Supplementary

Table S1 CT scanner specifications and acquisition parameters by participating centers

Center	CT Scanner Model (Manufacturer)	Slice Thickness (mm)	Slice Interval (mm)	Tube Voltage (kV)	Tube Current (mA)	Matrix Size
I	IQon Spectral CT (Philips)	0.9	0.7	120	252	512×512
	Revolution CT (GE Healthcare)	0.63	0.63	100	505	512×512
	iCT 256-slice (Philips)	0.9	0.45	100	298	512×512
II	IQon Spectral CT (Philips)	0.9	0.45	120	609	512×512
III	Discovery CT750 HD (GE Healthcare)	1.25	1.25	120	350	512×512

All CT scans were performed with coverage extending from the skull base to the vertex. CT, computed tomography.

Table S2 Definitions of automated morphological parameters

Parameter	Definition
Multiplicity	Presence of ≥2 aneurysms in a patient
Location	Internal carotid artery (ICA), middle cerebral artery (MCA), anterior circulation, posterior circulation
Height	Maximum vertical distance from the neck plane to the dome tip
Diameter	Maximum distance from the neck center to the dome tip
Width	Maximum distance perpendicular to the diameter line
Maximum Diameter	The greatest distance between any two points on the aneurysm wall
Neck Diameter	The longest dimension measured across the aneurysm neck plane
Neck Area	The area of the aneurysm neck plane
Parent Artery Average Diameter	Weighted average diameter of continuous vascular cross-sections between 5mm proximal and 5 mm distal to the neck
Size Ratio (SR)	Height / mean parent artery diameter
Aspect Ratio (AR)	Height / neck diameter
Height-Width Ratio	Height / width
Volume-Neck Area Ratio	Aneurysm volume / neck area
Undulation Index (UI)	$1-\frac{V}{V_{ch}}$
Non-Sphericity Index (NSI)	$1-\frac{(18\pi)^{1/3}V^{2/3}}{S}$
Ellipticity Index (EI)	$1-\frac{(18\pi)^{1/3}V^{2/3}}{S_{ch}}$
Aneurysm Angle (AA)	Angle between the neck plane and the vector of the diameter line
Flow Angle (FA)	Projected angle between the centerline of the parent artery and the vector of the diameter line

All parameters were automatically computed using the “Advanced Aneurysm” software function. Definitions are based on established literature references (1,6,7). V=aneurysm volume, Vch=convex hull volume, S=surface area, Sch=convex hull surface area.

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Table S3 Distribution of key predictors, demographics, and outcome across training, internal validation, and external validation cohorts

Variables	Training set (n=314)	Internal validation set (n=136)	External validation set I (n=148)	External validation set II (n=279)
Age (y)	66.00 (57.00, 73.25)	64.83±11.36	66.00 (55.25, 70.00)	65.00 (55.00, 74.00)
Admission blood glucose (mmol/L)	5.74 (5.24, 7.86)	6.28 (5.11, 7.92)	5.53 (4.90, 6.87)	7.40 (5.85, 9.97)
Location				
ICA	170 (54.1%)	65 (47.8%)	69 (46.6%)	111 (39.8%)
MCA	43 (13.7%)	23 (16.9%)	25 (16.9%)	57 (20.4%)
Anterior circulation	88 (28%)	36 (26.5%)	44 (29.7%)	78 (28.0%)
Posterior circulation	13 (4.1%)	12 (8.8%)	10 (6.8%)	33 (11.8%)
Diameter (mm)	3.54 (2.67, 4.80)	3.00 (2.00, 5.00)	4.04 (2.89, 6.02)	4.12 (2.91, 5.95)
Parent artery average diameter (mm)	3.35 (2.37, 4.03)	3.19±1.10	3.26±1.24	3.10 (2.30, 4.03)
Rupture	67 (21.3%)	29 (21.3%)	41 (27.7%)	111 (39.8%)

ICA, internal carotid artery; MCA, middle cerebral artery.

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