

Smaller WEB Devices Show Lower Retreatment Rates Than Larger Devices: Results from the WorldWideWEB Study

ELECTRONIC SUPPLEMENTARY MATERIAL

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Variable	Overall (n = 586)	WEB ≤ 4.5 mm (n = 229)	WEB > 7.5 mm (n = 357)	p
Male	170 (29.0)	64 (27.9)	106 (29.7)	0.718
Age (years)	59.0 [51.0, 67.0]	57.0 [50.0, 66.0]	60.0 [52.0, 68.2]	0.017
Current smoking	289 (59.1)	104 (58.8)	185 (59.3)	0.984
Median pre-treatment mRS score		0 [0, 1]	0 [0, 0]	0.011
Aneurysm neck (mm)	4.0 [3.0, 5.7]	3.0 [2.3, 3.1]	5.0 [4.1, 6.1]	<0.001
Maximum diameter of aneurysm (mm)	7.9 [4.4, 9.9]	4.0 [3.7, 4.9]	9.0 [8.0, 10.8]	<0.001
Aneurysm width (mm)	6.6 [3.8, 8.3]	3.5 [3.0, 4.0]	8.0 [7.0, 9.0]	<0.001
Aneurysm height (mm)	6.5 [4.0, 9.0]	4.0 [3.5, 4.6]	8.3 [7.0, 10.0]	<0.001
Aneurysm depth (mm)	7.0 [4.0, 8.7]	3.3 [3.0, 4.0]	8.0 [7.0, 9.5]	<0.001

Supplementary table 1. Baseline characteristics of patients in the subgroup analysis comparing small and very large WEB devices

Variable	Overall (n = 586)	WEB ≤ 4.5 mm (n = 229)	WEB > 7.5 mm (n = 357)	p
Length of procedure (min)	87.5 [60.2, 120.0]	92.0 [65.0, 126.0]	79.0 [60.0, 117.0]	0.029
Femoral access	507 (86.8)	199 (86.9)	308 (86.8)	1.000
Adjunctive treatment				0.093
None	423 (90.2)	189 (92.2)	234 (88.6)	
Balloon	8 (1.7)	5 (2.4)	3 (1.1)	
Coiling	14 (3.0)	6 (2.9)	8 (3.0)	
Stenting	24 (5.1)	5 (2.4)	19 (7.2)	
Immediate Raymond-Roy score				<0.001
Complete	235 (41.9)	125 (57.1)	110 (32.2)	
Remnant neck	120 (21.4)	39 (17.8)	81 (23.7)	
Remnant aneurysm	206 (36.7)	55 (25.1)	151 (44.2)	
Immediate occlusion status				0.004
100 – 90 %	322 (56.4)	140 (62.3)	182 (52.6)	
< 90%	249 (43.6)	85 (37.7)	164 (47.4)	
Periprocedural intracranial hemorrhage	8 (1.5)	5 (2.6)	3 (0.9)	0.266
Periprocedural thromboembolic complications	23 (3.9)	7 (3.1)	16 (4.5)	0.512

Supplementary table 2. Procedural characteristics, including angiographic and safety outcomes, in the subgroup analysis comparing small and very large WEB devices

Variable	Overall (n = 586)	WEB ≤ 4.5 mm (n = 229)	WEB > 7.5 mm (n = 357)	p
Time since last FU (months)	8.0 [3.8, 20.2]	6.6 [3.1, 15.0]	10.0 [5.0, 24.0]	<0.001
Median mRs		1 [1, 2]	1 [1, 2]	0.65
Median difference in mRs		0 [0, 0]	0 [0, 0]	0.05
Occlusion status				<0.001
100 – 90 %	399 (84.9)	150 (94.3)	249 (80.1)	
< 90%	71 (15.1)	9 (5.7)	62 (19.9)	
Raymond-Roy score				<0.001
Complete	270 (59.0)	115 (76.2)	155 (50.5)	
Remnant neck	119 (26.0)	28 (18.5)	91 (29.6)	
Remnant aneurysm	69 (15.1)	8 (5.3)	61 (19.9)	
Retreatment	62 (11.5)	9 (4.3)	53 (16.1)	<0.001

