Online Supplemental Data

Timing of spot sign appearance, spot sign volume, and leakage rate between phases of mCTA predicts intracerebral hemorrhage growth

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Table S1a. Logistic regression of clinical variables for hematoma growth*

Variable	OR (95% CI)	*P* value
History of stroke	3.31 (1.10-9.83)	0.033
NIHSS at presentation (per 1-point increase)	1.10 (1.05-1.16)	<0.001
Onset-to-CT time (per 10-min increase)	0.98 (0.95-1.00)	0.013

*Hematoma growth is defined as >6 mL increase in volume of hematoma from baseline.

Table S1b. Logistic regression of imaging variables for hematoma growth*

Variable	OR (95% CI)	*P* value
Baseline ICH volume (per 1-mL increase)	1.02 (1.01-1.05)	<0.001

*Hematoma growth is defined as >6 mL increase in volume of hematoma from baseline.
Abbreviations: ICH, intracerebral hemorrhage.

Table S2a. Logistic regression analysis for >12.5 mL hematoma growth*

	OR (95% CI)	*P* value	C-Statistic	BIC	AIC
Model 1			0.748	162.1	155.4
No spot sign in the first phase (reference)	1.0				
Spot sign in the first phase	10.6 (4.7–24.2)	<0.001			
Model 2			0.810	156.8	146.6
No spot sign (reference)	1.0				
Spot sign first appearing in the first phase	19.1 (7.0–51.9)	<0.001			
Spot sign first appearing in the second or third phase	8.9 (2.6–30.8)	0.001			
Model 3			0.813	162.0	148.4
No spot sign (reference)	1.0				
Spot sign first appearing in the first phase with volume <19.7 μL	16.9 (5.3–53.5)	<0.001			
Spot sign first appearing in the first phase with volume ≥19.7 μL	21.7 (6.8–68.9)	<0.001			
Spot sign first appearing in the second or third phase	8.9 (2.6–30.8)	0.001			
Model 4			0.800	156.9	146.8
No spot sign (reference)	1.0				
Spot sign with positive leakage rate between phases	11.8 (4.2–33.0)	<0.001			
Spot sign with negative leakage rate between any phases	23.7 (7.5–74.3)	<0.001			
Model 5[†]			0.703	94.5	90.0
Absolute leakage rate (per 1-μL/sec increase)	1.18 (1.00–1.38)	0.043			

*Hematoma growth is defined as >12.5 mL increase in volume of hematoma from baseline. [†]Model 5 includes only patients with spot sign (n = 69). Abbreviations: AIC, Akaike information criterion; BIC, Bayesian information criterion.

Table S2b. Logistic regression analysis for >33% hematoma growth*

	OR (95% CI)	*P* value	C-Statistic	BIC	AIC
Model 1			0.728	182.0	175.2
No spot sign in the first phase (reference)	1.0				
Spot sign in the first phase	9.2 (4.3–19.9)	<0.001			
Model 2			0.812	167.4	157.3
No spot sign (reference)	1.0				
Spot sign first appearing in the first phase	19.3 (7.5–49.9)	<0.001			
Spot sign first appearing in the second or third phase	13.9 (4.5–43.6)	<0.001			
Model 3			0.824	170.2	156.7
No spot sign (reference)	1.0				
Spot sign first appearing in the first phase with volume <19.7 μL	13.9 (4.5–43.6)	<0.001			
Spot sign first appearing in the first phase with volume ≥19.7 μL	31.3 (10.1–97.0)	<0.001			
Spot sign first appearing in the second or third phase	13.9 (4.5–45.4)	<0.001			
Model 4			0.811	167.6	157.5
No spot sign (reference)	1.0				
Spot sign with positive leakage rate between phases	16.1 (6.2–42.1)	<0.001			
Spot sign with negative leakage rate between any phases	20.1 (6.7–60.7)	<0.001			
Model 5[†]			0.666	99.2	94.8
Absolute leakage rate (per 1-μL/sec increase)	1.14 (0.98–1.33)	0.083			

*Hematoma growth is defined as >33% increase in volume of hematoma from baseline. [†]Model 5 includes only patients with spot sign (n = 69). Abbreviations: AIC, Akaike information criterion; BIC, Bayesian information criterion.

