Electronic Supplementary Materials

Journal: Molecular Imaging and Biology

Test-Retest Repeatability of Patlak Slopes versus Standardized Uptake Values for Hypermetabolic Lesions and Normal Organs in an Oncologic PET/CT Population

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Suppl. Table 1. Normal organ VOI placement methods.

Normal organ	Method
Liver	Place a spherical VOI of 30 mm diameter in the central right hemiliver, avoiding masses (hot or cold) or large intrahepatic vessels
Lung	Place a spherical VOI of 30 mm diameter in the periphery of the right lung base, avoiding large vessels, airways, and pleural surfaces
Blood pool	Place a spherical VOI of 20 mm diameter in the center of ascending thoracic aorta, avoiding vessel walls and cardiac activity
Bone marrow	Place a spherical VOI of 15 mm diameter in the center of the L5 vertebral body, avoiding adjacent disc spaces
Skeletal muscle	Place a spherical VOI of 20 mm diameter in the right paraspinal skeletal muscle at the left of the L5 vertebra, avoiding adjacent bone and fat
Grey matter	Place a spherical VOI of 10 mm diameter in the anterior aspect of the left basal ganglia, avoiding ventricles and adjacent white matter (i.e., internal/external capsules)
Spleen	Place a spherical VOI of 15 mm diameter in the central spleen, avoiding focal lesions and large hilar vessels

Abbreviations: VOI = volume of interest

Suppl. Table 2. Area under the time-activity curve, [^{18}F]FDG dose, and blood glucose analysis.

Subject	Test AUTAC (Bq·s/ml)	Test [^{18}F]FDG dose (MBq)	Test BG (mg/dl)	Retest AUTAC (Bq·s/ml)	Retest [^{18}F]FDG dose (MBq)	Retest BG (mg/dl)	%Δ AUTAC	%Δ [^{18}F]FDG dose	%Δ BG	(%Δ AUTAC) – (%Δ[^{18}F]FDG dose)
1	28640	500	114	28046	485	121	-2.1%	-3.0%	6.1%	0.9%
2 (err.)	28933	581	102	14709	551	102	-49.2%	-5.1%	0.0%	-44.1% [a]
2 (adj.)	28933	581	102	29631	551	102	2.4%	-5.1%	0.0%	7.5%
3	23834	599	98	23592	574	109	-1.0%	-4.3%	11.2%	3.3%
4	26779	648	97	23388	592	84	-12.7%	-8.6%	-13.4%	-4.1%
5	43440	588	108	38856	603	95	-10.6%	2.5%	-12.0%	-13.1%
6	29704	603	89	32503	611	87	9.4%	1.2%	-2.2%	8.2%
7	33439	559	96	34462	559	97	3.1%	0.0%	1.0%	3.1%
8	33536	618	114	34860	614	93	3.9%	-0.6%	-18.4%	4.5%
9	28518	463	90	29564	463	91	3.7%	0.0%	1.1%	3.7%

Abbreviations: adj. = adjusted values after correction of VOI placement error; AUTAC = area under the time-activity curve; BG = blood glucose; err. = values derived from VOI placement error; VOI = volume of interest

[a] Flagged for additional analysis due to ≥ 15% difference between %Δ AUTAC and %Δ [^{18}F]FDG dose

Note: %Δ represents the retest measurement (session 2) minus the test measurement (session 1), divided by the test measurement (session 1). A positive percentage represents an increase in the metric from session 1 to session 2. Note that the %Δ differs from the T-RT %Δ, which instead utilizes the mean of the test and retest values in the denominator.

Suppl. Table 3. SUV-max and PS-max values of [^{18}F]FDG-avid lesions by subject.

