Appendix 1. Reproducibility of IVIM Parameters Measured by Two Diagnostic Radiologists.

Parameter	ROI	ICC Inter-group (95% CI)	Intra-group (95% CI)	Parameter	ROI	ICC Inter-group (95% CI)	Intra-group (95% CI)
ADC	Right frontal lobe	0.976 (0.959,0.986)	0.904 (0.840,0.943)	D	Right frontal lobe	0.978 (0.963,0.987)	0.920 (0.867,0.952)
	Left frontal lobe	0.980 (0.966,0.988)	0.923 (0.871,0.954)		Left frontal lobe	0.984 (0.974,0.991)	0.928 (0.880,0.957)
	Right temporal lobe	0.991 (0.985,0.995)	0.953 (0.922,0.972)		Right temporal lobe	0.989 (0.982,0.994)	0.935 (0.892,0.961)
	Left temporal lobe	0.974 (0.956,0.984)	0.882 (0.803,0.930)		Left temporal lobe	0.944 (0.906,0.967)	0.828 (0.712,0.897)
	Right occipital lobe	0.985 (0.975,0.991)	0.933 (0.888,0.960)		Right occipital lobe	0.977 (0.961,0.986)	0.872 (0.785,0.923)
	Left occipital lobe	0.973 (0.955,0.984)	0.885 (0.807,0.931)		Left occipital lobe	0.943 (0.904,0.966)	0.806 (0.675,0.884)
	Right parietal lobe	0.982 (0.970,0.989)	0.906 (0.843,0.944)		Right parietal lobe	0.973 (0.955,0.984)	0.849 (0.748,0.910)
	Left parietal lobe	0.972 (0.953,0.983)	0.777 (0.627,0.867)		Left parietal lobe	0.979 (0.964,0.987)	0.907 (0.844,0.944)
	Right cingulate gyrus	0.996 (0.994,0.998)	0.949 (0.914,0.969)		Right cingulate gyrus	0.993 (0.989,0.996)	0.951 (0.918,0.971)
	Left cingulate gyrus	0.997 (0.995,0.998)	0.977 (0.961,0.986)		Left cingulate gyrus	0.995 (0.992,0.997)	0.968 (0.946,0.981)
	Right thalamus	0.960 (0.934,0.976)	0.842 (0.735,0.905)		Right thalamus	0.956 (0.941,0.979)	0.852 (0.751,0.911)
	Left thalamus	0.963 (0.938,0.978)	0.851 (0.750,0.911)		Left thalamus	0.979 (0.965,0.988)	0.913 (0.854,0.948)

	Region				Region		
D*	Right frontal lobe	0.989 (0.981,0.993)	0.967 (0.944,0.980)	f	Right frontal lobe	0.968 (0.946,0.981)	0.895 (0.824,0.937)
	Left frontal lobe	0.987 (0.979,0.993)	0.962 (0.937,0.978)		Left frontal lobe	0.976 (0.960,0.986)	0.911 (0.850,0.947)
	Right temporal lobe	0.999 (0.997,0.999)	0.988 (0.980,0.993)		Right temporal lobe	0.972 (0.954,0.983)	0.855 (0.758,0.914)
	Left temporal lobe	0.990 (0.983,0.994)	0.944 (0.906,0.966)		Left temporal lobe	0.964 (0.940,0.979)	0.846 (0.742,0.908)
	Right occipital lobe	0.992 (0.987,0.995)	0.954 (0.923,0.972)		Right occipital lobe	0.995 (0.991,0.997)	0.958 (0.930,0.975)
	Left occipital lobe	0.975 (0.969,0.985)	0.888 (0.812,0.933)		Left occipital lobe	0.975 (0.958,0.985)	0.881 (0.801,0.929)
	Right parietal lobe	0.996 (0.992,0.997)	0.975 (0.957,0.985)		Right parietal lobe	0.985 (0.975,0.991)	0.927 (0.878,0.956)
	Left parietal lobe	0.994 (0.989,0.996)	0.967 (0.948,0.982)		Left parietal lobe	0.987 (0.978,0.992)	0.943 (0.904,0.966)
	Right cingulate gyrus	0.997 (0.995,0.998)	0.985 (0.975,0.991)		Right cingulate gyrus	0.997 (0.995,0.998)	0.970 (0.949,0.982)
	Left cingulate gyrus	0.998 (0.997,0.999)	0.993 (0.988,0.996)		Left cingulate gyrus	0.993 (0.989.0.996)	0.971 (0.951,0.982)
	Right thalamus	0.994 (0.990,0.996)	0.976 (0.959,0.985)		Right thalamus	0.973 (0.955,0.984)	0.883 (0.804,0.930)
	Left thalamus	0.990 (0.984,0.994)	0.968 (0.946,0.981)		Left thalamus	0.967 (0.945,0.980)	0.859 (0.764,0.916)
DDC	Right frontal lobe	0.971 (0.952,0.983)	0.909 (0.848,0.946)	α	Right frontal lobe	0.963 (0.938,0.978)	0.885 (0.807,0.931)
	Left frontal lobe	0.973 (0.955,0.984)	0.917 (0.862,0.951)		Left frontal lobe	0.949 (0.914,0.969)	0.876 (0.793,0.926)
	Right temporal lobe	0.997 (0.994,0.998)	0.986 (0.976,0.991)		Right temporal lobe	0.989 (0.982,0.994)	0.902 (0.836,0.942)
	Left temporal lobe	0.990 (0.983,0.994)	0.956 (0.926,0.974)		Left temporal lobe	0.956 (0.926,0.974)	0.816 (0.693,0.890)