Table S3a. Logistic regression analysis in patients underwent mCTA ICH protocol

	OR (95% CI)	*P* value	C-Statistic	BIC	AIC
Model 1			0.712	167.2	160.8
No spot sign in the first phase (reference)	1.0				
Spot sign in the first phase	8.3 (3.7–18.6)	<0.001			
Model 2			0.771	163.8	154.2
No spot sign (reference)	1.0				
Spot sign first appearing in the first phase	12.6 (5.1–31.1)	<0.001			
Spot sign first appearing in the second or third phase	5.8 (1.9–17.9)	0.002			
Model 3			0.781	165.7	153.0
No spot sign (reference)	1.0				
Spot sign first appearing in the first phase with volume <19.7 μL	7.2 (2.4–21.7)	<0.001			
Spot sign first appearing in the first phase with volume ≥19.7 μL	23.4 (7.3–75.0)	<0.001			
Spot sign first appearing in the second or third phase	5.8 (1.9–17.9)	0.002			
Model 4			0.776	161.8	152.3
No spot sign (reference)	1.0				
Spot sign with positive leakage rate between phases	6.9 (2.8–17.0)	<0.001			
Spot sign with negative leakage rate between any phases	21.6 (6.7–69.9)	<0.001			
Model 5*			0.684	87.6	83.3
Absolute leakage rate (per 1-μL/sec increase)	1.21 (1.01–1.46)	0.042			

Only patients who underwent mCTA using ICH mCTA protocol (n = 177). Hematoma growth is defined as >6 mL increase in volume of hematoma from baseline. *Model 5 includes only patients with spot sign (n = 59). Abbreviations: AIC, Akaike information criterion; BIC, Bayesian information criterion; ICH, intracerebral hemorrhage; mCTA, multiphase CTA.

Table S3b. Logistic regression analysis in patients underwent follow up imaging by CT

	OR (95% CI)	*P* value	C-Statistic	BIC	AIC
Model 1			0.705	166.2	160.1
No spot sign in the first phase (reference)	1.0				
Spot sign in the first phase	7.0 (3.2–15.4)	<0.001			
Model 2			0.762	162.7	153.5
No spot sign (reference)	1.0				
Spot sign first appearing in the first phase	10.9 (4.5–26.8)	<0.001			
Spot sign first appearing in the second or third phase	5.5 (1.8–16.6)	0.003			
Model 3			0.767	167.3	155.2
No spot sign (reference)	1.0				
Spot sign first appearing in the first phase with volume <19.7 μL	9.0 (3.1–26.5)	<0.001			
Spot sign first appearing in the first phase with volume ≥19.7 μL	13.3 (4.4–40.0)	<0.001			
Spot sign first appearing in the second or third phase	5.5 (1.8–16.6)	0.003			
Model 4			0.765	162.1	153.0
No spot sign (reference)	1.0				
Spot sign with positive leakage rate between phases	6.8 (2.8–16.6)	<0.001			
Spot sign with negative leakage rate between any phases	15.2 (4.9–47.1)	<0.001			
Model 5*			0.743	80.4	76.3
Absolute leakage rate (per 1-μL/sec increase)	1.32 (1.05–1.66)	0.019			

Only patients who underwent follow-up imaging by CT (n = 154). Hematoma growth is defined as >6 mL increase in volume of hematoma from baseline. *Model 5 includes only patients with spot sign (n = 62). Abbreviations: AIC, Akaike information criterion; BIC, Bayesian information criterion.

Table S4. Logistic regression analysis of spot sign parameters for mRS ≥3 at 90 days

	OR (95% CI)	*P* value	C-Statistic	BIC	AIC
Model 1			0.583	211.7	205.7
No spot sign in the first phase (reference)	1.0				
Spot sign in the first phase	2.8 (1.2–6.7)	0.019			
Model 2			0.616	213.1	204.0
No spot sign (reference)	1.0				
Spot sign first appearing in the first phase	3.1 (1.3–7.5)	0.010			
Spot sign first appearing in the second or third phase	4.0 (0.8–19.5)	0.084			
Model 3			0.628	213.4	201.2
No spot sign (reference)	1.0				
Spot sign first appearing in the first phase with volume <19.7 μL	1.7 (0.6–4.5)	0.316			
Spot sign first appearing in the first phase with volume ≥19.7 μL	13.4 (1.7–105.2)	0.013			
Spot sign first appearing in the second or third phase	4.0 (0.8–19.5)	0.084			
Model 4			0.622	211.6	202.5
No spot sign (reference)	1.0				
Spot sign with positive leakage rate between phases	2.5 (1.0–6.0)	0.048			
Spot sign with negative leakage rate between any phases	6.7 (1.5–30.8)	0.084			
Model 5*			0.673	52.1	48.4
Absolute leakage rate (per 1-μL/sec increase)	1.37 (0.9–2.0)	0.124			

