

**Further definitions**

History of cerebrovascular accident was defined as any ND any time before surgery. Cerebral malperfusion was assessed through imaging modalities. It was defined as a clear border between the well-perfused and the malperfused part of at least one carotid or vertebral artery characterized by a visually identifiable difference in Hounsfield units/brightness in CT- or MR-angiography.

According to the KDIGO guidelines (1), chronic renal failure was defined by a glomerular filtration rate of less than 60 mL/min that was not due to acute renal failure.

Genetic aortic syndromes included Marfan, Ehlers-Danlos and Loeys-Dietz syndrome, as well as familial thoracic aortic aneurysm and dissection (FTAAD) with positive family history, or pathological mutation in a known causal gene for FTAAD (2,3).

Aortic surgeon was defined as a surgeon who performed more than 20 aortic procedures per year. Surgery was considered to be performed at nighttime when time of skin incision and closure was not within 7 am and 10 pm and as weekend surgery if the date of the procedure was at the weekend or a local public holiday.

**mRS**

“0—*No symptoms at all*; 1—*No significant disability despite symptoms: able to carry out all usual duties and activities*; 2—*Slight disability: unable to carry out all previous activities but able to look after own affairs without assistance*; 3—*Moderate disability: requiring some help, but able to walk without assistance*; 4—*Moderately severe disability: unable to walk without assistance, and unable to attend to own bodily needs without assistance*; 5—*Severe disability: bedridden, incontinent, and requiring constant nursing care and attention*” (10).

**References**

37. Stevens PE, Levin A; Kidney Disease: Improving Global Outcomes Chronic Kidney Disease Guideline Development Work Group Members. Evaluation and management of chronic kidney disease: synopsis of the kidney disease: improving global outcomes 2012 clinical practice guideline. Ann Intern Med 2013;158:825-30.
38. Renard M, Francis C, Ghosh R, et al. Clinical Validity of Genes for Heritable Thoracic Aortic Aneurysm and Dissection. J Am Coll Cardiol 2018;72:605-15.
39. Caspar SM, Dubacher N, Matyas G. More Genes for Thoracic Aortic Aneurysms and Dissections. J Am Coll Cardiol 2019;73:528-9.

**Table S1** Baseline characteristics including univariate analysis for embolic stroke

Characteristics	All (n=1,334)	No embolic stroke (n=1,275)	Embolic stroke (n=59)	P value
Age (years), mean ± SD	61.4±14.2	61.2±14.3	66.0±11.5	0.011
Female gender, n (%)	466 (34.9)	445 (34.9)	21 (35.6)	0.913
Obesity (BMI >35 kg/m <sup>2</sup> ), n (%)	81 (6.1)	80 (6.3)	1 (1.7)	0.257
Arterial hypertension, n (%)	1040 (78.0)	986 (77.3)	54 (91.5)	0.010
Any atherosclerotic entity, n (%)	493 (37.0)	466 (36.5)	27 (45.8)	0.152
Coronary artery disease	380 (28.5)	357 (28.0)	23 (39.0)	0.068
Extracardiac arteriopathy	184 (13.8)	172 (13.5)	12 (20.3)	0.136
Atrial fibrillation, n (%)	209 (15.7)	196 (15.4)	13 (22.0)	0.169
IDDM, n (%)	31 (2.3)	28 (2.2)	3 (5.1)	0.154
Chronic lung disease, n (%)	134 (10.0)	124 (9.7)	10 (16.9)	0.071
Smoker, n (%)	525 (39.4)	503 (39.5)	22 (37.3)	0.740
Chronic kidney disease, n (%)	256 (19.2)	237 (18.6)	19 (32.2)	0.009
Previous cardiac surgery, n (%)	136 (10.2)	132 (10.4)	4 (6.8)	0.375
EuroSCORE II, mean ± SD	8.6±10.1	8.3±9.8	14.1±14.1	0.003
Preoperative stroke, n (%)	114 (8.5)	108 (8.5)	6 (10.2)	0.648
Linked to aortic syndrome	34 (2.5)	34 (2.7)	0 (0.0)	0.398
Not linked to aortic syndrome	80 (6.0)	74 (5.8)	6 (10.2)	0.161
Preoperative critical state, n (%)	134 (10.0)	120 (9.4)	14 (23.7)	<0.001
Preoperative cerebral malperfusion, n (%)	56 (4.2)	48 (3.8)	8 (13.6)	0.002
Genetic aortic syndrome, n (%)	123 (9.2)	122 (9.6)	1 (1.7)	0.041
Malfunction or infection of TEVAR or aortic graft, n (%)	14 (1.0)	13 (1.0)	1 (1.7)	0.471
Aneurysm, n (%)	948 (71.1)	922 (72.3)	26 (44.1)	<0.001
ATAD, n (%)	240 (18.0)	220 (17.3)	20 (33.9)	0.001
IMH, n (%)	43 (3.2)	39 (3.1)	4 (6.8)	0.114
PAU, n (%)	13 (1.0)	11 (0.9)	2 (3.4)	0.110
Chronic dissection, n (%)	61 (4.6)	57 (4.5)	4 (6.8)	0.341
Aortic rupture, n (%)	68 (5.1)	60 (4.7)	8 (13.6)	0.008
Maximum thoracic aortic diameter (mm), mean ± SD	5.49±1.18	5.48±1.18	5.68±1.16	0.251
Urgency status, n (%)				
Elective	999 (74.9)	971 (76.2)	28 (47.5)	<0.001
Urgent	47 (3.5)	44 (3.5)	3 (5.1)	0.460
Emergent or salvage	286 (21.4)	258 (20.2)	28 (47.5)	<0.001

SD, standard deviation; BMI, body mass index; IDDM, insulin-dependent diabetes mellitus; TEVAR, thoracic endovascular aortic repair; ATAD, acute type A dissection; IMH, intramural hematoma; PAU, penetrating atherosclerotic ulcer.