Subject	Lesion or normal organ	Test SUV-early-max	Retest SUV-early-max	Test PS-early-max [a]	Retest PS-early-max [a]	Test SUV-late-max	Retest SUV-late-max	Test PS-late-max [a]	Retest PS-late-max [a]
1	Lesion 1 (liver)	9.73	9.54	5.42	5.68	13.58	15.34	5.17	6.03
	Lesion 2 (liver)	6.35	6.94	4.09	3.68	9.91	12.76	3.42	4.24
	Lesion 3 (liver)	6.64	6.66	3.11	3.36	11.07	11.41	3.50	3.82
	Lesion 4 (liver)	6.99	6.53	3.27	3.02	11.67	13.51	4.17	5.12
	Lesion 5 (l.n.)	7.61	6.07	3.87	3.31	10.59	11.22	3.83	3.86
2	Lesion 1 (RML)	3.39	3.93	1.19	1.67	4.63	4.39	1.29	1.39
	Lesion 2 (LUL)	1.82	2.54	0.60	0.71	3.43	3.30	0.68	0.77
3	Lesion 1 (l.n.)	7.61	8.68	3.87	3.68	13.53	12.97	3.45	3.89
	Lesion 2 (l.n.)	6.88	6.38	1.85	2.43	15.94	14.88	2.50	3.05
	Lesion 3 (l.n.)	3.09	3.57	1.25	2.25	7.42	6.86	1.64	1.84
	Lesion 4 (l.n.)	2.65	2.67	0.80	1.20	4.08	5.69	0.81	1.23
	Lesion 5 (l.n.)	2.81	2.78	0.84	0.89	2.97	3.36	0.64	0.88
4	Lesion 1 (liver)	5.05	4.97	0.87	1.55	8.29	8.30	1.61	1.78
	Lesion 2 (liver)	6.29	6.81	1.25	1.93	11.55	15.70	2.36	3.52
	Lesion 3 (liver)	3.76	4.33	0.76	1.01	4.61	5.75	1.06	1.47
	Lesion 4 (liver)	4.54	4.42	0.74	1.04	6.15	6.96	1.23	1.64
	Lesion 5 (liver)	4.15	3.86	0.75	0.85	6.21	8.13	1.26	1.76

Abbreviations: l.n. = lymph node; LUL = left upper lobe; PS = Patlak slope; RML = right middle lobe; SUV = standardized uptake value

[a] PS has units of mg/min/100ml

Suppl.Table 4. SUV-peak and PS-peak values of [^{18}F]FDG-avid lesions by subject.

Subject	Lesion or normal organ	Test SUV-early-peak	Retest SUV-early-peak	Test PS-early-peak [a]	Retest PS-early-peak [a]	Test SUV-late-peak	Retest SUV-late-peak	Test PS-late-peak [a]	Retest PS-late-peak [a]
1	Lesion 1 (liver)	8.67	8.80	4.92	5.25	11.82	13.38	4.95	5.64
	Lesion 2 (liver)	5.56	6.04	3.44	3.18	7.83	8.98	3.08	3.75
	Lesion 3 (liver)	5.23	5.29	2.33	2.46	7.59	8.15	2.71	2.94
	Lesion 4 (liver)	5.86	5.51	2.77	2.54	9.91	10.45	3.47	4.14
	Lesion 5 (l.n.)	6.32	5.30	2.94	2.64	8.30	8.37	3.17	3.08
2	Lesion 1 (RML)	3.03	3.40	0.95	1.37	3.30	3.26	1.13	1.23
	Lesion 2 (LUL)	0.85	1.17	0.38	0.41	1.51	1.53	0.46	0.51
3	Lesion 1 (l.n.)	6.48	6.80	3.26	2.95	10.08	9.47	2.86	3.41
	Lesion 2 (l.n.)	4.73	4.54	1.26	1.58	6.61	6.70	1.68	2.03
	Lesion 3 (l.n.)	2.16	2.43	0.78	1.38	3.95	4.00	1.04	1.24
	Lesion 4 (l.n.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Lesion 5 (l.n.)	2.12	2.48	0.59	0.70	1.85	2.24	0.53	0.74
4	Lesion 1 (liver)	3.82	3.86	0.59	0.97	4.50	4.27	1.25	1.31
	Lesion 2 (liver)	4.72	4.66	0.89	1.16	6.10	6.69	1.62	2.07
	Lesion 3 (liver)	3.35	3.29	0.49	0.64	3.05	3.44	0.89	1.16
	Lesion 4 (liver)	3.21	3.28	0.41	0.69	4.55	3.58	0.95	1.15
	Lesion 5 (liver)	3.67	3.27	0.57	0.69	3.37	3.73	0.99	1.26

