SUPPLEMENTAL DATA:

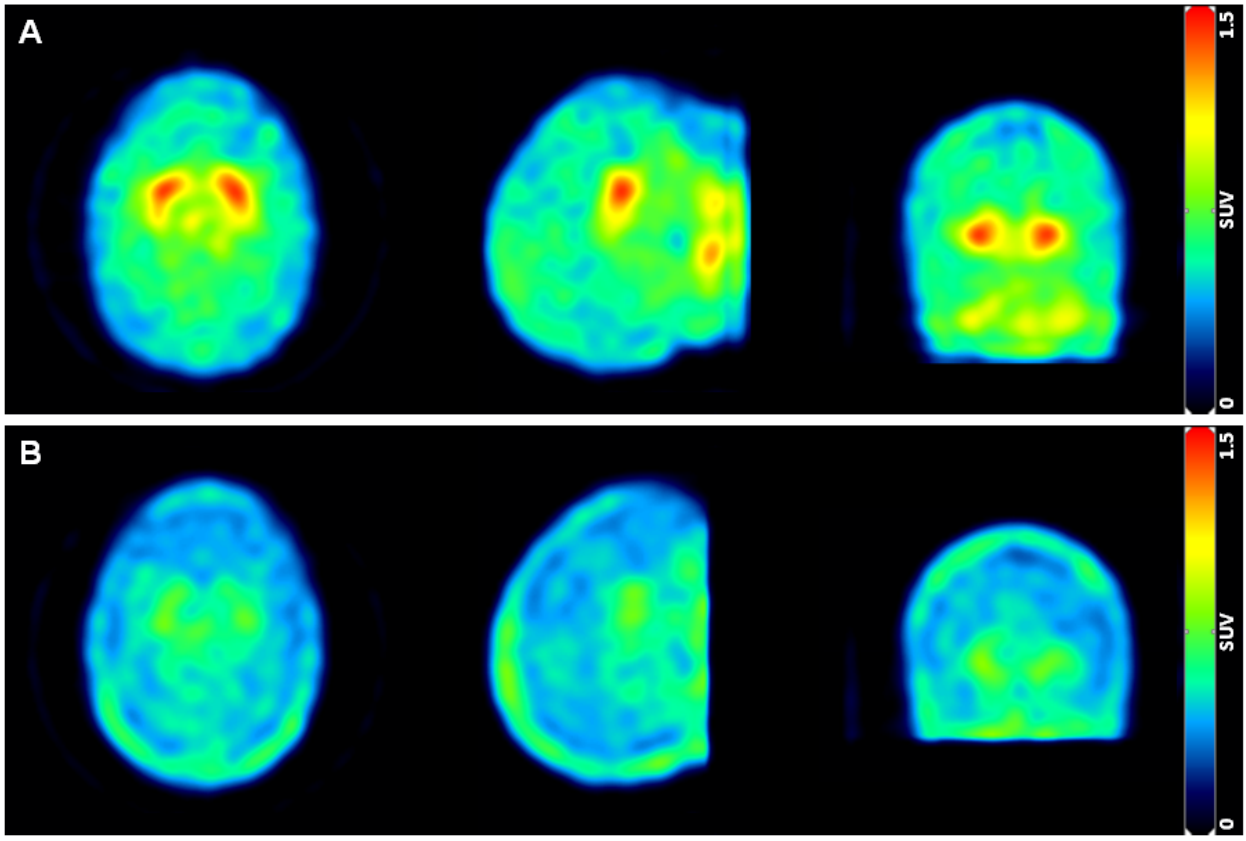
CROSS CALIBRATION - BRAIN SPECT IMAGES

A pre-checked dose calibrator was used to prepare the solution subsequently used to fill the brain shell of a human brain anthropomorphic phantom (Radiology Support Devices, Inc., Long Beach, CA, USA). The brain shell was homogenously filled with a volume of water (≈1360 mL) containing approximately 18.5 MBq (0.5 mCi) of ^{123}I (concentration ≈ 0.014 MBq/mL) and then inserted into the skull. For each solution prepared, 3 aliquots of 1 mL each were withdrawn and counted in a well-type γ-counter (Perkin Elmer Wallac 2480, USA) using a 22-190 keV window. Simultaneously, the phantom was scanned for 30 minutes using a SPECT 3-headed camera (Picker PRISM 3000 XP, Philips Healthcare, Cleveland, OH, USA) equipped with low energy high resolution fan-beam collimators (LEHR-FAN). An energy window of 15% centered at 159 keV and continuous acquisition mode were used. Acquisitions were obtained using a 128×128 matrix and a zoom=1. Raw SPECT data was reconstructed using the ordered subset maximum likelihood expectation maximization (OS ML-EM) method and a low pass post-filter (order 5 and cut-off 0.24). Reconstructed scans were imported into PMOD 3.203 software (PMOD Technologies, Zurich, Switzerland) and attenuation correction was performed by applying the Chang algorithm (attenuation coefficient = 0.011 mm-1) to a semi-automatically drawn ellipse around the brain (*1*). The cross calibration of the SPECT camera to the well-type γ-counter was done by comparing the image activity concentration in the region of interest (i.e. whole brain) with phantom activity concentration, as calculated from the aliquots measured by the well-type