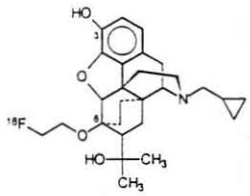
No. 280

SYNTHESIS, PRECLINICAL EVALUATION AND FIRST HUMAN STUDY OF [F-18]DIPRENORPHINE ([F-18]DPN) FOR CENTRAL OPIOID RECEPTOR IMAGING WITH PET. HJ. Wester, F. Willoch, F. Munz, M. Herz, TR. Tölle*, M. Schwaiger, P. Bartenstein. Nuklearmedizinische Klinik und Neurologische Klinik*, Klinikum r.d. Isar der TU München, Germany



Attempts to determine the central release of endogenous opioid receptor ligands in vivo using [C-11]diprenorphine ([C-11]DPN) and PET are complicated by the short half-life of C-11, because as a consequence of the small activity at the end of the protocol the sensitivity for small signal changes is limited (*Bartenstein P et al. J. Neurol. Neurosurg. Psych. 1993;56:1295).* To improve signal intensity, and thus statistics and accuracy of these investigations, a F-18-labeled analogue of [C-11]DPN was synthesized and evaluated. 6-O-([F-18]Fluoroethyl)-6-desmethyl-diprenorphine ([F-18]DPN) was obtained by F-18-fluorethylation of 3-O-trityl-6-O-desmethyl-diprenorphine and subsequent deprotection in good yields (23±7% RCY, 100 min, not optimized) with a specific activity (SA) of 1000 Ci/mmol and radiochemical purity > 98%. Autoradiography of rat brain slices revealed high affinity of [F-18]DPN to μ, κ and δ opioid receptors and comparable regional brain distribution of [F-18]DPN and [H-3]DPN. Parametric images (IRF60) obtained by spectral analysis of a dynamic [F-18]DPN PET scan (25 frames, 90 min) of a healthy volonteer after i.v. application of 185 MBq [F-18]DPN (SA 36 GBq/μmol) showed a binding pattern identical to those of a control group (n=10) with [C-11]DPN. As a parameter of specific to unspecific binding, the uptake ratios thalamus/occipetal cortex showed identical and continuously increasing values of up to 2.5 at 60 min p.i. of [C-11]DPN and [F-18]DPN. The plasma half life of [F-18]DPN was determined to be about 35 min, also comparable to that of [C-11]DPN. The present results demonstrate that [F-18]DPN is a new and suitable unselective opioid receptor ligand for PET. Its kinetics and binding characteristics are very similar to [C-11]DPN, with the advantage of the longer half life of F-18 allowing an extended scanning period, and therefore a higher sensitivity especially in displacement studies.

Cardiovascular Clinical: Attenuation Correction

4:00PM-5:30PM **Session 41** **Room: 701 B**

Moderator: Robert C. Hendel, MD

Co-Moderator: Mark I. Travin, MD

No. 281

ATTENUATION CORRECTED SPECT PERFUSION IMAGING: SHOULD CORRECTED AND UNCORRECTED IMAGES BE VIEWED TOGETHER? **J.R. Corbett, C.S. Duvernoy, J.A. Fessler, E.P. Ficaro. U. of Michigan, Ann Arbor, MI**

Although attenuation correction has significantly increased the accuracy of SPECT myocardial perfusion imaging for the diagnosis of coronary heart disease, it is controversial whether attenuation corrected (AC) images should be interpreted separately or in conjunction with the uncorrected images (NC). We hypothesized that interpretation of AC images in combination with NC images would be more specific than the separate interpretation of AC images alone. We studied 61 patients (39 male, age 64±12 yrs) who underwent stress perfusion imaging with Tc-99m sestamibi using simultaneous transmission-emission tomography with a triple detector system as we have previously reported. Coronary angiography was performed in all patients and 50% diameter stenosis (DS) was considered significant. Results for separate and combined interpretations follow:

(>50% DS)	NC	AC	AC+NC
Sensitivity (n=50)	0.78	0.84	0.8
Specificity (n=11)	0.55	0.82*	0.82*
(>70% DS)			
Sensitivity (n=50)	0.84	0.93	0.89
Specificity (n=11)	0.63	0.88*	0.88*

* p<0.05 AC vs. NC or AC+NC vs. NC

There was a slight (p=NS) overall reduction in sensitivity with modest reductions in LCx combined with slight increases in LAD and RCA sensitivities. Combined interpretations of AC with NC perfusion images is no more specific than separate interpretations of corrected images alone. Both combined and separate interpretations are more specific than uncorrected images.

No. 282

DOES ATTENUATION CORRECTION IN ML-EM RECONSTRUCTION AFFECT CORONARY ARTERY DISEASE (CAD) DIAGNOSIS ACCURACY IN TL-201 STRESS/REDISTRIBUTION CARDIAC IMAGING?

