Supplementary Materials

Table S1: PET and MRI Data Acquisition Parameters

Parameter	Unit	Value
PET		
Matrix		192 x 192
FOV	mm	300
Voxel size	mm	1.56 x 1.56 x 2.78
Slice thickness	mm	2.78
Scan duration	min	10:00
MRA		
TR/TE	ms	22/2.4
Number of slices		120
Flip angle	degrees	15
Slice thickness	mm	1.2
Matrix		512 x 512
FOV	mm^2	220 x 220
Voxel size	mm^2	0.43 x 0.43
Scan duration	min	4:03
GRE		

TR/TE	ms	667/15
Number of slices		30
Flip angle	degrees	20
FOV	cm	24 x 24
Matrix		256 x 256
Slice thickness	mm	5
Scan duration	min	1:56
Single-PLD PCASL		
Labeling pulse shape		Hanning
Labeling pulse duration	ms	0.5
Labeling pulse spacing	ms	1.22
Mean B1	µT	1.4
Mean gradient strength	mT/m	0.7
Maximal gradient strength	mT/m	7
Bolus duration	ms	1450
TR/TE	ms	4854/10.7
PLD	ms	2025
NEX		3
Acquisition Matrix		8 interleaved spirals X 512 sampling points per spiral

Number of slices		36
FOV	cm^3	24
Acquisition Voxel size	mm	3.73 x 3.73 x 4
Reconstruction Voxel size	mm	1.875 x 1.875 x 4
Number of Background suppression pulses		5
Scan duration	min	4:13

Multi-PLD PCASL

Labeling pulse shape		Hanning
Labeling pulse duration	ms	0.5
Labeling pulse spacing	ms	1.22
Mean B1	µT	1.8
Mean gradient strength	mT/m	0.7
Maximal gradient strength	mT/m	4.5
Bolus duration	ms	1700
TR/TE	ms	5652/10.7
PLD	ms	300, 2000, 3700
Acquisition Matrix		4 interleaved spirals X 512 sampling points per spiral
NEX		2
Number of slices		36

FOV	cm^3	24
Acquisition Voxel size	mm	5.77 x 5.77 x 4
Reconstruction Voxel size	mm	1.875 x 1.875 x 4
Number of Background suppression pulses		5
Scan duration	min	4:47

DSC

TR/TE	ms	1800/40
NEX		1
Flip angle	degrees	60
Slice thickness	mm	5
Pre-delay	s	18
Number of slices		21
FOV	cm	22 x 22
Matrix		128 x 128
Timepoints		60
Acquisition Voxel size	mm	1.719 x 1.719 x 5
Scan duration	min	1:48

Table S2: Comparison between PET, Single- and Multi-PLD PCASL techniques

	PET	Single-PLD PCASL	Multi-PLD PCASL
Quantitative Comparison			
Image Resolution (mm^3)	1.56 x 1.56 x 2.78	3.73 x 3.73 x 4	5.77 x 5.77 x 4
FOV (cm^3)	30	24	24
Scan duration (min)	10	4:13	4:47
Image reconstruction time (min)	5	Less than 1min	Less than 1min
CBF change in affected regions (ml/100g/min)	15.6	12.7	18.8
CBF change in unaffected regions (ml/100g/min)	27.7	15.3	23.7
Mean CVR of affected regions (%)	30.8	24.1	34.3
Mean CVR of unaffected regions (%)	33.2	24.5	37.2
Qualitative Comparison			
Tracer	^{15}O-water	Blood water as the endogenous tracer	Blood water as the endogenous tracer
Hemodynamic model used analysis	1-compartment model	General kinetic model	General kinetic model
Parameters measured	CBF and CVR	CBF and CVR	CBF, CVR, and ATT