Supplementary table 3. Clinical and angiographic outcomes at last follow-up in the subgroup analysis comparing small and very large WEB devices

Variable	All unruptured aneurysms (n = 1030)	WEB ≤ 4.5 mm (n = 132)	WEB > 4.5 mm (n = 898)	p
Length of procedure (min)	79.0 [58.0, 111.0]	91.0 [62.0, 117.5]	77.5 [58.0, 110.0]	0.026
Type of access				0.928
Radial	141 (13.7)	18 (13.6)	123 (13.7)	
Femoral	885 (86.2)	114 (86.4)	771 (86.1)	
Transcarotid	1 (0.1)	0 (0.0)	1 (0.1)	
Adjunctive treatment				0.333
None	722 (90.2)	115 (94.3)	607 (89.5)	
Balloon	9 (1.1)	2 (1.6)	7 (1.0)	
Coiling	27 (3.4)	3 (2.5)	24 (3.5)	
Flow diverter	3 (0.4)	0 (0.0)	3 (0.4)	
Stenting	39 (4.9)	2 (1.6)	37 (5.5)	
Immediate Raymond-Roy score				<0.001
Complete	380 (38.6)	73 (57.9)	307 (35.7)	
Remnant neck	190 (19.3)	21 (16.7)	169 (19.7)	
Remnant aneurysm	415 (42.1)	32 (25.4)	383 (44.6)	
Immediate occlusion status				0.047
100 – 90 %	321 (32.1)	54 (41.5)	267 (30.7)	
< 90%	678 (67.8)	76 (58.5)	602 (69.2)	
Periprocedural intracranial hemorrhage	9 (1.0)	1 (0.9)	8 (1.0)	1.000
Periprocedural thromboembolic complications	31 (3.0)	3 (2.3)	28 (3.1)	0.795

Supplementary table 4. Procedural characteristics, including angiographic and safety outcomes in the sensitivity analysis restricted to unruptured aneurysms

Variable	All unruptured aneurysms (n = 1030)	WEB ≤ 4.5 mm (n = 132)	WEB > 4.5 mm (n = 898)	p
Time since last follow-up (months)	9.0 [5.1, 20.0]	6.6 [3.7, 15.0]	10.0 [5.9, 22.0]	<0.001
Median mRS score		1 [1, 1]	1 [1, 1]	0.806
Median difference in mRS score		0 [0, 0]	0 [0, 0]	0.228
Occlusion status				<0.001
100 – 90 %	548 (65.4)	81 (83.5)	467 (63.0)	
< 90%	290 (34.6)	16 (16.5)	274 (37.0)	
Raymond-Roy score				<0.001
Complete	502 (61.6)	72 (80.0)	430 (59.3)	
Remnant neck	223 (27.4)	15 (16.7)	208 (28.7)	
Remnant aneurysm	90 (11.0)	3 (3.3)	87 (12.0)	
Retreatment	64 (6.9)	3 (2.5)	61 (7.6)	0.064

Supplementary table 5. Clinical and angiographic outcomes at last follow-up in the sensitivity analysis restricted to unruptured aneurysms

Variable	Overall (n = 930)	WEB ≤ 4.5 mm (n = 123)	WEB > 4.5 mm (n = 807)	p
Occlusion status (%)				0.003
100 – 90 %	513 (60.4)	79 (75.2)	434 (58.3)	
< 90%	336 (39.6)	26 (24.8)	301 (41.7)	
Raymond-Roy score (%)				0.009
Complete	470 (56.4)	70 (70.7)	400 (54.5)	
Remnant neck	248 (29.8)	21 (21.2)	227 (30.9)	
Remnant aneurysm	115 (13.8)	8 (8.1)	107 (14.6)	
Retreatment	93 (10.9)	9 (8.3)	84 (11.3)	0.433

Supplementary table 6. Sensitivity analysis comparing small and large WEB devices in patients with a minimum follow-up period of 6 months