Abbreviations: l.n. = lymph node; LUL = left upper lobe; PS = Patlak slope; RML = right middle lobe; SUV = standardized uptake value

[a] PS has units of mg/min/100ml

N/A – lesion was too small for peak calculation

Suppl.Table 5. Descriptive statistics for SUV-mean and PS-mean values of normal organs across participants.

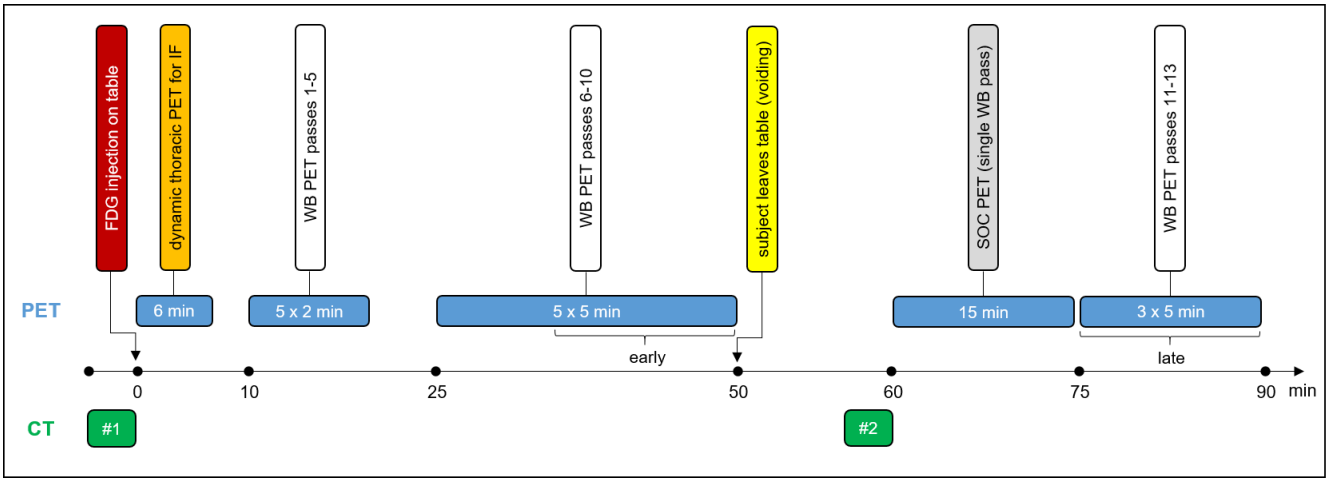
Normal organ	Test SUV-early-mean	Retest SUV-early-mean	Test PS-early-mean [a]	Retest PS-early-mean [a]	Test SUV-late-mean	Retest SUV-late-mean	Test PS-late-mean [a]	Retest PS-late-mean [a]
Liver	2.94 (2.26, 3.50)	2.84 (2.07, 3.26)	0.43 (0.32, 0.58)	0.39 (0.26, 0.51)	2.23 (1.91, 2.74)	2.14 (2.02, 2.53)	0.75 (0.58, 0.85)	0.71 (0.63, 0.87)
Lung	0.59 (0.46, 0.85)	0.61 (0.38, 0.80)	0.09 (0.05, 0.15)	0.07 (0.05, 0.19)	0.45 (0.39, 0.63)	0.48 (0.33, 0.71)	0.15 (0.12, 0.19)	0.165 (0.12, 0.24)
Blood pool	2.65 (2.37, 3.26)	2.52 (2.07, 3.20)	0.28 (0.22, 0.39)	0.31 (0.22, 0.60)	1.77 (1.42, 2.11)	1.74 (1.41, 2.16)	0.58 (0.44, 0.62)	0.57 (0.47, 0.69)
Bone marrow	1.69 (1.01, 2.30)	1.88 (1.05, 2.42)	0.63 (0.22, 0.85)	0.67 (0.30, 0.81)	1.85 (1.09, 2.53)	2.02 (0.98, 2.48)	0.66 (0.33, 0.86)	0.69 (0.26, 0.99)
Skeletal muscle	0.70 (0.58, 0.78)	0.60 (0.53, 0.97)	0.16 (0.10, 0.34)	0.17 (0.14, 0.26)	0.63 (0.57, 0.81)	0.60 (0.48, 1.03)	0.23 (0.19, 0.26)	0.20 (0.17, 0.34)
White matter	3.00 (2.32, 4.02)	2.92 (2.23, 3,41)	1.05 (0.66, 1.94)	1.12 (0.94, 1.73)	3.19 (2.70, 4.18)	3.40 (2.80, 4.61)	1.15 (0.95, 1.39)	1.21 (1.00, 1.62)
Grey matter	7.95 (5.22, 11.02)	6.92 (6.31, 10.69)	3.34 (2.86, 4.98)	3.14 (2.50, 4.53)	10.49 (8.45, 15.51)	10.23 (7.71, 14.40)	3.10 (2.97, 4.34)	3.34 (2.76, 3.91)
Spleen	2.33 (2.17, 3.02)	2.40 (1.97, 2.97)	0.47 (0.34, 0.69)	0.55 (0.28, 0.72)	2.14 (1.82, 2.65)	2.22 (1.77, 3.10)	0.72 (0.57, 0.94)	0.78 (0.53, 1.09)