γ-counter and phantom volume. The cross calibration factor (CF) was determined as follows: $CF=AC_{wc}/AC_{SPECT}$, where AC_{wc}= activity concentration measured in well-type γ-counter (kBq/mL) and AC_{SPECT}=activity concentration in the phantom measured in the SPECT camera (kBq/mL). The generated cross calibration factor was applied to the SPECT images for subsequent studies.

SUPPLEMENTAL TABLE 1. Comparison between kinetic modeling results obtained using 1T and 2T models with arterial input function.

Brain region	1T model				2T model			
	V_T (ml/cc)	% SE	AIC	MSC	V_T (ml/cc)	% SE	AIC	MSC
Caudate	**2.53±0.42**	**10.02±1.13**	**45.95±3.73**	**-0.22±0.54**	**3.18±0.30**	**5.67±1.16**	**13.70±2.70**	**1.99±0.78**
Putamen	**3.19±0.77**	**11.03±1.98**	**47.69±2.86**	**-0.38±0.77**	**3.90±0.91**	**7.07±2.32**	**17.60±5.57**	**1.68±0.63**
Striatum	**2.87±0.59**	**10.67±1.18**	**46.60±2.71**	**-0.32±0.67**	**3.58±0.65**	**5.97±1.55**	**14.08±3.53**	**1.90±0.69**
Frontal cortex	1.40±0.08	12.56±2.70	57.72±2.39	0.14±0.38	2.07±0.18	7.87±2.35	18.89±6.64	2.75±0.52
Parietal cortex	1.39±0.06	12.30±2.00	60.01±2.64	0.10±0.35	2.07±0.24	8.15±1.48	20.61±6.18	2.74±0.18
Temporal cortex	1.51±0.13	12.68±2.02	58.78±2.72	0.10±0.36	2.16±0.19	9.56±4.18	19.38±5.17	2.75±0.29
Occipital cortex	1.32±0.05	12.17±2.82	61.95±2.71	0.15±0.31	2.01±0.15	8.53±2.47	18.54±7.33	3.04±0.32
Cerebellum	1.22±0.07	13.72±2.31	62.66±3.63	0.28±0.44	1.80±0.13	7.11±1.27	21.45±6.73	3.06±0.21

Note that 2T model is the preferred kinetic model for quantification of regional TACs obtained following intravenous bolus injection of [^{123}I]MNI-420 (lower AIC and higher MSC compared with 1T model). Results presented as mean±SD (n=3). %SE=percentage of standard error.