Right occipital lobe	0.995 (0.992,0.997)	0.975 (0.958,0.985)	Right occipital lobe	0.965 (0.941,0.979)	0.823 (0.704,0.894)
Left occipital lobe	0.983 (0.971,0.990)	0.952 (0.920,0.972)	Left occipital lobe	0.953 (0.922,0.972)	0.799 (0.663,0.880)
Right parietal lobe	0.993 (0.988,0.996)	0.967 (0.945,0.981)	Right parietal lobe	0.933 (0.889,0.960)	0.801 (0.667,0.881)
Left parietal lobe	0.992 (0.987,0.995)	0.972 (0.953,0.983)	Left parietal lobe	0.898 (0.829,0.939)	0.808 (0.679,0.885)
Right cingulate gyrus	0.992 (0.987,0.996)	0.960 (0.933,0.976)	Right cingulate gyrus	0.979 (0.965,0.987)	0.864 (0.773,0.919)
Left cingulate gyrus	0.994 (0.990,0.996)	0.973 (0.955,0.984)	Left cingulate gyrus	0.980 (0.967,0.988)	0.885 (0.808,0.932)
Right thalamus	0.971 (0.952,0.983)	0.881 (0.801,0.929)	Right thalamus	0.966 (0.943,0.980)	0.853 (0.754,0.912)
Left thalamus	0.981 (0.968,0.989)	0.922 (0.870,0.954)	Left thalamus	0.959 (0.931,0.975)	0.874 (0.789,0.925)

Abbreviations: IVIM, intravoxel incoherent motion; ROI, region of interest; ICC,intraclass correlation coefficients;CI, confidence interval; *ADC*, apparent diffusion coefficient; *D*, true diffusion coefficient; *D**, Pseudo-diffusion coefficient; *f*, perfusion fraction; *DDC*, distributed diffusion coefficient; α, water molecular diffusion heterogeneity index

Appendix 2. Comparison of Parameters of IVIM Index in ROI between the MHE and Control Groups.

Position	ADC ($\times10^{-3}$ mm^2/s)			D ($\times10^{-3}$ mm^2/s)			D^{*} ($\times10^{-3}$ mm^2/s)			f			DDC ($\times10^{-3}$ mm^2/s)			α		
	MHE group	Control group	P-value	MHE group	Control group	P-value	MHE group	Control group	P-value	MHE group	Control group	P-value	MHE group	Control group	P-value	MHE group	Control group	P-value
Right frontal lobe	0.85±0.08*	0.70±0.02	<0.001	0.65±0.06*	0.57±0.04	0.003	4.18±1.15	3.67±1.31	0.934	0.26±0.04*	0.22±0.02	<0.001	0.86±0.12*	0.73±0.03	<0.001	0.81±0.05*	0.84±0.02	0.004
Left frontal lobe	0.85±0.08*	0.71±0.03	<0.001	0.67±0.07*	0.56±0.02	<0.001	4.05±1.51	3.76±1.22	0.461	0.27±0.06*	0.22±0.02	<0.001	0.88±0.15*	0.73±0.04	<0.001	0.82±0.05*	0.84±0.02	<0.001
Right temporal lobe	0.83±0.07*	0.78±0.05	0.026	0.66±0.05	0.64±0.04	0.191	5.71±1.63*	4.10±1.02	0.024	0.23±0.05*	0.20±0.02	0.002	0.96±0.14*	0.79±0.08	0.003	0.80±0.04*	0.85±0.04	0.014
Left temporal lobe	0.84±0.10*	0.76±0.04	0.023	0.67±0.05*	0.63±0.04	0.026	5.94±1.56*	4.22±1.04	0.023	0.24±0.07*	0.20±0.02	<0.001	1.00±0.28*	0.79±0.07	0.005	0.79±0.06*	0.85±0.03	0.015