**Table S2** Surgical procedures including univariate analysis for embolic stroke

Procedures	All (n=1,334)	No embolic stroke (n=1,275)	Embolic stroke (n=59)	P value
Aortic root surgery, n (%)	451 (33.8)	438 (34.4)	13 (22.0)	0.051
Bentall procedure	230 (17.2)	219 (17.2)	11 (18.6)	0.770
Valve-sparing root replacement	221 (16.6)	219 (17.2)	2 (3.4)	0.005
Isolated ascending replacement, n (%)	82 (6.1)	80 (6.3)	2 (2.1)	0.577
Wheat (supracoronary + AVR), n (%)	251 (18.8)	245 (19.2)	6 (10.2)	0.082
Arch procedure, n (%)	622 (46.6)	576 (45.2)	46 (78.0)	<0.001
Hemimarch	419 (31.4)	387 (30.4)	32 (54.2)	<0.001
Total arch	203 (15.2)	189 (14.8)	14 (23.7)	0.063
Conventional	69 (5.2)	63 (4.9)	6 (10.2)	0.120
FET	134 (10.0)	126 (9.9)	8 (13.6)	0.358
Simplified FET technique	70 (5.2)	67 (5.3)	3 (5.1)	1.000
Descending procedure, n (%)	9 (0.7)	8 (0.6)	1 (1.7)	0.335
Concomitant surgery, n (%)				
CABG	193 (14.5)	179 (14.0)	14 (23.7)	0.039
TVR	21 (1.6)	21 (1.6)	0 (0.0)	1.000
MVR	58 (4.3)	55 (4.3)	3 (5.1)	0.740
VAD implantation	2 (0.1)	2 (0.2)	0 (0.0)	1.000

AVR, aortic valve replacement; FET, frozen elephant trunk; CABG, coronary artery bypass grafting; TVR, tricuspid valve replacement; MVR, mitral valve repair; VAD, ventricular assist device.

**Table S3** Intraoperative data including univariate analysis for embolic stroke

Intraoperative data	All (n=1,334)	No embolic stroke (n=1,275)	Embolic stroke (n=59)	P value
Aortic surgeon, n (%)	771 (57.8)	739 (58.0)	32 (54.2)	0.571
Time of surgery, n (%)				
Weekend surgery	63 (4.7)	57 (4.5)	6 (10.2)	0.055
Night-time surgery	197 (14.8)	180 (14.1)	17 (28.8)	0.002
ECC time (min), mean ± SD	185.9±79.8	183.6±77.7	233.2±105.8	0.001
Aortic clamp time (min), mean ± SD	105.3±50.5	104.7±49.7	119.1±66.0	0.108
HCA with SACP, n (%)	530 (39.7)	492 (38.6)	38 (64.4)	<0.001
Circulatory arrest time (min), mean ± SD	36.8±25.3	36.3±24.5	42.2±34.5	0.139
CP time (min), mean ± SD	41.6±31.7	41.3±30.8	45.1±42.1	0.559
Deepest body temperature (°C), mean ± SD	28.7±4.0	28.8±4.0	26.3±3.5	<0.001
Site of arterial cannulation, n (%)				
Ascending aorta or aortic arch	903 (67.7)	872 (68.4)	31 (52.5)	0.011
Innominate artery	182 (13.6)	176 (13.8)	6 (10.2)	0.427
Subclavian artery	211 (15.8)	193 (15.1)	18 (30.5)	0.002
Femoral artery	34 (2.5)	30 (2.4)	4 (6.8)	0.059

ECC, extracorporeal circulation; SD, standard deviation; HCA, hypothermic circulatory arrest; SACP, selective antegrade cerebral perfusion; CP, cerebral perfusion.

**Table S4** Outcome parameters including univariate analysis for embolic stroke

Parameters	All (n=1,334)	No embolic stroke (n=1,275)	Embolic stroke (n=59)	P value
Overall in-hospital-/30-day mortality, n (%)	79 (5.9)	64 (5.0)	15 (25.4)	<0.001
One-year mortality, n (%)	106 (17.8)	88 (15.7)	18 (51.4)	<0.001
Transient ND, n (%)	34 (2.5)	34 (2.7)	–	–
Resternotomy for bleeding or tamponade, n (%)	139 (10.4)	127 (10.0)	12 (20.3)	0.011
Reanimation or shock, n (%)	77 (5.8)	72 (5.6)	5 (8.5)	0.383
Paraplegia, n (%)	14 (1.0)	13 (1.0)	1 (1.7)	0.471
Recurrent nerve palsy, n (%)	29 (2.2)	28 (2.2)	1 (1.7)	1.000
Pneumonia or other respiratory insufficiency, n (%)	174 (13.0)	155 (12.2)	19 (32.2)	<0.001
Sepsis, n (%)	30 (2.2)	22 (1.7)	8 (13.6)	<0.001
New-onset atrial fibrillation, n (%)	265 (19.9)	251 (19.7)	14 (23.7)	0.447
Myocardial infarction, n (%)	10 (0.7)	9 (0.7)	1 (1.7)	0.365

ND, neurological deficit.