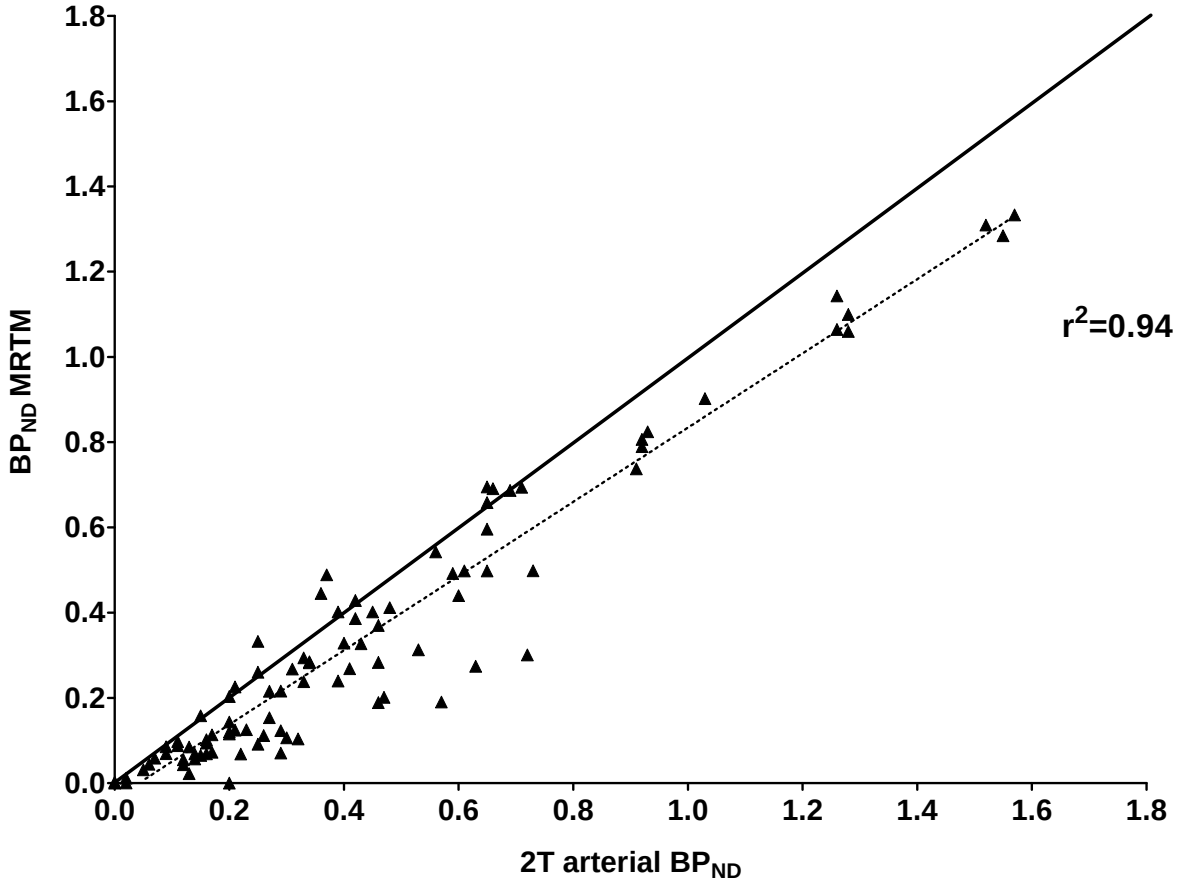


SUPPLEMENTAL FIGURE 1. SPECT SUV sum images (0-240 minutes) of [^{123}I]MNI-420 distribution in subject 4 brain at test (A) and retest (B) conditions. Note the significant reduction in striatal uptake in the retest SPECT images in comparison with test SPECT images. This subject was subsequently found to have inadvertently ingested a single caffeinated beverage prior to radiotracer injection on the retest scan.

SUPPLEMENTAL TABLE 2. Summary of BP_{ND} values derived using different kinetic models.

Brain region	BP_{ND} 2T	BP_{ND} SRTM	BP_{ND} Logan ref	BP_{ND} MRTM	BP_{ND} SUVr
Caudate	**0.76±0.14**	**0.68±0.17**	**0.68±0.15**	**0.67±0.13**	**0.76±0.14**
Putamen	**1.16±0.44**	**1.03±0.33**	**1.04±0.33**	**1.02±0.30**	**1.12±0.31**
Striatum	**0.98±0.31**	**0.86±0.25**	**0.87±0.24**	**0.85±0.22**	**0.94±0.23**
Frontal cortex	0.15±0.03	0.08±0.04	0.08±0.04	0.09±0.03	0.09±0.02
Parietal cortex	0.15±0.06	0.11±0.05	0.08±0.02	0.13±0.06	0.09±0.05
Temporal cortex	0.20±0.08	0.14±0.06	0.14±0.06	0.15±0.04	0.16±0.06
Occipital cortex	0.12±0.06	0.09±0.04	0.08±0.02	0.13±0.12	0.09±0.05

Note the underestimation of BP_{ND} values is highest for SRTM, Logan reference and MRTM models, in comparison with 2T invasive model. Results presented as mean±SD (n=3). Logan reference t*=10 min, MRTM t*=7.5 min.



SUPPLEMENTAL FIGURE 2. Comparative analysis between BP_{ND} values obtained from 2T model using an arterial input function and MRTM (r^2=0.94). Equation: y=0.87x-0.03

REFERENCES:

1. Chang L-T. A method for attenuation correction in radionuclide computed tomography. *IEEE Trans Nuc Med.* 1978;25:638-643.