Supplementary

Table S1 Comparison of other hemodynamics of M1 segment in the MCAs with and without plaque

Parameters	Group I (N=28)	Group II (N=46)	Group III (N=44)	P values						
				Group I *vs.* II *vs.* III	Group I *vs.* II		Group I *vs.* III		Group II *vs.* III	
					Original	Adjusted†	Original	Adjusted†	Original	Adjusted†
Lesion-level WSS parameters										
$TAWSS_{mean}$ (Pa)	4.62 (3.73–5.52)									
Initial		4.61 (3.91–5.63)	4.80 (3.29–5.78)	0.959						
Upstream		4.83 (4.05–5.86)	4.94 (3.73–5.81)	0.808						
MNL		4.98 (3.67–6.26)	5.00 (3.39–5.94)	0.629						
Downstream		4.95 (3.35–6.11)	4.84 (3.16–5.80)	0.611						
Terminal		4.39 (2.95–5.55)	4.44 (3.19–5.11)	0.505						
$TAWSS_{max}$ (Pa)	7.31 (6.36–8.94)									
Initial		7.52 (6.45–9.00)	7.43 (6.17–9.47)	0.914						
Upstream		8.11 (6.26–9.74)	7.78 (6.53–9.26)	0.648						
MNL		8.20 (6.47–9.62)	7.95 (6.27–9,29)	0.674						
Downstream		7.84 (6.09–9.32)	7.83 (6.02–9.49)	0.817						
Terminal		7.32 (5.89–9.23)	7.45 (5.99–8.99)	0.962						
TAWSSCV	0.36 (0.31–0.40)									
Initial		0.35 (0.27–0.39)	0.35 (0.26–0.42)	0.840						
Upstream		0.34 (0.26–0.40)	0.36 (0.28–0.43)	0.610						
MNL		0.31 (0.23–0.38)	0.32 (0.27–0.43)	0.254						
Downstream		0.35 (0.24–0.45)	0.40 (0.34–0.48)	0.068						
Terminal		0.38 (0.28–0.46)	0.41 (0.33–0.48)	0.094						
OSI_{max}	0.152 (0.136–0.165)									
Initial		0.064 (0.018–0.210)	0.124 (0.030–0.295)	0.098						
Upstream		0.055 (0.014–0.246)	0.115 (0.036–0.212)	0.039*	0.012*	0.036*	0.060	0.179	0.489	<0.999
MNL		0.057 (0.018–0.245)	0.099 (0.018–0.209)	0.049*	0.022*	0.067	0.034*	0.101	0.869	<0.999
Downstream		0.103 (0.021–0.264)	0.140 (0.041–0.250)	0.172						
Terminal		0.130 (0.031–0.320)	0.129 (0.049–0.289)	0.798						
Segment-level WSS parameters										
$TAWSS_{mean}$ (Pa)	4.62 (3.73–5.52)	4.62 (3.86–5.55)	4.87 (3.87–5.40)	0.977						
$TAWSS_{max}$ (Pa)	7.31 (6.36–8.94)	7.28 (6.47–8.77)	8.01 (6.68–8.70)	0.799						
TAWSSCV	0.36 (0.31–0.40)	0.35 (0.32–0.40)	0.37 (0.32–0.44)	0.345						
OSI_{max}	0.152 (0.136–0.165)	0.144 (0.108–0.183)	0.139 (0119–0.174)	0.398						

Values are presented as median (interquartile range). Group I: MCA without plaque; Group II: MCA with plaque only in M1; Group III: MCA with plaque in both M1 and M2. In segments with multiple plaques, the most stenotic plaque was used in calculating plaque characteristics and lesion-level hemodynamics. In Group I, segment-level WSS-derived parameters were used as lesion-level hemodynamic parameters. †, P values were adjusted with Bonferroni correction. *, P<0.05. MCA, middle cerebral artery; MNL, the most narrowed lumen; OSI, oscillatory shear index; TAWSS, time-averaged wall shear stress; TAWSSCV, time-averaged wall shear stress coefficient variation; WSS, wall shear stress.

