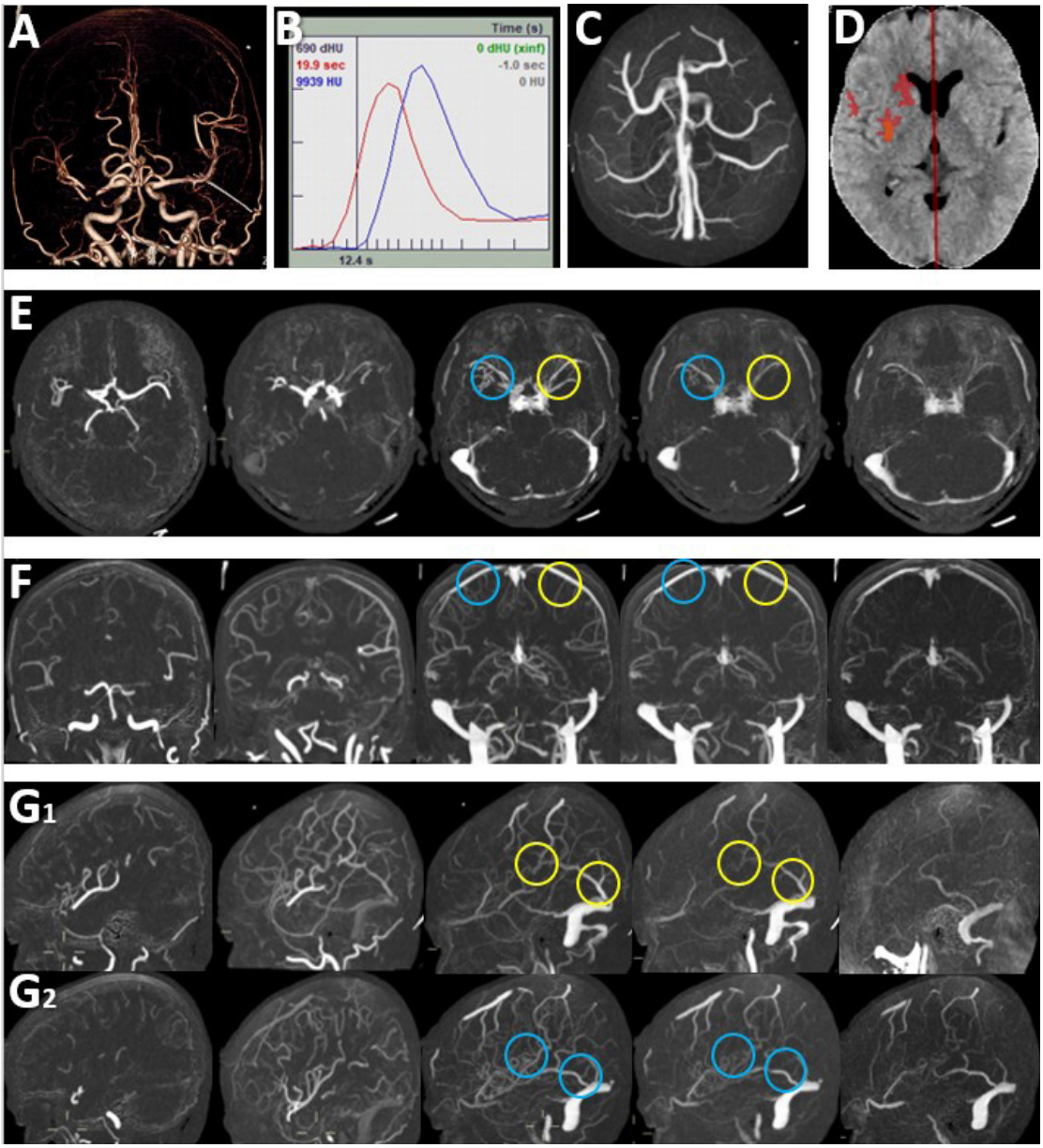

Figure S1 A case with favourable cerebral venous outflow from good outcome group. This patient was a female of 66 years old and had an admission NIHSS of 2 and an mRS of 0 after 90 days. (A) Vascular volume reconstruction showed occlusion of RMCA (M1) at arterial peak phase. (B) Arterial and venous curve with the time points underneath. The label for the x-axes is time(s), the small intervals represent 2 seconds, large intervals represent 5 seconds; and the label for the y-axes is CT value (HU). The rCVF1 was 1.9 (Fast), the rCVF2 was 0 (Fast), and the rCVF21 was -1.9 (FAST). (C) The MIP image of cortical venous filling, it showed more than 50% cortical venous opacified compared with the healthy side, which defined as GOOD extent. (D) The Olea post-processed tissue map with an HIR of 0.04 (yellow: 0.609 mL; red: 15.455 mL), the volume of Tmax >10 