Region																		
Right occipital lobe	0.79±0.10*	0.71±0.05	0.018	0.63±0.06	0.61±0.05	0.615	4.55±0.66*	3.42±0.64	0.026	0.23±0.07*	0.19±0.03	0.007	0.85±0.16*	0.69±0.07	0.001	0.81±0.03*	0.85±0.03	0.014
Left occipital lobe	0.78±0.09*	0.70±0.05	0.017	0.63±0.04	0.61±0.06	0.136	4.58±0.68*	3.50±0.47	0.022	0.23±0.08*	0.19±0.03	0.006	0.85±0.15*	0.68±0.07	0.015	0.80±0.03*	0.84±0.03	0.011
Right parietal lobe	0.77±0.06*	0.71±0.03	0.001	0.61±0.05*	0.57±0.02	<0.001	4.47±0.77*	3.36±0.36	<0.001	0.22±0.05*	0.19±0.02	<0.001	0.80±0.15*	0.72±0.04	0.026	0.83±0.03*	0.86±0.02	0.020
Left parietal lobe	0.77±0.05*	0.73±0.04	0.002	0.59±0.05*	0.56±0.02	<0.001	4.48±0.81*	3.43±0.32	<0.001	0.24±0.60*	0.20±0.03	0.002	0.84±0.15*	0.74±0.05	0.039	0.82±0.03*	0.85±0.02	0.006
Right cingulate gyrus	0.76±0.06*	0.71±0.06	0.006	0.65±0.06*	0.59±0.05	0.013	8.65±4.28*	3.16±0.54	<0.001	0.19±0.06	0.18±0.02	0.102	0.84±0.10*	0.69±0.08	0.030	0.82±0.08*	0.86±0.04	0.001
Left cingulate gyrus	0.76±0.05*	0.70±0.04	0.003	0.64±0.05*	0.59±0.05	0.016	9.09±4.76*	3.03±0.40	<0.001	0.20±0.06	0.18±0.02	0.089	0.85±0.12*	0.69±0.07	0.024	0.81±0.07*	0.86±0.03	<0.001

Right thalamus	0.76± 0.03	0.75±0. 03	0.778	0.62± 0.04	0.62±0. 03	0.121	5.53± 2.10	5.75±1. 58	0.943	0.16± 0.02	0.16±0. 02	0.981	0.77± 0.05*	0.73±0. 04	0.033	0.84± 0.03	0.85±0. 02	0.091
Left thalamus	0.76± 0.03	0.74±0. 03	0.385	0.62± 0.04	0.61±0. 03	0.094	5.18± 1.61	5.82±1. 56	0.292	0.17± 0.02*	0.15±0. 01	0.035	0.77± 0.05*	0.72±0. 03	0.027	0.84± 0.03	0.84±0. 02	0.084

Note: "*" : The parameter difference is statistically significant ($P < 0.05$)

Abbreviations: IVIM, intravoxel incoherent motion; ROI, region of interest; MHE, minimal hepatic encephalopathy; *ADC*, apparent diffusion coefficient; *D*, true diffusion coefficient; *D**, Pseudo-diffusion coefficient; *f*, perfusion fraction; *DDC*, distributed diffusion coefficient; *α*, water molecular diffusion heterogeneity index

Appendix 3. Diagnostic Efficacy of IVIM Parameters for Diagnosis of MHE

IVIM index		Right temporal lobe	Left temporal lobe	Right occipital lobe	Left occipital lobe	Right parietal lobe	Left parietal lobe	Right cingulate gyrus	Left cingulate gyrus
ADC ($\times 10^{-3}$ mm^2/s)	AUC	0.737	0.796	0.782	0.801	0.776	0.722	0.781	0.801
	(95%confidence intervals)	(0.697-0.842)	(0.672-0.889)	(0.656-0.878)	(0.677-0.893)	(0.650-0.874)	(0.591-0.830)	(0.656-0.878)	(0.678-0.893)
	P-value	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Youden index	0.433	0.467	0.500	0.567	0.500	0.367	0.467	0.533
	accuracy	0.667	0.717	0.667	0.667	0.683	0.667	0.700	0.750
	sensitivity	0.633	0.667	0.567	0.967	0.667	0.767	0.900	0.733
	specificity	0.800	0.800	0.933	0.600	0.833	0.600	0.567	0.767
D ($\times 10^{-3}$ mm^2/s)	AUC	-	0.701	-	-	0.718	0.666	0.778	0.737
	(95%confidence intervals)		(0.569-0.812)			(0.587-0.826)	(0.532-0.782)	(0.652-0.875)	(0.608-0.842)
	P-value	-	<0.01	-	-	<0.01	0.03	<0.01	<0.01