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Table S2 Comparison of other hemodynamics of M2 segment in in the MCAs with and without plaque

Parameters	Group I (N=28)	Group III (N=44)	Group IV (N=32)	P values						
				Group I *vs.* III *vs.* IV	Group I *vs.* III		Group I *vs.* IV		Group III *vs.* IV	
					Original	Adjusted†	Original	Adjusted†	Original	Adjusted†
Lesion-level WSS parameters										
$TAWSS_{mean}$ (Pa)	3.80 (3.38–4.20)									
Initial		3.90 (3.42–4.98)	4.20 (2.78–5.41)	0.474						
Upstream		3.85 (3.19–5.57)	3.74 (2.97–4.34)	0.619						
MNL		3.68 (2.93–5.59)	3.77 (2.52–5.22)	0.904						
Downstream		3.43 (2.74–4.85)	3.91 (2.25–4.71)	0.835						
Terminal		3.37 (2.72–4.47)	3.85 (2.24–4.71)	0.330						
$TAWSS_{max}$ (Pa)	5.65 (4.99–6.36)									
Initial		6.71 (5.09–7.66)	6.29 (4.61–7.55)	0.046*	0.013*	0.040*	0.186	0.558	0.269	0.806
Upstream		6.89 (4.81–8.14)	6.25 (4.72–7.43)	0.050						
MNL		6.41 (4.71–7.47)	5.88 (4.29–7.46)	0.258						
Downstream		5.76 (4.11–7.02)	6.28 (3.97–7.44)	0.839						
Terminal		5.64 (4.20–6.70)	6.10 (3.96–7.12)	0.831						
TAWSSCV	0.29 (0.25–0.31)									
Initial		0.33 (0.23–0.45)	0.30 (0.20–0.37)	0.051						
Upstream		0.34 (0.22–0.46)	0.35 (0.25–0.45)	0.035*	0.036*	0.108	0.014*	0.043*	0.583	<0.999
MNL		0.29 (0.21–0.43)	0.29 (0.18–0.43)	0.847						
Downstream		0.34 (0.27–0.44)	0.30 (0.18–0.38)	0.137						
Terminal		0.34 (0.25–0.38)	0.34 (0.25–0.44)	0.083						
OSI_{max}	0.105 (0.075–0.126)									
Initial		0.109 (0.022–0.229)	0.044 (0.019–0.110)	0.044*	0.827	<0.999	0.030*	0.090	0.028*	0.085
Upstream		0.074 (0.012–0.242)	0.118 (0.037–0.198)	0.462						
MNL		0.010 (0.014–0.207)	0.045 (0.009–0.248)	0.502						
Downstream		0.090 (0.025–0.222)	0.048 (0.011–0.188)	0.247						
Terminal		0.059 (0.026–0.195)	0.040 (0.011–0.227)	0.150						
Segment-level WSS parameters										
$TAWSS_{mean}$ (Pa)	3.80 (3.38–4.20)	3.38 (3.00–4.16)	3.63 (2.89–4.15)	0.242						
$TAWSS_{max}$ (Pa)	5.65 (4.99–6.36)	5.56 (4.66–6.53)	5.63 (4.72–6.02)	0.629						
TAWSSCV	0.29 (0.25–0.31)	0.29 (0.24–0.36)	0.31 (0.26–0.35)	0.373						
OSI_{max}	0.105 (0.075–0.126)	0.113 (0.083–0.149)	0.112 (0.089–0.160)	0.326						

Values are presented as median (interquartile range). Group I: MCA without plaque; Group III: MCA with plaque in both M1 and M2; Group IV: MCA with plaque only in M2. In segments with multiple plaques, the most stenotic plaque was used in calculating plaque characteristics and lesion-level hemodynamics. In Group I, segment-level WSS-derived parameters were used as lesion-level hemodynamic parameters. †, P values were adjusted with Bonferroni correction. *, P<0.05. MCA, middle cerebral artery; MNL, the most narrowed lumen; OSI, oscillatory shear index; TAWSS, time-averaged wall shear stress; TAWSSCV, time-averaged wall shear stress coefficient variation; WSS, wall shear stress.

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Table S3 Comparison of other hemodynamic characteristics between single- and multiple-plaque MCAs