Abbreviations: PS = Patlak slope; SUV = standardized uptake value

[a] PS has units of mg/min/100ml

Note: Entries in cells represent median (minimum, maximum) values across all participants. Late values are derived from data for 8 participants only, as one individual did not complete the requisite whole-body PET passes at the late time point.

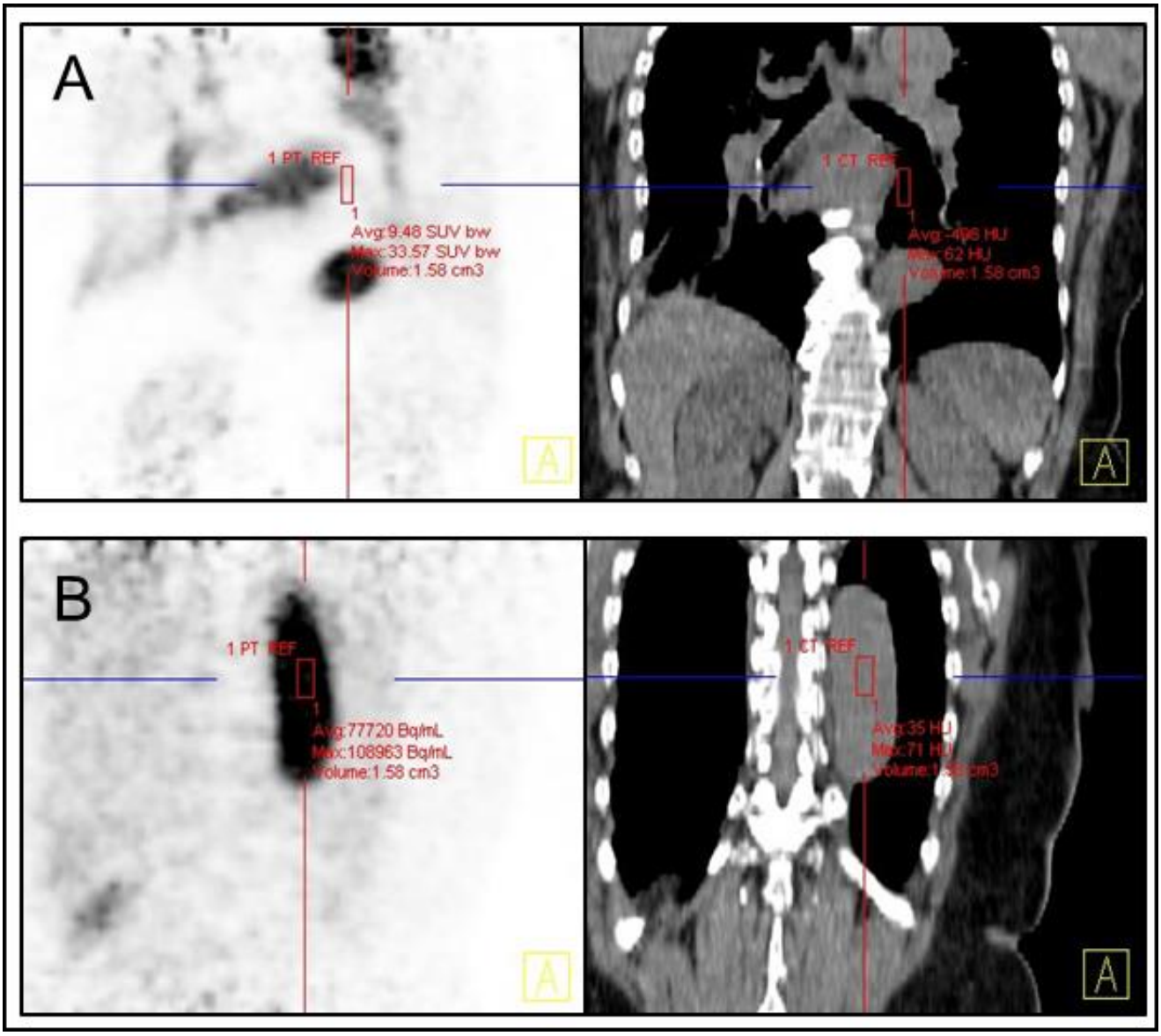
Suppl. Figure 1.



Suppl. Figure 1. Study imaging protocol diagram. Brackets ("early" and "late") correspond to the time points from which data were utilized for reconstruction of Patlak slope and SUV images.