**Table S5** Risk factors for embolic stroke after aortic surgery

Risk factors	OR	95% CI	P value
Advanced age (>70 years)	–	–	0.655
Arterial hypertension	–	–	0.123
Any atherosclerotic entity	–	–	0.952
Chronic kidney disease	–	–	0.098
Genetic aortic syndrome	0.20	0.03–1.44	0.109
Preoperative cerebral malperfusion	2.52	1.10–5.77	0.028
Preoperative critical state	–	–	0.294
ATAD	–	–	0.668
Aortic rupture	–	–	0.099
Night-time surgery	–	–	0.761
Valve-sparing root replacement	–	–	0.132
Aortic arch surgery	3.95	2.08–7.51	<0.001
Concomitant CABG	2.09	1.11–3.96	0.023
High ECC time (>230 min)	–	–	0.159
HCA with SACP	–	–	0.973
High circulatory arrest time (>60 min)	–	–	0.627
High CP time (>90 min)	–	–	0.382
Low body temperature (<25 °C)	–	–	0.677
Site of arterial cannulation			
Ascending aorta or aortic arch	–	–	0.700
Subclavian artery	–	–	0.127
Femoral artery	–	–	0.066

ATAD, acute type A dissection; CABG, coronary artery bypass grafting; ECC, extracorporeal circulation; HCA, hypothermic circulatory arrest; SACP, selective antegrade cerebral perfusion; CP, cerebral perfusion; OR, odds ratio; CI, confidence interval.

**Table S6** Baseline characteristics including univariate analysis for hemodynamic stroke

Characteristics	All (n=1,334)	No hemodynamic stroke (n=1,311)	Hemodynamic stroke (n=23)	P value
Age (years), mean ± SD	61.4±14.2	61.3±14.3	70.3±8.2	<0.001
Female gender, n (%)	466 (34.9)	462 (35.2)	4 (17.4)	0.075
Obesity (BMI >35 kg/m <sup>2</sup> ), n (%)	81 (6.1)	80 (6.1)	1 (4.3)	1.000
Arterial hypertension, n (%)	1,040 (78.0)	1,021 (77.9)	19 (82.6)	0.588
Any atherosclerotic entity, n (%)	493 (37.0)	479 (36.5)	14 (60.9)	0.017
Coronary artery disease	380 (28.5)	370 (28.2)	10 (43.5)	0.108
Extracardiac arteriopathy	184 (13.8)	179 (13.7)	5 (21.7)	0.233
Atrial fibrillation, n (%)	209 (15.7)	207 (15.8)	2 (8.7)	0.562
IDDM, n (%)	31 (2.3)	31 (2.4)	0 (0.0)	1.000
Chronic lung disease, n (%)	134 (10.0)	133 (10.1)	1 (4.3)	0.722
Smoker, n (%)	525 (39.4)	513 (39.1)	12 (52.2)	0.204
Chronic kidney disease, n (%)	256 (19.2)	247 (18.8)	9 (39.1)	0.027
Previous cardiac surgery, n (%)	136 (10.2)	131 (10.0)	5 (21.7)	0.076
EuroSCORE II, mean ± SD	8.6±10.1	8.4±9.9	16.0±14.5	0.020
Preoperative stroke, n (%)	114 (8.5)	110 (8.4)	4 (17.4)	0.126
Linked to aortic syndrome	34 (2.5)	33 (2.5)	1 (4.3)	0.451
Not linked to aortic syndrome	80 (6.0)	77 (5.9)	3 (13.0)	0.155
Preoperative critical state, n (%)	134 (10.0)	128 (9.8)	6 (26.1)	0.022
Preoperative cerebral malperfusion, n (%)	56 (4.2)	54 (4.1)	2 (8.7)	0.251
Genetic aortic syndrome, n (%)	123 (9.2)	123 (9.4)	0 (0.0)	0.261
Malfunction or infection of TEVAR or aortic graft, n (%)	14 (1.0)	13 (1.0)	1 (4.3)	0.217
Aneurysm, n (%)	948 (71.1)	944 (72.0)	4 (17.4)	<0.001
ATAD, n (%)	240 (18.0)	227 (17.3)	13 (56.5)	<0.001
IMH, n (%)	43 (3.2)	41 (3.1)	2 (8.7)	0.168
PAU, n (%)	13 (1.0)	13 (1.0)	0 (0.0)	1.000
Chronic dissection, n (%)	61 (4.6)	60 (4.6)	1 (4.3)	1.000
Aortic rupture, n (%)	68 (5.1)	68 (5.2)	0 (0.0)	0.626
Maximum thoracic aortic diameter (mm), mean ± SD	5.49±1.18	5.49±1.19	5.11±0.83	0.185
Urgency status, n (%)				
Elective	999 (74.9)	994 (75.8)	5 (21.7)	<0.001
Urgent	47 (3.5)	46 (3.5)	1 (4.3)	0.565
Emergent or salvage	286 (21.4)	269 (20.5)	17 (73.9)	<0.001

SD, standard deviation; BMI, body mass index; IDDM, insulin-dependent diabetes mellitus; TEVAR, thoracic endovascular aortic repair; ATAD, acute type A dissection; IMH, intramural hematoma; PAU, penetrating atherosclerotic ulcer.