s was shown in yellow while the volume of Tmax >6 s was shown in red, and the overlapped area is shown in orange. Five images of (E-G2) from left to right showed the arterial peak phase, the phase of cortical veins start to fill, the venous phase, the late venous phase, and the phase of contralateral cortical veins completely outflow; and the yellow circle marked healthy side while blue circle marked affected side. (E) Axial plane: a 4 for SPS of 4D-VCS and a 2 for SPS of COVES. (F) Coronal plane: a 4 for VOT of 4D-VCS. (G1,G2) Sagittal plane: a 4 for SMCV of 4D-VCS and a 2 for SMCV of COVES; a 3 for VOL of 4D-VCS and a 2 for VOL of COVES. In conclusion, the total 4D-VCS was 15; and the total COVES was 6. Combining the velocity and extent, this patient showed favourable V1&E, V2&E, and V21&E.

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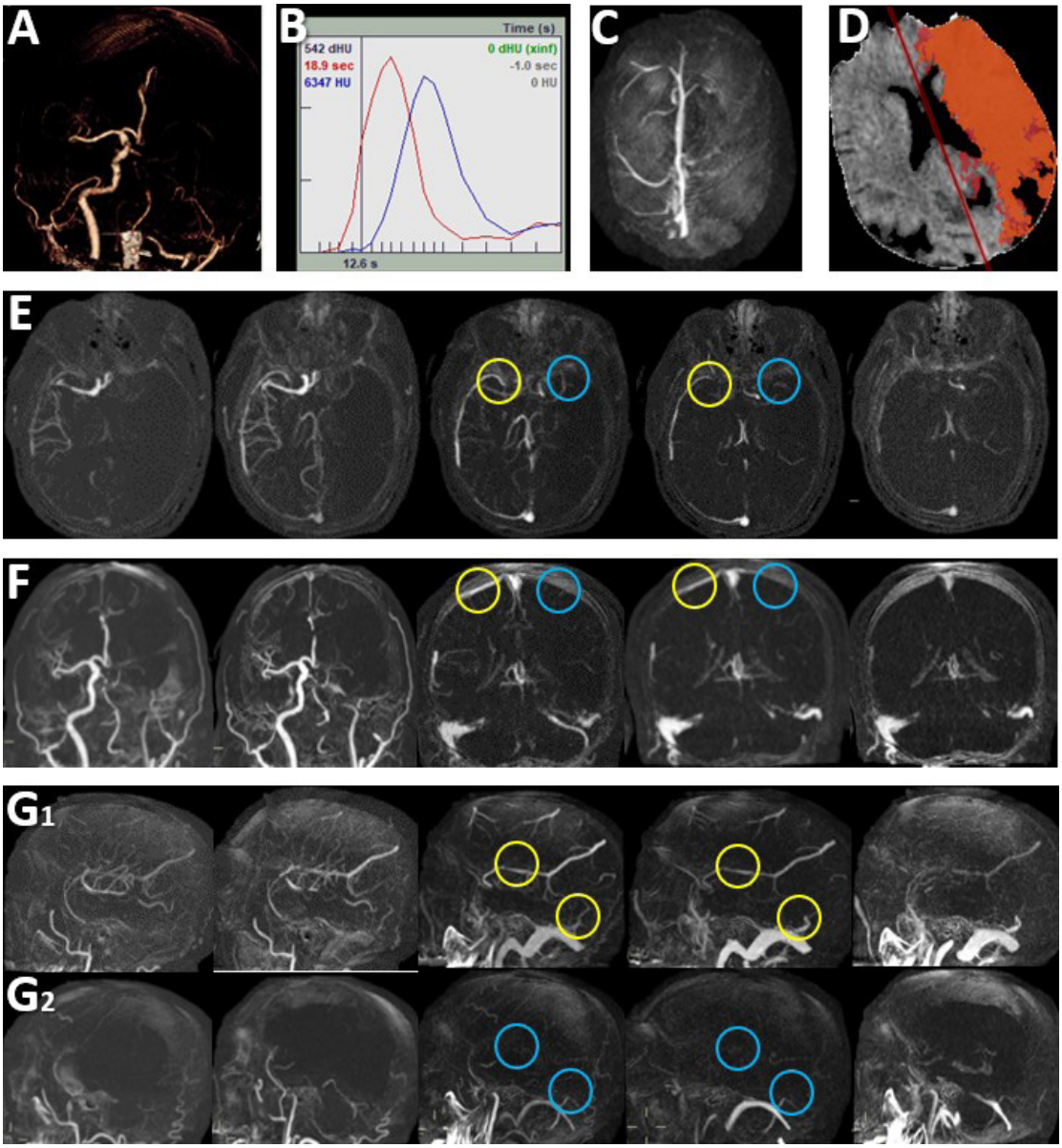