Low-volume center		Medium-volume center			High-volume center		
Variable	WEB > 4.5 mm (n=8)*	WEB <= 4.5 mm (n=13)	WEB > 4.5 mm (n=65)	p	WEB <= 4.5 mm (n=217)	WEB > 4.5 mm (n=1170)	p
Male	4 (50.0)	2 (15.4)	13 (20.0)	1.000	62 (28.6)	356 (30.5)	0.635
Age	54.5 [50.0, 64.8]	50.0 [49.0, 64.0]	61.0 [54.0, 74.0]	0.019	57.5 [50.0, 66.0]	59.0 [52.0, 68.0]	0.068
Current smoking	3 (37.5)	9 (75.0)	42 (70.0)	1.000	95 (57.2)	590 (61.5)	0.337
Ruptured aneurysms	3 (37.5)	5 (38.5)	7 (10.8)	0.035	93 (42.9)	335 (28.6)	<0.001
Aneurysm neck (mm)	4.0 [4.0, 4.6]	3.1 [2.8, 3.6]	4.4 [3.5, 5.8]	0.001	2.9 [2.3, 3.1]	4.0 [3.1, 5.0]	<0.001
Maximum diameter of aneurysm (mm)	7.6 [6.8, 8.8]	5.0 [4.5, 6.2]	7.0 [6.0, 8.2]	0.001	4.0 [3.6, 4.7]	6.9 [5.6, 8.3]	<0.001
Aneurysm width (mm)	6.0 [5.9, 7.0]	3.8 [3.3, 3.8]	6.0 [4.5, 7.3]	<0.001	3.5 [3.0, 4.0]	5.7 [4.7, 7.0]	<0.001
Aneurysm height (mm)	6.4 [5.5, 7.5]	3.6 [3.1, 3.9]	5.8 [5.0, 7.3]	<0.001	4.0 [3.5, 4.9]	6.0 [5.0, 7.9]	<0.001
Aneurysm depth (mm)	6.1 [5.9, 6.9]	3.1 [2.9, 3.4]	5.0 [4.1, 6.9]	<0.001	3.3 [3.0, 4.0]	5.8 [4.7, 7.2]	<0.001
Aneurysm location				0.035			0.060
Acom	1 (12.5)	5 (38.5)	15 (23.1)		99 (45.6)	426 (36.4)	
Basilar	4 (50.0)	1 (7.7)	15 (23.1)		34 (15.7)	230 (19.7)	
MCA	3 (37.5)	3 (23.1)	30 (46.2)		53 (24.4)	300 (25.6)	
ICA-PCom	0 (0.0)	4 (30.8)	5 (7.7)		31 (14.3)	214 (18.3)	

Supplementary Table 7. Baseline characteristics of the participants by WEB device size and center volume

Legend. *Low-volume centers used only WEB >4.5 mm; no comparison possible

Variable	Low-volume center	Medium-volume center			High-volume center		
	WEB > 4.5 mm (n=8)	WEB ≤ 4.5 mm (n=13)	WEB > 4.5 mm (n=65)	p	WEB ≤ 4.5 mm (n=217)	WEB > 4.5 mm (n=1170)	p
Length of procedure (min)	156 [112, 375.0]	86.0 [58.0, 120.0]	72.0 [44.0, 110.0]	0.415	92.0 [65.0, 126.0]	79.0 [57.0, 111.0]	<0.001
Femoral access	7 (87.5)	13 (100.0)	54 (83.1)	0.244	187 (86.2)	1025 (87.8)	0.629
Adjunctive treatment				0.052			0.625
None	7 (87.5)	11 (84.6)	57 (89.1)		179 (92.7)	792 (90.6)	
Balloon	0 (0.0)	1 (7.7)	1 (1.6)		4 (2.1)	12 (1.4)	
Coiling	0 (0.0)	1 (7.7)	0 (0.0)		5 (2.6)	33 (3.8)	
Stenting	1 (12.5)	0 (0.0)	6 (9.4)		5 (2.6)	34 (3.9)	
Immediate Raymond-Roy score				0.653			<0.001
Complete	1 (12.5)	4 (30.8)	12 (19.4)		121 (58.5)	421 (37.7)	
Remnant neck	1 (12.5)	4 (30.8)	21 (33.9)		35 (16.9)	223 (20.0)	
Remnant aneurysm	6 (75.0)	5 (38.5)	29 (46.8)		51 (24.6)	472 (42.3)	
Immediate occlusion status				0.649			0.006
100 – 90 %	2 (25)	5 (38.5)	28 (45.1)		117 (63.4)	608 (54)	
< 90%	6 (75.0)	8 (61.5)	34 (54.8)		78 (36.6)	519 (46.1)	
Periprocedural TECs	0 (0.0)	0 (0.0)	5 (7.7)	0.679	7 (3.2)	43 (3.7)	0.893
Periprocedural ICH	0 (0.0)	0 (0.0)	0 (0.0)	NA	5 (2.7)	10 (1.0)	0.104

