite to the success of any such method is that, given two possible attenuation images and a