**Table S7** Surgical procedures including univariate analysis for hemodynamic stroke

Procedures	All (n=1,334)	No hemodynamic stroke (n=1,311)	Hemodynamic stroke (n=23)	P value
Aortic root surgery, n (%)	451 (33.8)	447 (34.1)	4 (17.4)	0.093
Bentall procedure	230 (17.2)	227 (17.3)	13 (13.0)	0.783
Valve-sparing root replacement	221 (16.6)	220 (16.8)	1 (4.3)	0.156
Isolated ascending replacement, n (%)	82 (6.1)	82 (6.3)	0 (0.0)	0.393
Wheat (supracoronary + AVR), n (%)	251 (18.8)	248 (18.9)	3 (13.0)	0.599
Arch procedure, n (%)	622 (46.6)	600 (45.8)	22 (95.7)	<0.001
Hemiarch	419 (31.4)	401 (30.6)	18 (78.3)	<0.001
Total arch	203 (15.2)	199 (15.2)	4 (17.4)	0.769
Conventional	69 (5.2)	69 (5.3)	0 (0.0)	0.628
FET	134 (10.0)	130 (9.9)	4 (17.4)	0.279
Simplified FET technique	70 (5.2)	70 (5.3)	0 (0.0)	0.629
Descending procedure, n (%)	9 (0.7)	9 (0.7)	0 (0.0)	1.000
Concomitant surgery, n (%)				
CABG	193 (14.5)	188 (14.3)	5 (21.7)	0.363
TVR	21 (1.6)	21 (1.6)	0 (0.0)	1.000
MVR	58 (4.3)	58 (4.4)	0 (0.0)	0.621
VAD implantation	2 (0.1)	2 (0.2)	0 (0.0)	1.000

AVR, aortic valve replacement; FET, frozen elephant trunk; CABG, coronary artery bypass grafting; TVR, tricuspid valve replacement; MVR, mitral valve repair; VAD, ventricular assist device.

**Table S8** Intraoperative data including univariate analysis for hemodynamic stroke

Intraoperative data	All (n=1,334)	No hemodynamic stroke (n=1,311)	Hemodynamic stroke (n=23)	P value
Aortic surgeon, n (%)	771 (57.8)	760 (58.0)	11 (47.8)	0.329
Time of surgery, n (%)				
Weekend surgery	63 (4.7)	60 (4.6)	3 (13.0)	0.091
Night-time surgery	197 (14.8)	187 (14.3)	10 (43.5)	0.001
ECC time (min), mean ± SD	185.9±79.8	184.8±79.5	246.7±79.0	<0.001
Aortic clamp time (min), mean ± SD	105.3±50.5	105.3±50.6	108.1±50.2	0.800
HCA with SACP, n (%)	530 (39.7)	512 (39.1)	18 (78.3)	<0.001
Circulatory arrest time (min), mean ± SD	36.8±25.3	36.7±25.6	37.0±17.7	0.957
CP time (min), mean ± SD	41.6±31.7	41.6±32.0	41.9±23.0	0.966
Deepest body temperature (°C), mean ± SD	28.7±4.0	28.8±4.0	24.7±1.6	<0.001
Site of arterial cannulation, n (%)				
Ascending aorta or aortic arch	903 (67.7)	894 (68.2)	9 (39.1)	0.003
Innominate artery	182 (13.6)	178 (13.6)	4 (17.4)	0.542
Subclavian artery	211 (15.8)	202 (15.4)	9 (39.1)	0.006
Femoral artery	34 (2.5)	33 (2.5)	1 (4.3)	0.451

ECC, extracorporeal circulation; SD, standard deviation; HCA, hypothermic circulatory arrest; SACP, selective antegrade cerebral perfusion; CP, cerebral perfusion.

**Table S9** Outcome parameters including univariate analysis for hemodynamic stroke

Parameters	All (n=1,334)	No hemodynamic stroke (n=1,311)	Hemodynamic stroke (n=23)	P value
Overall in-hospital-/30-day mortality, n (%)	79 (5.9)	70 (5.3)	9 (39.1)	<0.001
One-year mortality, n (%)	106 (17.8)	94 (16.2)	12 (75.0)	<0.001
Transient ND, n (%)	34 (2.5)	34 (2.6)	–	–
Resternotomy for bleeding or tamponade, n (%)	139 (10.4)	132 (10.1)	7 (30.4)	0.007
Reanimation or shock, n (%)	77 (5.8)	71 (5.4)	6 (26.1)	0.001
Paraplegia, n (%)	14 (1.0)	10 (0.8)	4 (17.4)	<0.001
Recurrent nerve palsy, n (%)	29 (2.2)	29 (2.2)	0 (0.0)	1.000
Pneumonia or other respiratory insufficiency, n (%)	174 (13.0)	165 (12.6)	9 (39.1)	0.001
Sepsis, n (%)	30 (2.2)	28 (2.1)	2 (8.7)	0.092
New-onset atrial fibrillation, n (%)	265 (19.9)	260 (19.8)	5 (21.7)	0.793
Myocardial infarction, n (%)	10 (0.7)	10 (0.8)	0 (0.0)	1.000

ND, neurological deficit.