Supplementary Table 8. Procedural characteristics and safety outcomes by WEB device size and center volume

Legend. ICH – intracranial hemorrhage; TECs - thromboembolic complications

*Low-volume centers used only WEB >4.5 mm; no comparison possible

Variable	Low-volume center	Medium-volume center			High-volume center		
	WEB > 4.5 mm (n=8)*	WEB ≤ 4.5 mm (n=13)	WEB > 4.5 mm (n=65)	p	WEB ≤ 4.5 mm (n=217)	WEB > 4.5 mm (n=1170)	p
Time since last follow-up (months)	8.0 [7.8, 12.2]	11.0 [6.0, 15.0]	10.0 [5.7, 19.5]	0.958	6.6 [3.1, 15.7]	10.0 [5.0, 21.0]	<0.001
Occlusion status				0.358			<0.001
100 – 90 %	7 (87.5)	10 (77.8)	46 (92.0)		143 (95.4)	821 (86.1)	
< 90%	1 (12.5)	2 (22.2)	4 (8.0)		7 (4.7)	132 (13.9)	
Raymond-Roy score				0.712			<0.001
Complete	4 (50.0)	4 (44.4)	25 (50.0)		111 (78.2)	552 (59.0)	
Remnant neck	3 (37.5)	3 (33.3)	19 (38.0)		25 (17.6)	258 (27.6)	
Remnant aneurysm	1 (12.5)	2 (22.2)	6 (12.0)		6 (4.2)	125 (13.4)	
Retreatment	1 (12.5)	1 (7.7)	7 (12.1)	1.000	8 (4.0)	91 (8.6)	0.039

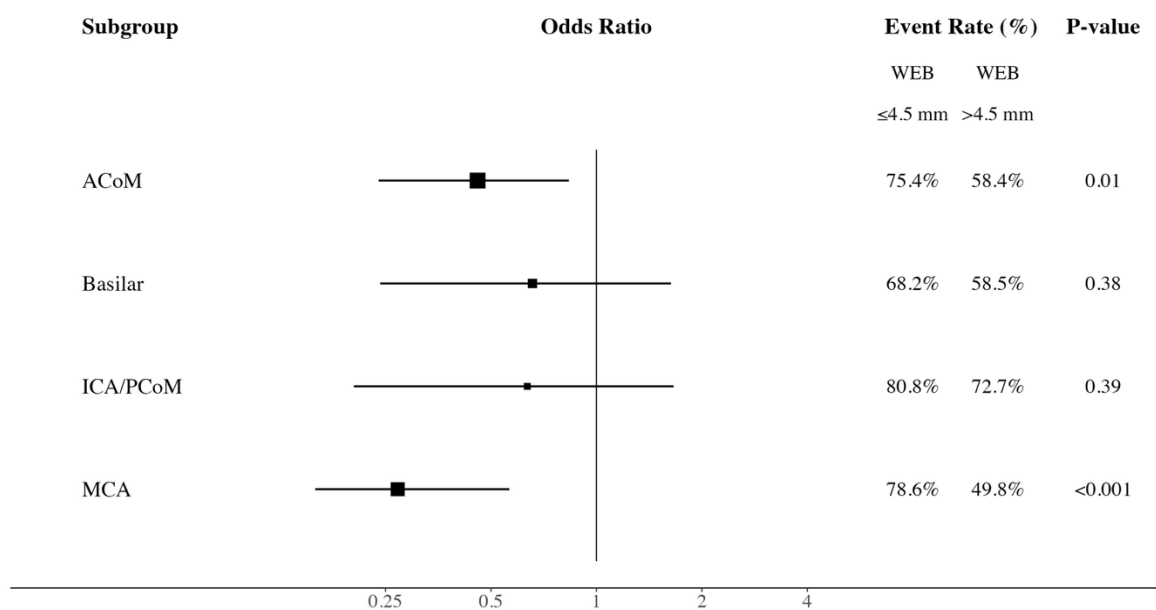
Supplementary Table 9. Angiographic and retreatment outcomes by WEB device size and center volume