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We studied whether ML-EM reconstruction with non uniform attenuation correction (AC) improved CAD diagnosis accuracy in Tl-201 stress/redistribution studies compared to ML-EM w/o attenuation correction, using coronary angiography as the reference. Method: 56 patients (82% men, 59±10 year old) who had all undergone a coronary angiography within 3 months of the nuclear medicine study were retrospectively considered. All underwent a stress/4 hour redistribution Tl-201 study on a 3 headed Picker camera. Using a transmission Tc-99m line source, attenuation maps were acquired with the simultaneous transmission and emission protocol (STEP). For each study, Tl-201 images were reconstructed using 20 iterations of the ML-EM algorithm w/o and with AC and then resliced into the standard long and short axis images. Three blinded experienced nuclear physicians independently interpreted the stress/redistribution images for myocardial infarction and/or ischemia diagnosis using a 5 point scale (from 1=certainly absent to 5=certainly present) in the apical, left anterior descending (LAD) and right coronary artery (RCA) regions. Coronary angiography (stenosis>70% without collateral blood flow), ECG and enzyme findings were used to establish the ischemia or infarction diagnosis and perform ROC analyses. Eighteen couples of ROC curves (with and w/o AC) were obtained (2 diagnoses x 3 regions x 3 observers). Results: There were 22 normal patients and 19, 13 and 2 patients with single, two and three-vessel disease respectively. In the apical region, the ROC area was higher with AC compared to w/o AC for 2/6 ROC curve comparisons (2 diagnoses x 3 observers), but none of these differences was significant at p=0.05. In the LAD region, the ROC area was lower with AC than w/o in 6/6 comparisons, with 4 significant differences (p<0.05). W/o AC, the sensitivity and specificity values for abnormality detection averaged over the 3 observers were 61±2% and 86±11%, against 37±8% and 86±4% with AC. In the RCA regions, the ROC area was higher with AC than w/o in 6/6 comparisons (3 with p<0.05). Mean abnormality detection sensitivity and specificity were 82±10% and 40±8% w/o AC against 70±7% and 91±1% with AC. Conclusion: For this population including severe CAD patients and for this particular imaging and image processing protocol, AC did not alter significantly the diagnosis outcome in the apical region and increased CAD diagnosis specificity in the RCA region. However, the abnormality detection sensitivity was significantly reduced in the LAD region.

No. 283

SIMULTANEOUS EMISSION/TRANSMISSION MYOCARDIAL PERFUSION IMAGING WITH ^{201}Tl AND A ^{153}Gd SCANNING LINE SOURCE: CROSSOVER CORRECTIONS AND VALIDATION.

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The aim of this work has been to develop a protocol and validate the use of a commercial scanning line source (ADAC Vantage™) containing Gd153(E_γ=98, 103keV) for transmission measurements while acquiring Tl201(X-rays≈70-80keV,E_γ=167keV) myocardial perfusion SPECT data. The potential exists for corruption of the lower (67-84keV) emission window(Em_{70}) with scattered Gd153 transmission photons. No downscatter correction is supplied by the manufacturer. Downscatter fractions for Gd153->Em_{70} were measured on two normal volunteers without any emission radiotracer present by measuring transmission data for 2 minutes in both the scanning transmission window(Tm_{100}) and conventional emission (Em_{70}) windows in antero-posterior (AP) and lateral (LAT) projections. Mean count rates for the whole chest and heart regions were measured in both windows and the downscatter fraction estimated as cps(Em_{70})/cps(Tm_{100}). The downscatter fractions were (i) 6%, 9% and 22%, and (ii) 5%, 7%, 14% for whole chest(AP), heart(AP) and heart(LAT) regions respectively in the male(i) and female(ii) volunteers. As they were the higher, the male values were subsequently used in all calculations. These values was applied to a series of patient data to estimate the fractional downscatter component in the Em_{70} window. All patients were administered ~74 MBq of Tl201 at rest. Scans were acquired with either LEHR or LEAP collimators. Count rates in the Tm_{100} window in regions of the heart on AP and LAT projections were measured and the downscatter estimated based on the previously derived values. In 6 subjects selected at random, the estimated contamination in the Em_{70} window from Gd153 photons in the heart region was 0.9±0.4% (range 0.6-1.7%) in the AP projections and 1.3±0.8% (range 0.7-2.8%) in the LAT projections of the observed count rate in the Em_{70} window. The whole chest downscatter values were much lower than the regional heart values. This fraction would be decreased even further if a larger dose of Tl201 was administered. We conclude that Gd153 downscatter is typically a small (<~3% worst case) contribution to the Em_{70} window, and we therefore apply no correction to the Tl201 emission data.