**Table S10** Risk factors for hemodynamic stroke after aortic surgery

Risk factors	OR	95% CI	P value
Advanced age (>70 years)	2.46	1.02–5.92	0.046
Any atherosclerotic entity	2.66	1.10–6.42	0.030
Chronic kidney disease	–	–	0.078
Preoperative critical state	–	–	0.877
ATAD	3.92	1.59–9.66	0.003
Night-time surgery	–	–	0.556
Aortic arch surgery	14.26	1.82–111.74	0.011
High ECC time (>230 min)	–	–	0.287
High aortic clamp time (>155 min)	–	–	0.503
HCA with SACP	–	–	0.873
High circulatory arrest time (>60 min)	–	–	0.915
High CP time (>90 min)	–	–	0.998
Low body temperature (<25 °C)	–	–	0.830
Site of arterial cannulation			
Ascending aorta or aortic arch	–	–	0.629
Subclavian artery	–	–	0.695

ATAD, acute type A dissection; ECC, extracorporeal circulation; HCA, hypothermic circulatory arrest; SACP, selective antegrade cerebral perfusion; CP, cerebral perfusion; OR, odds ratio; CI, confidence interval.

**Table S11** Baseline characteristics of patients with ATAD

Characteristics	All (n=240)	No stroke (n=202)	Stroke (n=38)	P value
Age (years), mean ± SD	62.4±13.0	61.5±13.3	66.7±10.3	0.026
Female gender, n (%)	74 (30.8)	63 (31.2)	11 (28.9)	0.784
Obesity (BMI >35 kg/m <sup>2</sup> ), n (%)	15 (6.3)	14 (6.9)	1 (2.6)	0.477
Arterial hypertension, n (%)	203 (84.6)	170 (84.2)	33 (86.8)	0.674
Any atherosclerotic entity, n (%)	77 (32.1)	63 (31.2)	14 (36.8)	0.493
Coronary artery disease	38 (15.8)	28 (13.9)	10 (26.3)	0.054
Extracardiac arteriopathy	46 (19.2)	39 (19.3)	7 (18.4)	0.899
Atrial fibrillation, n (%)	34 (14.2)	31 (15.3)	3 (7.9)	0.227
IDDM, n (%)	6 (2.5)	4 (2.0)	2 (5.3)	0.242
Chronic lung disease, n (%)	16 (6.7)	14 (6.9)	2 (5.3)	1.000
Smoker, n (%)	96 (40.0)	82 (40.6)	14 (36.8)	0.665
Chronic kidney disease, n (%)	46 (19.2)	39 (19.3)	7 (18.4)	0.899
Previous cardiac surgery, n (%)	17 (7.1)	13 (6.4)	4 (10.5)	0.321
EuroSCORE II, mean ± SD	18.0±14.6	17.7±14.6	19.6±14.8	0.450
Preoperative stroke, n (%)	38 (15.8)	35 (17.3)	3 (7.9)	0.144
Linked to aortic syndrome	25 (10.4)	24 (11.9)	1 (2.6)	0.143
Not linked to aortic syndrome	13 (5.4)	11 (5.4)	2 (5.3)	1.000
Preoperative critical state, n (%)	112 (46.7)	94 (46.5)	18 (47.4)	0.925
Preoperative cerebral malperfusion, n (%)	45 (18.8)	36 (17.8)	9 (23.7)	0.396
Genetic aortic syndrome, n (%)	13 (5.4)	13 (6.4)	0 (0.0)	0.231
Aortic rupture, n (%)	29 (12.1)	26 (12.9)	3 (7.9)	0.587
Maximum thoracic aortic diameter (mm), mean ± SD	5.42±1.24	5.55±1.31	4.90±0.63	0.001

ATAD, acute type A dissection; SD, standard deviation; BMI, body mass index; IDDM, insulin-dependent diabetes mellitus.

**Table S12** Surgical procedures of patients with ATAD

Procedures	All (n=240)	No stroke (n=202)	Stroke (n=38)	P value
Aortic root surgery, n (%)	53 (22.1)	45 (22.3)	8 (21.1)	0.867
Bentall procedure	36 (15.0)	31 (15.3)	5 (13.2)	0.729
Valve-sparing root replacement	17 (7.1)	14 (6.9)	3 (7.9)	0.738
Isolated ascending replacement, n (%)	5 (2.1)	5 (2.5)	0 (0.0)	1.000
Wheat (supracoronary + AVR), n (%)	7 (2.9)	6 (3.0)	1 (2.6)	1.000
Arch procedure, n (%)	225 (93.8)	190 (94.1)	35 (92.1)	0.648
Hemiarch	163 (67.9)	136 (67.3)	27 (71.1)	0.652
Total arch	62 (25.8)	54 (26.7)	8 (21.1)	0.463
Conventional	32 (13.3)	29 (14.4)	3 (7.9)	0.282
FET	30 (12.5)	25 (12.4)	5 (13.2)	0.796
Simplified FET technique	8 (3.3)	5 (2.5)	3 (7.9)	0.116
Concomitant surgery, n (%)				
CABG	24 (10.0)	19 (9.4)	5 (13.2)	0.553
TVR	2 (0.8)	2 (1.0)	0 (0.0)	1.000
MVR	2 (0.8)	2 (1.0)	0 (0.0)	1.000
VAD implantation	0 (0.0)	0 (0.0)	0 (0.0)	–

ATAD, acute type A dissection; AVR, aortic valve replacement; FET, frozen elephant trunk; CABG, coronary artery bypass grafting; TVR, tricuspid valve replacement; MVR, mitral valve repair; VAD, ventricular assist device.