Legend. *Low-volume centers used only WEB >4.5 mm; no comparison possible

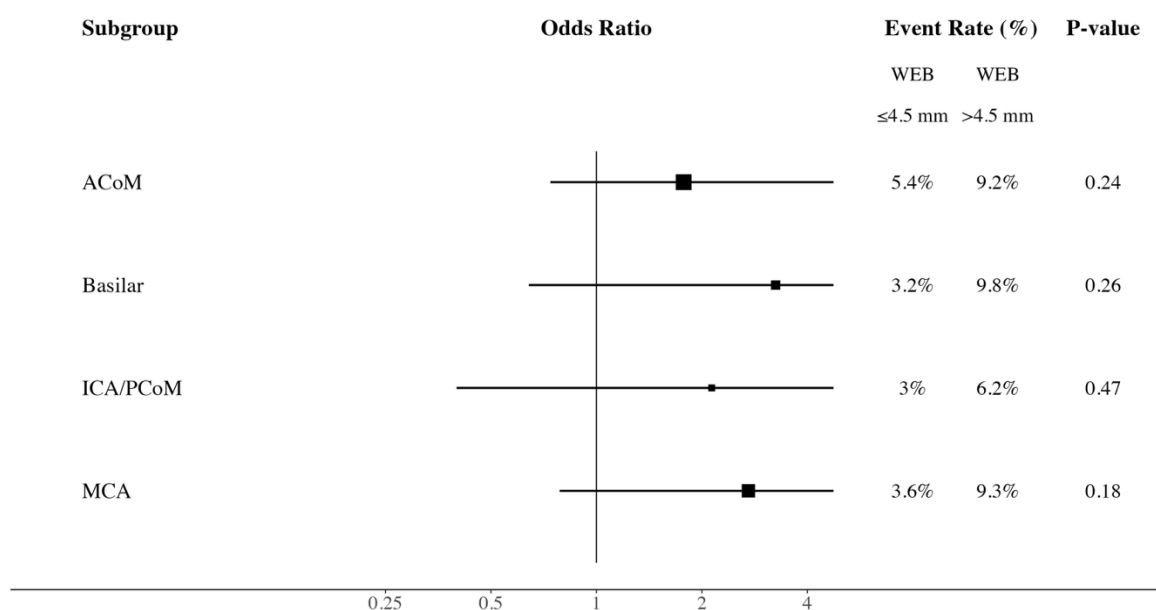
Supplementary figure

Supplementary figure 1. Forest plots showing odds ratios for complete occlusion at follow-up (Raymond-Roy score, Panel A) and retreatment (Panel B) stratified by anatomical location, comparing WEB devices ≤ 4.5 mm versus > 4.5 mm. Box size is proportional to number of patients. OR > 1 favors large WEB devices

A) Complete Occlusion (Raymond-Roy Score I)



B) Retreatment



Supplementary figure 1. Forest plots showing odds ratios for complete occlusion at follow-up (Raymond-Roy score, Panel A) and retreatment (Panel B) stratified by anatomical location, comparing WEB devices ≤ 4.5 mm versus > 4.5 mm. Box size is proportional to number of patients. OR > 1 favors large WEB devices

Legend. ACoM: anterior communicating artery; ICA: internal carotid artery; MCA: middle cerebral artery; PCoM: posterior communicating artery