Figure S2 A case with unfavourable cerebral venous outflow from poor outcome group. This patient was a male of 82 years old and had an admission NIHSS of 21 and an mRS of 6 after 90 days. (A) Vascular volume reconstruction showed non-visualization of RICA, RMCA and RACA at arterial peak phase. (B) Arterial and venous curve with the time points underneath. The label for the x-axes is time(s), the small intervals represent 2 seconds, large intervals represent 5 seconds; and the label for the y-axes is CT value (Hu). The rCVF1 was 2 (Fast), the rCVF2 was 4 (Fast), and the rCVF21 was 2 (Slow). (C) The MIP image of cortical venous filling, it showed nearly non-visualization of cortical veins, which defined as Poor extent. (D) The Olea post-processed tissue map with an HIR of 0.72 (yellow: 313.753 mL; red: 435.79 mL), the volume of Tmax >10 s was shown in yellow while the volume of Tmax >6 s was shown in red, and the overlapped area is shown in orange. Five images of (E-G2) from left to right showed the arterial peak phase, the phase of cortical veins start to fill, the venous phase, the late venous phase, and the phase of contralateral cortical veins completely outflow; and the yellow circle marked healthy side while blue circle marked affected side. (E) Axial plane: a 0 for SPS of 4D-VCS and a 0 for SPS of COVES. (F) Coronal plane: a 0 for VOT of 4D-VCS. (G1,G2) Sagittal plane: a 0 for SMCV of 4D-VCS and a 0 for SMCV of COVES; a 0 for VOL of 4D-VCS and a 0 for VOL of COVES. In conclusion, the total 4D-VCS was 0; and the total COVES was 0. Combining the velocity and extent, this patient showed moderate V1&E and V2&E, and unfavourable V21&E.