**Table S13** Intraoperative data of patients with ATAD

Intraoperative data	All (n=240)	No stroke (n=202)	Stroke (n=38)	P value
Aortic surgeon (>20 aortic procedures per year), n (%)	103 (42.9)	85 (42.1)	18 (47.4)	0.546
Time of surgery, n (%)				
Weekend surgery	45 (18.8)	38 (18.8)	7 (18.4)	0.955
Night-time surgery	157 (65.4)	133 (65.8)	24 (63.2)	0.750
ECC time (min), mean ± SD	246.4±84.0	245.6±81.9	251.0±95.9	0.723
Aortic clamp time (min), mean ± SD	120.1±70.6	120.5±70.8	117.8±70.3	0.834
HCA with SACP, n (%)	188 (78.3)	158 (78.2)	30 (78.9)	0.920
Circulatory arrest time (min), mean ± SD	45.6±30.5	46.3±29.5	41.7±35.9	0.432
CP time (min), mean ± SD	48.5±36.3	48.8±35.5	46.5±41.3	0.739
Deepest body temperature (°C), mean ± SD	24.2±2.1	24.2±2.1	24.4±2.3	0.658
Site of arterial cannulation, n (%)				
Ascending aorta or aortic arch	88 (36.7)	75 (37.1)	13 (34.2)	0.732
Innominate artery	38 (15.8)	34 (16.8)	4 (10.5)	0.329
Subclavian artery	104 (43.3)	85 (42.1)	19 (50.0)	0.366
Femoral artery	12 (5.0)	10 (5.0)	2 (5.3)	1.000

ATAD, acute type A dissection; ECC, extracorporeal circulation; SD, standard deviation; HCA, hypothermic circulatory arrest; SACP, selective antegrade cerebral perfusion; CP, cerebral perfusion.

**Table S14** Outcome parameters of patients with ATAD

Parameters	All (n=240)	No stroke (n=202)	Stroke (n=38)	P value
In-hospital-/30-day mortality, n (%)	33 (13.8)	17 (8.4)	16 (42.1)	<0.001
One-year mortality, n (%)	36 (27.9)	19 (18.4)	17 (65.4)	<0.001
Transient ND, n (%)	18 (7.5)	18 (8.9)	–	0.085
Resternotomy for bleeding or tamponade, n (%)	43 (17.9)	30 (14.9)	13 (34.2)	0.004
Reanimation or shock, n (%)	23 (9.6)	13 (6.4)	10 (26.3)	0.001
Paraplegia, n (%)	9 (3.8)	6 (3.0)	3 (7.9)	0.156
Recurrent nerve palsy, n (%)	12 (5.0)	12 (5.9)	0 (0.0)	0.222
Pneumonia or other respiratory insufficiency, n (%)	61 (25.4)	49 (24.3)	12 (31.6)	0.342
Sepsis, n (%)	14 (5.8)	8 (4.0)	6 (15.8)	0.012
New-onset atrial fibrillation, n (%)	52 (21.7)	45 (22.3)	7 (18.4)	0.597
Myocardial infarction, n (%)	1 (0.4)	1 (0.5)	0 (0.0)	1.000

ATAD, acute type A dissection; ND, neurological deficit.

**Table S15** Risk factors for stroke after thoracic aortic surgery of patients with ATAD

Risk factors	OR	95% CI	P value
Advanced age (>70 years)	–	–	0.137
Preoperative cerebral malperfusion	–	–	0.396
Aortic diameter >5.90 cm	–	–	0.253
Preoperative critical state	–	–	0.925
Aortic arch surgery	–	–	0.648
High circulatory arrest time (>60 min)	–	–	0.195

ATAD, acute type A dissection; OR, odds ratio; CI, confidence interval.

**Table S16** Baseline characteristics of patients with aneurysm

Characteristics	All (n=948)	No stroke (n=914)	Stroke (n=34)	P value
Age (years), mean ± SD	61.2±14.5	61.0±14.5	67.1±13.0	0.015
Female gender, n (%)	340 (35.9)	326 (35.7)	14 (41.2)	0.511
Obesity (BMI >35 kg/m <sup>2</sup> ), n (%)	64 (6.8)	64 (7.0)	0 (0.0)	0.161
Arterial hypertension, n (%)	711 (75.0)	681 (74.5)	30 (88.2)	0.070
Any atherosclerotic entity, n (%)	353 (37.2)	330 (36.1)	23 (67.6)	<0.001
Coronary artery disease	302 (31.9)	281 (30.7)	21 (61.8)	<0.001
Extracardiac arteriopathy	98 (10.3)	90 (9.8)	8 (23.5)	0.018
Atrial fibrillation, n (%)	149 (15.7)	143 (15.6)	6 (17.6)	0.753
IDDM, n (%)	24 (2.5)	23 (2.5)	1 (2.9)	0.588
Chronic lung disease, n (%)	101 (10.7)	89 (9.7)	12 (35.3)	<0.001
Smoker, n (%)	385 (40.6)	366 (40.0)	19 (55.9)	0.065
Chronic kidney disease, n (%)	171 (18.0)	154 (16.8)	17 (50.0)	<0.001
Previous cardiac surgery, n (%)	71 (7.5)	69 (7.5)	2 (5.9)	1.000
EuroSCORE II, mean ± SD	5.8±6.2	5.5±5.5	12.9±15.0	0.008
Preoperative stroke, n (%)	59 (6.2)	56 (6.1)	3 (8.8)	0.464
Linked to aortic syndrome	5 (0.5)	5 (0.5)	0 (0.0)	1.000
Not linked to aortic syndrome	54 (5.7)	51 (5.6)	3 (8.8)	0.436
Preoperative critical state, n (%)	7 (0.7)	4 (0.4)	3 (8.8)	0.001
Preoperative cerebral malperfusion, n (%)	2 (0.2)	2 (0.2)	0 (0.0)	1.000
Genetic aortic syndrome, n (%)	80 (8.4)	79 (8.6)	1 (2.9)	0.352
Aortic rupture, n (%)	13 (1.4)	11 (1.2)	2 (5.9)	0.076
Maximum thoracic aortic diameter (mm), mean ± SD	5.50±1.16	5.49±1.17	5.88±0.95	0.060
Urgency status, n (%)				
Elective	917 (96.7)	889 (97.3)	28 (82.4)	0.001
Urgent	22 (2.3)	19 (2.1)	3 (8.8)	0.041
Emergent or salvage	7 (0.7)	4 (0.4)	3 (8.8)	0.001