Parameters	M1 group			M2 group		
	Single-plaque (N=32)	Multiple-plaque (N=31)	P value	Single-plaque (N=17)	Multiple-plaque (N=42)	P value
Lesion-level WSS parameters						
$TAWSS_{mean}$ (Pa)						
Initial	4.61 (3.89–5.36)	4.47 (3.23–5.92)	0.690	4.11 (3.21–6.30)	3.91 (3.12–5.17)	0.525
Upstream	4.70 (3.94–5.49)	5.06 (3.47–6.19)	0.372	3.94 (3.45–4.72)	3.77 (3.00–5.08)	0.738
MNL	4.82 (3.59–5.77)	5.79 (3.27–6.64)	0.187	3.66 (2.62–5.45)	3.68 (2.76–5.37)	0.763
Downstream	4.72 (2.98–5.39)	5.40 (3.08–6.20)	0.336	3.94 (2.66–4.50)	3.43 (2.36–5.00)	0.536
Terminal	4.26 (2.71–5.43)	4.40 (3.48–5.86)	0.592	3.85 (2.87–4.67)	3.27 (2.05–4.66)	0.349
Highest/initial $TAWSS_{mean}$ ratio	1.09 (1.02–1.27)	1.25 (1.10–1.54)	0.037*	1.00 (1.00–1.21)	1.07 (1.00–1.27)	0.329
MNL/REF $TAWSS_{mean}$ ratio	0.99 (0.90–1.29)	1.10 (0.91–1.35)	0.592	0.86 (0.67–1.40)	0.96 (0.76–1.33)	0.581
$TAWSS_{max}$ (Pa)						
Initial	7.62 (6.28–9.00)	7.23 (5.90–8.30)	0.265	6.36 (5.53–7.60)	6.46 (4.73–7.59)	0.776
Upstream	7.79 (6.11–9.61)	8.11 (6.56–9.30)	0.858	6.74 (5.52–7.50)	6.68 (4.65–7.87)	0.738
MNL	7.83 (6.41–9.06)	8.47 (7.04–9.91)	0.336	6.42 (4.82–8.07)	5.96 (4.31–7.44)	0.514
Downstream	7.67 (5.77–8.94)	8.61 (6.37–10.06)	0.260	6.39 (5.17–7.66)	5.52 (3.67–7.15)	0.170
Terminal	7.17 (5.55–8.78)	7.49 (6.37–9.60)	0.265	6.24 (4.91–7.24)	5.69 (3.67–6.88)	0.248
Highest/initial $TAWSS_{max}$ ratio	1.07 (1.01–1.18)	1.19 (1.08–1.41)	0.013*	1.15 (1.03–1.26)	1.13 (1.00–1.23)	0.614
MNL/REF $TAWSS_{max}$ ratio	0.97 (0.86–1.23)	1.06 (0.89–1.14)	0.650	0.99 (0.69–1.41)	0.96 (0.77–1.19)	0.713
TAWSSCV						
Initial	0.35 (0.27–0.38)	0.35 (0.26–0.41)	0.805	0.25 (0.15–0.33)	0.31 (0.21–0.43)	0.181
Upstream	0.35 (0.27–0.42)	0.35 (0.24–0.42)	0.794	0.34 (0.21–0.44)	0.33 (0.20–0.45)	0.973
MNL	0.32 (0.25–0.44)	0.33 (0.21–0.38)	0.441	0.36 (0.22–0.47)	0.28 (0.18–0.40)	0.222
Downstream	0.36 (0.26–0.44)	0.40 (0.24–0.46)	0.441	0.36 (0.23–0.52)	0.31 (0.18–0.40)	0.170
Terminal	0.38 (0.27–0.46)	0.38 (0.29–0.46)	0.826	0.36 (0.19–0.44)	0.34 (0.25–0.42)	0.789
OSI_{max}						
Initial	0.064 (0.021–0.267)	0.149 (0.025–0.295)	0.343	0.070 (0.026–0.107)	0.045 (0.010–0.172)	<0.999
Upstream	0.071 (0.017–0.246)	0.126 (0.013–0.257)	0.741	0.061 (0.035–0.147)	0.082 (0.010–0.248)	0.802
MNL	0.057 (0.020–0.306)	0.068 (0.012–0.147)	0.178	0.056 (0.013–0.239)	0.087 (0.009–0.224)	0.973
Downstream	0.086 (0.019–0.259)	0.121 (0.031–0.240)	0.826	0.027 (0.011–0.208)	0.097 (0.019–0.216)	0.750
Terminal	0.080 (0.034–0.313)	0.086 (0.040–0.332)	0.783	0.042 (0.010–0.188)	0.107 (0.016–0.259)	0.197
Segment-level WSS parameters						
$TAWSS_{mean}$ (Pa)	4.41 (3.74–5.41)	4.97 (3.86–5.43)	0.322	3.80 (3.25–4.25)	3.20 (2.94–4.16)	0.181
$TAWSS_{max}$ (Pa)	7.12 (6.29–8.56)	7.91 (6.74–8.73)	0.221	5.80 (5.30–6.12)	5.29 (4.62–6.23)	0.461
TAWSSCV	0.352 (0.322–0.401)	0.35 (0.29–0.42)	0.805	0.28 (0.25–0.34)	0.32 (0.25–0.36)	0.569
OSI_{max}	0.146 (0.111–0.180)	0.133 (0.109–0.178)	0.409	0.114 (0.079–0.171)	0.122 (0.090–0.158)	0.461

Values are presented as median (interquartile range). In segments with multiple plaques, the most stenotic plaque was used in calculating plaque characteristics and lesion-level hemodynamics. *, P<0.05. MCA, middle cerebral artery; MNL, the most narrowed lumen; OSI, oscillatory shear index; REF, reference; TAWSS, time-averaged wall shear stress; TAWSSCV, time-averaged wall shear stress coefficient variation; WSS, wall shear stress.

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