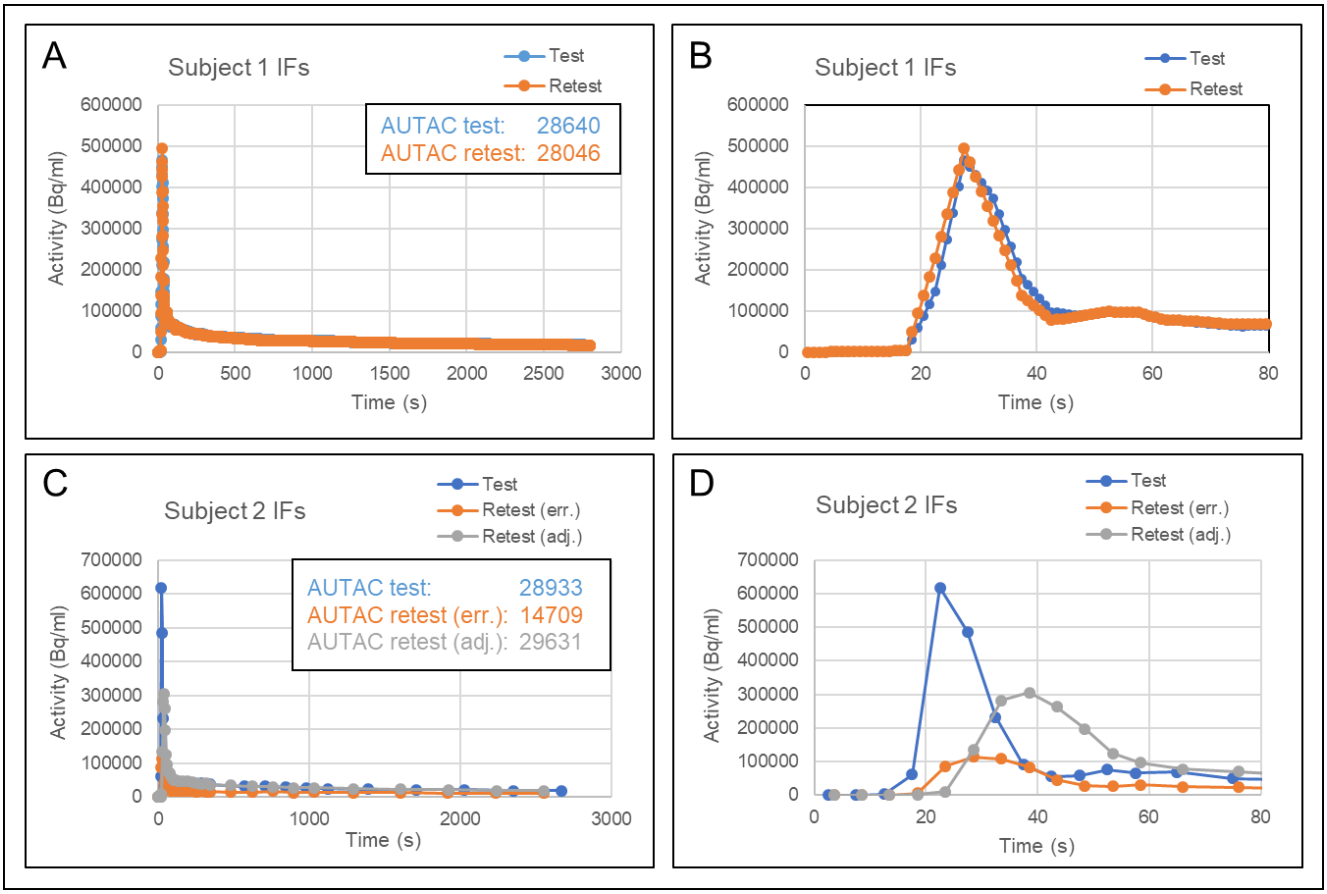
Abbreviations: SOC = standard-of-care; WB = whole-body

Suppl. Figure 2.



Suppl. Figure 2. Correction of VOI placement for proper input function generation. Coronal PET and CT images from the retest session for subject 2 show incorrect automated scanner VOI (red rectangle) placement (A) in the medial left lung parenchyma. The VOI location was manually adjusted to achieve placement in the descending thoracic aorta (B), allowing for an appropriate vascular input function to be generated.

Suppl. Figure 3.



Suppl. Figure 3. Time-activity curve (TAC) analysis. Time-activity curves (TACs) are shown for subject 1 (A-B) and subject 2 (C-D) for the entire post-injection PET imaging period (A, C), as well as for the first 80 seconds of PET imaging (B, D) to highlight early post-injection curve differences. For subject 1, the TAC is nearly identical for test and retest sessions, resulting in very similar area under the TAC (AUTAC) values. For subject 2, the original retest TAC (err.) had a much flatter morphology (orange curve in D) with a substantially lower AUTAC due to incorrect VOI placement (see **Suppl. Figure 2**). After manual VOI adjustment (adj.), the AUTAC retest value was nearly identical to the AUTAC test value. Although the adjusted retest TAC (grey curve in D) was still more blunted than the test TAC (blue curve in D), likely due to inter-session differences in the [^{18}F]FDG bolus injection technique, only the AUTAC (i.e., not the TAC shape) impacts the resulting Patlak slope values. Thus, the similarity of the test and retest (adj.) AUTAC values indicates that the subject 2 data are suitable for Patlak analysis.

Abbreviations: IF = input function; VOI = volume of interest