SD, standard deviation; BMI, body mass index; IDDM, insulin-dependent diabetes mellitus.

**Table S17** Surgical procedures of patients with aneurysm

Procedures	All (n=948)	No stroke (n=914)	Stroke (n=34)	P value
Aortic root surgery, n (%)	368 (38.8)	359 (39.3)	9 (26.5)	0.132
Bentall procedure	177 (18.7)	169 (18.5)	8 (23.5)	0.459
Valve-sparing root replacement	191 (20.1)	190 (20.8)	1 (2.9)	0.011
Isolated ascending replacement, n (%)	76 (8.0)	74 (8.1)	2 (5.9)	1.000
Wheat (supracoronary + AVR), n (%)	240 (25.3)	232 (25.4)	8 (23.5)	0.807
Arch procedure, n (%)	266 (28.1)	246 (26.9)	20 (58.8)	<0.001
Hemiarch	196 (20.7)	184 (20.1)	12 (35.3)	0.032
Total arch	70 (7.4)	62 (6.8)	8 (23.5)	0.002
Conventional	18 (1.9)	18 (2.0)	0 (0.0)	1.000
FET	52 (5.5)	44 (4.8)	8 (23.5)	<0.001
Simplified FET technique	29 (3.1)	29 (3.2)	0 (0.0)	0.620
Descending procedure, n (%)	6 (0.6)	5 (0.5)	1 (2.9)	0.197
Concomitant surgery, n (%)				
CABG	154 (16.2)	143 (15.6)	11 (32.4)	0.010
TVR	14 (1.5)	13 (1.4)	1 (2.9)	0.402
MVR	53 (5.6)	51 (5.6)	2 (5.9)	0.715
VAD implantation	2 (0.2)	2 (0.2)	0 (0.0)	1.000

AVR, aortic valve replacement; FET, frozen elephant trunk; CABG, coronary artery bypass grafting; TVR, tricuspid valve replacement; MVR, mitral valve repair; VAD, ventricular assist device.

**Table S18** Intraoperative data of patients with aneurysm

Intraoperative data	All (n=948)	No stroke (n=914)	Stroke (n=34)	P value
Aortic surgeon (>20 aortic procedures per year), n (%)	564 (59.5)	545 (59.6)	19 (55.9)	0.662
Time of surgery, n (%)				
Weekend surgery	4 (0.4)	4 (0.4)	0 (0.0)	1.000
Night-time surgery	5 (0.5)	5 (0.5)	0 (0.0)	1.000
ECC time (min), mean ± SD	161.7±65.9	159.2±63.5	210.1±101.4	0.007
Aortic clamp time (min), mean ± SD	101.1±43.4	100.7±43.1	112.6±51.5	0.129
HCA with SACP, n (%)	225 (23.7)	208 (22.8)	17 (50.0)	<0.001
Circulatory arrest time (min), mean ± SD	26.5±16.4	25.4±15.2	38.5±24.1	0.023
CP time (min), mean ± SD	30.3±23.4	28.9±21.6	47.1±35.2	0.034
Deepest body temperature (°C), mean ± SD	30.4±3.3	30.5±3.2	28.1±4.1	0.002
Site of arterial cannulation, n (%)				
Ascending aorta or aortic arch	758 (80.0)	735 (80.4)	23 (67.6)	0.068
Innominate artery	119 (12.6)	114 (12.5)	5 (14.7)	0.605
Subclavian artery	51 (5.4)	47 (5.1)	4 (11.8)	0.104
Femoral artery	13 (1.4)	11 (1.2)	2 (5.9)	0.076

ECC, extracorporeal circulation; SD, standard deviation; HCA, hypothermic circulatory arrest; SACP, selective antegrade cerebral perfusion; CP, cerebral perfusion.