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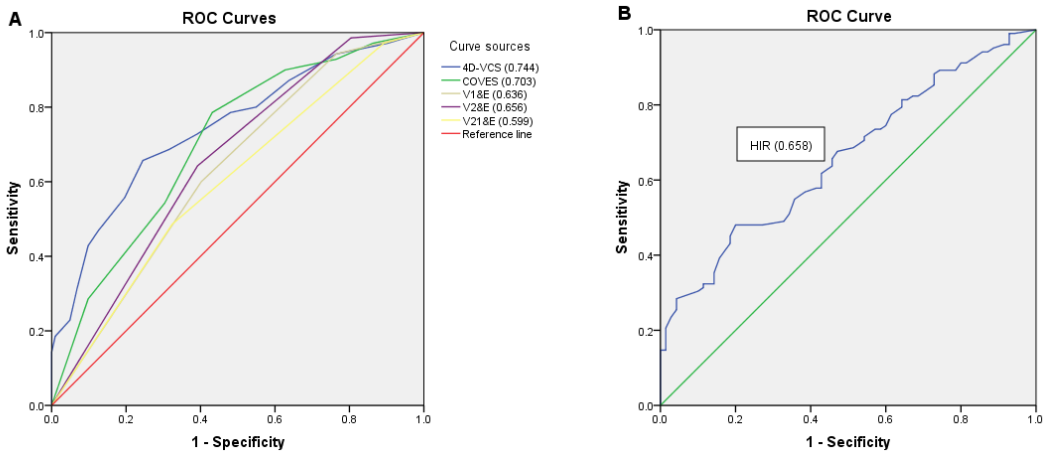

Figure S3 ROC curves of the 6 different imaging indicators. (A) contained the ROC curves for the 5 venous assessment methods, and (B) illustrated the ROC curve for HIR. The AUCs were 0.744 (95% CI: 0.668–0.820) for 4D-VCS, 0.703 (95% CI: 0.625–0.781) for COVES, 0.658 (95% CI: 0.578–0.739) for HIR, 0.636 (95% CI: 0.553–0.718) for V1&E, 0.656 (95% CI: 0.575–0.737) for V2&E, 0.599 (95% CI: 0.514–0.685) for V21&E. ROC, receiver operating characteristic; 4D-VCS, four-dimensional venous collateral score; COVES, cortical vein opacification score; HIR, hypoperfusion intensity ratio; V1&E, the velocity for the veins start to fill combined with the extent of peak venous phase; V2&E, the velocity for venous optimal opacification combined with the extent of peak venous phase; V21&E, the velocity for venous start to fill to optimal opacification combined with the extent of peak venous phase.

Table S1 Multivariable regression analysis for TLC– (HIR >0.4)

Predictors	OR (95% CI)				
	Model 1 (admission NIHSS + 4D-VCS)	Model 2 (admission NIHSS + V1&E)	Model 3 (admission NIHSS + V2&E)	Model 4 (admission NIHSS + V21&E)	Model 5 (admission NIHSS + COVES)
Admission NIHSS	1.099* (1.035–1.167)	1.140* (1.076–1.207)	1.130* (1.065–1.199)	1.139* (1.075–1.208)	1.113* (1.050–1.180)
4D-VCS	0.827* (0.759–0.902)	–	–	–	–
Fast1 + Good	–	–	–	–	–
Fast1 or Good	–	1.259 (0.605–2.618)	–	–	–
Slow1 + Poor	–	2.717* (1.010–7.306)	–	–	–
Fast2 + Good	–	–	–	–	–
Fast2 or Good	–	–	1.298 (0.631–2.669)	–	–
Slow2 + Poor	–	–	3.339 (0.956–11.662)	–	–
Fast21 + Good	–	–	–	–	–
Fast21 or Good	–	–	–	0.918 (0.460–1.832)	–
Slow21 + Poor	–	–	–	7.585 (0.872–66.017)	–
COVES	–	–	–	–	0.628* (0.505–0.782)

*, P<0.05 is the threshold for statistical significance. 4D-VCS, four-dimensional venous collateral score; Admission NIHSS, NIHSS score at admission; COVES, cortical vein opacification score; NIHSS, National Institutes of Health Stroke Scale; TLC, tissue-level collateral; V1&E, the velocity for the veins start to fill combined with the extent of peak venous phase; V2&E, the velocity for venous optimal opacification combined with the extent of peak venous phase.

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