Only patients in whom outcome data was available (n = 155). Hematoma growth is defined as >6 mL increase in volume of hematoma from baseline. *Model 5 includes only patients with spot sign (n = 47). Abbreviations: AIC, Akaike information criterion; BIC, Bayesian information criterion.

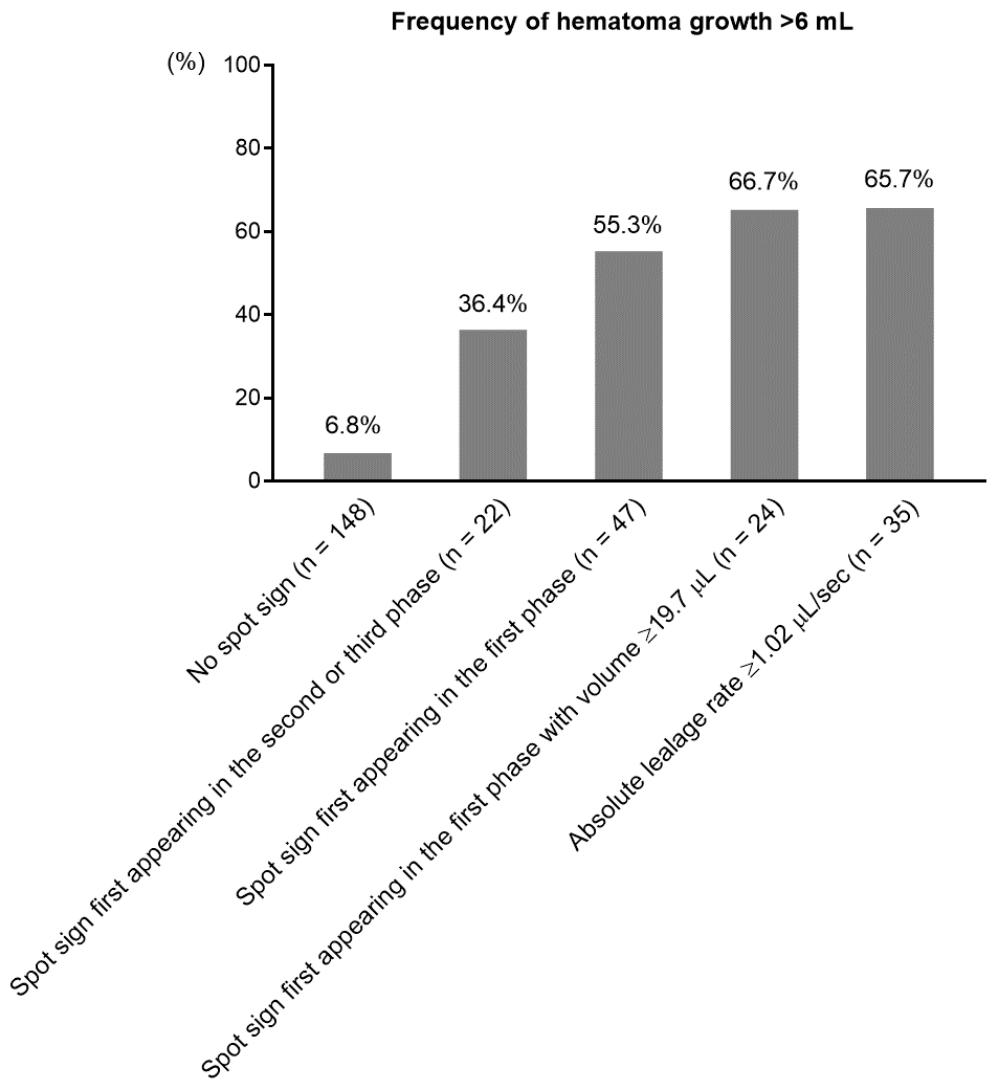

Figure S1. The frequency of hematoma growth by spot sign parameter
Spot sign parameters were separated by more than or equal to median.