	Youden index	-	0.367	-	-	0.567	0.500	0.467	0.400
	accuracy	-	0.633	-	-	0.700	0.750	0.650	0.650
	sensitivity	-	0.767	-	-	0.567	0.667	0.733	0.767
	specificity	-	0.567	-	-	1	0.833	0.733	0.600
	AUC	0.816	0.839	0.876	0.907	0.911	0.894	0.959	0.961
	(95%confidence intervals)	(0.694-0.904)	(0.721-0.921)	(0.765-0.947)	(0.803-0.966)	(0.808-0.969)	(0.788-0.959)	(0.873-0.993)	(0.877-0.994)
D^*	P-value	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
$(\times 10^{-3}$ mm^2/s)	Youden index	0.533	0.533	0.700	0.667	0.733	0.600	0.767	0.867
	accuracy	0.717	0.700	0.833	0.800	0.850	0.800	0.883	0.933
	sensitivity	0.733	0.833	0.933	0.933	0.767	0.800	0.900	0.933
	specificity	0.800	0.700	0.767	0.733	0.967	0.800	0.867	0.933
	AUC	0.718	0.755	0.683	0.745	0.693	0.767	-	-
f	(95%confidence intervals)	(0.587-0.827)	(0.627-0.857)	(0.550-0.797)	(0.616-0.849)	(0.561-0.806)	(0.640-0.866)		
	P-value	<0.01	<0.01	0.01	<0.01	0.01	<0.01	-	-

	Youden index	0.467	0.467	0.333	0.467	0.467	0.433	-	-
	accuracy	0.667	0.683	0.617	0.567	0.683	0.717	-	-
	sensitivity	0.633	0.733	0.733	0.900	0.533	0.567	-	-
	specificity	0.833	0.733	0.600	0.567	0.933	0.867	-	-
	AUC	0.886	0.889	0.914	0.867	0.861	0.869	0.879	0.877
	(95%confidence intervals)	(0.777-0.953)	(0.782-0.956)	(0.813-0.971)	(0.756-0.941)	(0.747-0.937)	(0.757-0.943)	(0.770-0.949)	(0.766-0.947)
DDC	*P*-value	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
$(\times 10^{-3}$ mm^2/s)	Youden index	0.667	0.667	0.733	0.633	0.667	0.633	0.6	0.633
	accuracy	0.800	0.800	0.850	0.817	0.800	0.783	0.767	0.783
	sensitivity	0.833	0.900	0.800	0.800	0.733	0.8	0.867	0.967
	specificity	0.833	0.768	0.933	0.833	0.933	0.833	0.733	0.667

Abbreviations: AUC represents the area under the curve; IVIM, intravoxel incoherent motion; MHE, minimal hepatic encephalopathy; *ADC*, apparent diffusion coefficient; *D*, true diffusion coefficient; *D**, Pseudo-diffusion coefficient; *f*, perfusion fraction; *DDC*, distributed diffusion coefficient

Appendix 4. AUCs of ROC Analysis of Six Parameters in Different ROIs.

AUC	*ADC*	*D*	*D**	*f*	*DDC*	*α*
Right temporal lobe	0.737	0.623	0.816	0.718	0.869	0.827
Left temporal lobe	0.796	0.701	0.839	0.755	0.879	0.809
Right occipital lobe	0.782	0.607	0.876	0.683	0.877	0.808
Left occipital lobe	0.801	0.594	0.907	0.745	0.887	0.814
Right parietal lobe	0.776	0.718	0.911	0.693	0.861	0.788
Left parietal lobe	0.722	0.666	0.894	0.767	0.886	0.793
Right cingulate gyrus	0.781	0.778	0.959	0.546	0.889	0.644
Left cingulate gyrus	0.801	0.737	0.961	0.559	0.914	0.776

Abbreviations:AUC represents the area under the curve;ROC represents receiver operating characteristic;ROI represents region of interest.