

Supplementary Table 1. Clinical and angiographic characteristics of patients with moyamoya disease

	All (n=311)	Pediatric (n=63)	Adult (n=248)	P
Female sex	196 (63)	35 (56)	161 (65)	0.17
Age at onset (yr)	38.9 [23.6, 50.0]	7.8 [6.1, 11.6]	43.9 [35.1, 51.9]	<0.001
Family history	46 (15)	8 (13)	38 (15)	0.60
Revascularization surgery	94 (30)	56 (89)	38 (15)	<0.001
<i>RNF213</i> genotype				<0.001
Wild type (GG)	68 (22)	9 (14)	59 (24)	
Heterozygote (GA)	238 (77)	49 (78)	189 (76)	
Homozygote (AA)	5 (2)	5 (8)	0 (0)	
Clinical manifestation				
Ischemic manifestation	170 (55)	46 (73)	124 (50)	0.001
TIA	108 (35)	39 (62)	69 (28)	<0.001
Infarction	62 (20)	7 (11)	55 (22)	0.05
ICH/IVH	24 (8)	2 (3)	22 (9)	0.19
Seizure	10 (3)	7 (11)	3 (1)	0.001
Incidental	49 (16)	0 (0)	49 (20)	<0.001
Others*	58 (19)	50 (20)	8 (13)	0.18
Angiographic findings				
Bilateral vasculopathy	200 (64)	54 (86)	146 (59)	<0.001
PCA involvement	59 (19)	13 (21)	46 (19)	0.71
Suzuki grade [†]				0.62
1–2	57 (25)	4 (17)	53 (26)	
3–4	138 (60)	16 (67)	122 (60)	
5–6	34 (15)	4 (17)	30 (15)	
Medical history				
Hypertension	92 (30)	0 (0)	92 (37)	<0.001
Diabetes mellitus	28 (9)	0 (0)	28 (11)	0.01
Dyslipidemia	70 (23)	0 (0)	70 (28)	<0.001
Coronary artery disease	6 (2)	0 (0)	6 (2)	0.61
Current smoker	38 (12)	0 (0)	38 (15)	0.001

Data are presented as n (%) or median [interquartile range]. *RNF213*, ring finger protein 213; TIA, transient ischemic attack; ICH/IVH, intracranial cerebral hemorrhage/intraventricular hemorrhage; PCA, posterior cerebral artery. *Others: headache, dizziness, and syncope; [†]The Suzuki grade on the severe side was applied.

Supplementary Table 2. Genotype–phenotype correlation of the *RNF213* R4810K variant in adult moyamoya disease

Variable	GG (n=59)	GA (n=189)	P
Age at onset (yr)	39.2 [33.5, 48.5]	46.2 [35.8, 53.0]	0.05
Female sex	40 (68)	121 (64)	0.60
Family history	2 (3)	36 (19)	<0.001
Revascularization surgery	3 (5)	35 (19)	0.01
Clinical manifestation			
TIA	17 (29)	52 (28)	0.85
Infarction	16 (27)	39 (21)	0.30
ICH/IVH	1 (2)	21 (11)	0.03
Seizure	0 (0)	3 (2)	>0.99
Incidental	9 (15)	40 (21)	0.32
Others*	16 (27)	34 (18)	0.13
Angiographic findings			
Bilateral vasculopathy	33 (56)	113 (60)	0.60
PCA involvement	5 (9)	41 (22)	0.02
Suzuki grade [†]			0.38
1–2	13 (27)	40 (26)	
3–4	26 (53)	96 (62)	
5–6	10 (20)	20 (13)	

Data are presented as n (%) or median [interquartile range]. *RNF213*, ring finger protein 213; GG, wild type; GA, heterozygote; TIA, transient ischemic attack; ICH/IVH, intracranial cerebral hemorrhage/intraventricular hemorrhage; PCA, posterior cerebral artery. *Others: headache, dizziness, and syncope; [†]The Suzuki grade on the severe side was applied.

Supplementary Table 3. Genotype–phenotype correlation of the *RNF213* R4810K variant in pediatric moyamoya disease

Variable	GG (n=9)	GA (n=49)	AA (n=5)	P	Post-hoc P		
					GG vs. GA	GG vs. AA	GA vs. AA
Female sex	2 (22)	32 (65)	1 (20)	0.01	0.08	>0.99	0.07
Age at onset (yr)	9.0 [7.8, 9.0]	7.7 [6.2, 11.6]	4.3 [1.9, 9.5]	0.60			
Age under 5	1 (11)	7 (14)	3 (60)	0.04	>0.99	0.28	0.11
Family history	0 (0)	8 (16)	0 (0)	0.51			
Revascularization surgery	8 (89)	45 (92)	3 (60)	0.14			
Clinical manifestation							
Infarction	0 (0)	5 (10)	2 (40)	0.14			
TIA	4 (44)	34 (69)	1 (20)	0.05			
ICH/IVH	0 (0)	2 (4)	0 (0)	>0.99			
Seizure	2 (22)	3 (6)	2 (40)	0.03	0.50	>0.99	0.06
Incidental	0 (0)	0 (0)	0 (0)	-			
Others*	3 (33)	5 (10)	0 (0)	0.15			
Angiographic findings							
Bilateral vasculopathy	7 (78)	42 (86)	5 (100)	0.67			
PCA involvement	2 (22)	7 (14)	4 (80)	<0.001	>0.99	0.27	<0.001
Suzuki grade [†]				0.72			
1–2	1 (25)	3 (18)	0 (0)				
3–4	2 (50)	12 (71)	2 (67)				
5–6	1 (25)	2 (12)	1 (33)				

Data are presented as n (%) or median [interquartile range].

RNF213, ring finger protein 213; GG, wild type; GA, heterozygote; AA, homozygote; TIA, transient ischemic attack; ICH/IVH, intracranial cerebral hemorrhage/ intraventricular hemorrhage; PCA, posterior cerebral artery.

*Others: headache, dizziness, and syncope; [†]The Suzuki grade on the severe side was applied.