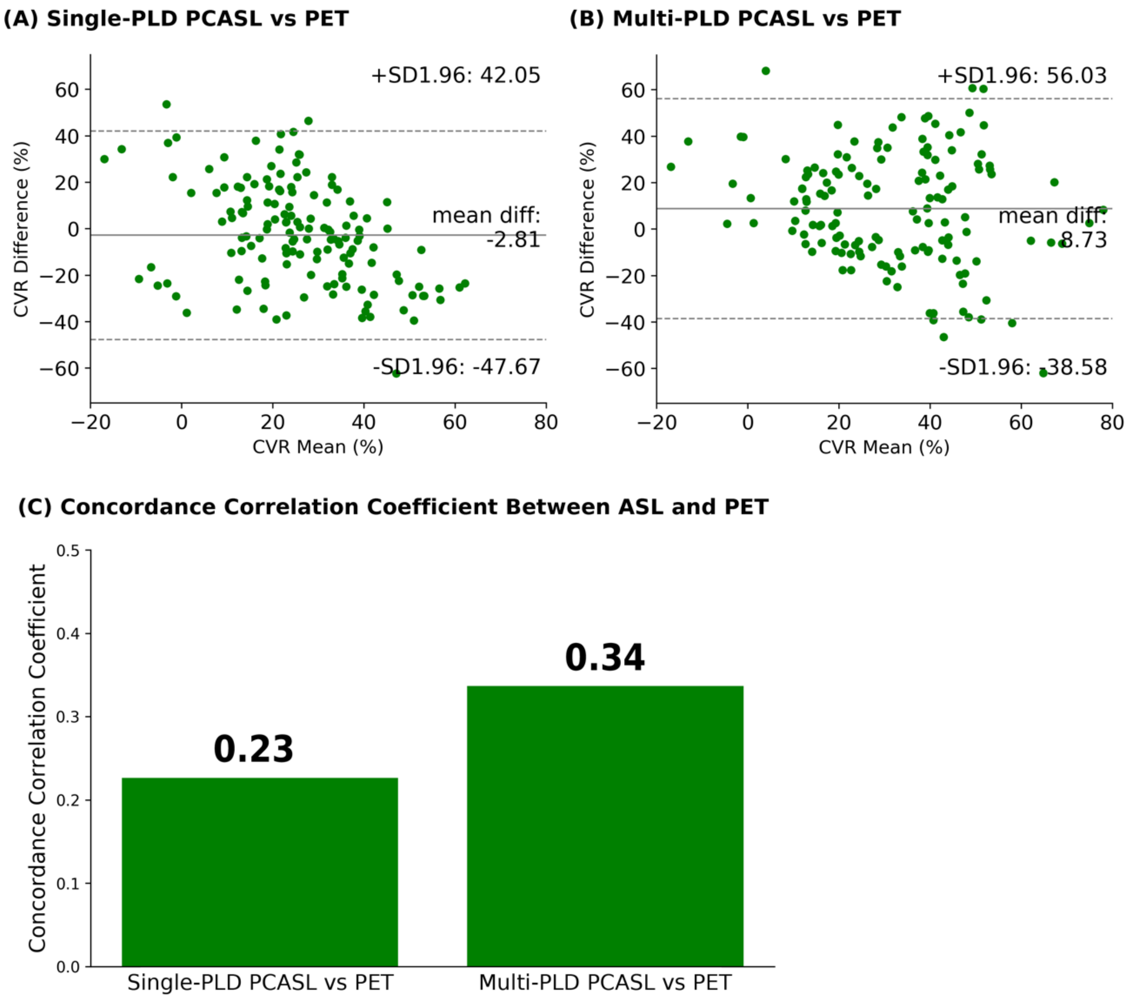

Figure S1: Relationship between CVR of all the regions (affected and unaffected) measured by ASL and PET. There were biases of 2.8% and 8.73% for single- and multi-PLD PCASL respectively. Multi-PLD PCASL achieved a stronger correlation with the reference PET technique.

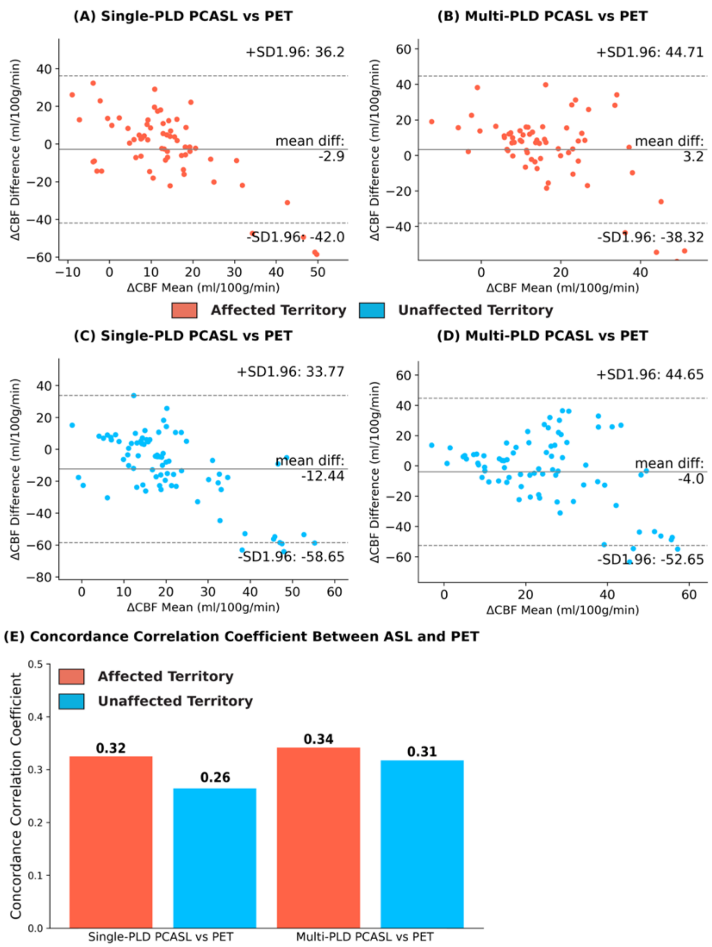

Figure S2: Relationship between ΔCBF measured by ASL and PET. Between multi-PLD PCASL and PET techniques, there were a bias of 3.2 and 4.0 ml/100g/min in the ΔCBF of affected and unaffected territories respectively. Both ASL techniques had a similar concordance correlation coefficient in regions affected by stenosis/occlusion while multi-PLD PCASL showed higher agreement with PET in normal (unaffected) territories.