**Table S19** Outcome parameters of patients with aneurysm

Parameters	All (n=948)	No stroke (n=914)	Stroke (n=34)	P value
In-hospital-/30-day mortality, n (%)	31 (3.3)	–	–	–
One-year mortality, n (%)	46 (12.0)	33 (9.12)	13 (65.0)	<0.001
Transient ND, n (%)	11 (1.2)	11 (1.2)	–	–
Resternotomy for bleeding or tamponade, n (%)	81 (8.5)	75 (8.2)	6 (17.6)	0.062
Reanimation or shock, n (%)	43 (4.5)	38 (4.2)	5 (14.7)	0.016
Paraplegia, n (%)	3 (0.3)	1 (0.1)	2 (5.9)	0.004
Recurrent nerve palsy, n (%)	4 (0.4)	3 (0.3)	1 (2.9)	0.136
Pneumonia or other respiratory insufficiency, n (%)	81 (8.5)	66 (7.2)	15 (44.1)	<0.001
Sepsis, n (%)	10 (1.1)	5 (0.5)	5 (14.7)	<0.001
New-onset atrial fibrillation, n (%)	187 (19.7)	182 (19.9)	5 (14.7)	0.454
Myocardial infarction, n (%)	8 (0.8)	7 (0.8)	1 (2.9)	0.254

ND, neurological deficit.

**Table S20** Risk factors for stroke after thoracic aortic surgery of patients with aneurysm

Risk factors	OR	95% CI	P value
Advanced age (>70 years)	–	–	0.056
Any atherosclerotic entity	2.62	1.22–5.61	0.014
Chronic kidney disease	4.13	2.00–8.54	<0.001
Preoperative critical state	15.97	3.01–84.85	0.001
Total arch replacement	–	–	0.090
High circulatory arrest time (>60 min)	–	–	0.297

OR, odds ratio; CI, confidence interval.

**Table S21** Baseline characteristics of patients undergoing root surgery

Characteristics	All (n=451)	No stroke (n=431)	Stroke (n=20)	P value
Age (years), mean ± SD	54.9±15.5	54.6±15.5	61.6±14.0	0.048
Female gender, n (%)	114 (25.3)	110 (25.5)	4 (20.0)	0.579
Obesity (BMI >35 kg/m <sup>2</sup> ), n (%)	31 (6.9)	31 (7.2)	0 (0.0)	0.384
Arterial hypertension, n (%)	304 (67.4)	286 (66.4)	18 (90.0)	0.027
Any atherosclerotic entity, n (%)	122 (27.1)	112 (26.0)	10 (50.0)	0.018
Coronary artery disease	100 (22.2)	93 (21.6)	7 (35.0)	0.171
Extracardiac arteriopathy	38 (8.4)	32 (7.4)	6 (30.0)	0.004
Atrial fibrillation, n (%)	58 (12.9)	54 (12.5)	4 (20.0)	0.308
IDDM, n (%)	9 (2.0)	9 (2.1)	0 (0.0)	1.000
Chronic lung disease, n (%)	38 (8.4)	34 (7.9)	4 (20.0)	0.078
Smoker, n (%)	178 (39.5)	169 (39.2)	9 (45.0)	0.605
Chronic kidney disease, n (%)	61 (13.5)	55 (12.8)	6 (30.0)	0.040
Previous cardiac surgery, n (%)	48 (10.6)	45 (10.4)	3 (15.0)	0.460
EuroSCORE II, mean ± SD	7.9±9.3	7.5±9.1	15.4±11.8	0.008
Preoperative stroke, n (%)	23 (5.1)	21 (4.9)	2 (10.0)	0.271
Linked to aortic syndrome	4 (0.9)	4 (0.9)	0 (0.0)	1.000
Not linked to aortic syndrome	19 (4.2)	17 (3.9)	2 (10.0)	0.204
Preoperative critical state, n (%)	33 (7.3)	28 (6.5)	5 (25.0)	0.011
Preoperative cerebral malperfusion, n (%)	10 (2.2)	8 (1.9)	2 (10.0)	0.068
Genetic aortic syndrome, n (%)	88 (19.5)	87 (20.2)	1 (5.0)	0.145
Malfunction or infection of TEVAR or aortic graft, n (%)	4 (0.9)	4 (0.9)	0 (0.0)	1.000
Aneurysm, n (%)	368 (81.6)	359 (83.3)	9 (45.0)	<0.001
ATAD, n (%)	53 (11.8)	45 (10.4)	8 (40.0)	0.001
IMH, n (%)	5 (1.1)	4 (0.9)	1 (5.0)	0.204
PAU, n (%)	2 (0.4)	2 (0.5)	0 (0.0)	1.000
Chronic dissection, n (%)	13 (2.9)	12 (2.8)	1 (5.0)	0.450
Aortic rupture, n (%)	12 (2.7)	11 (2.6)	1 (5.0)	0.424
Maximum thoracic aortic diameter (mm), mean ± SD	5.58±1.52	5.59±1.54	5.47±1.04	0.740
Urgency status, n (%)				
Elective	381 (84.5)	370 (85.8)	11 (55.0)	0.001
Urgent	9 (2.0)	9 (2.1)	0 (0.0)	1.000
Emergent or salvage	61 (13.5)	52 (12.1)	9 (45.0)	<0.001

SD, standard deviation; BMI, body mass index; IDDM, insulin-dependent diabetes mellitus; TEVAR, thoracic endovascular aortic repair; ATAD, acute type A dissection; IMH, intramural hematoma; PAU, penetrating atherosclerotic ulcer.

**Table S22** Surgical procedures of patients undergoing root surgery

Procedures	All (n=451)	No stroke (n=431)	Stroke (n=20)	P value
Bentall procedure, n (%)	230 (51.0)	214 (49.7)	16 (80.0)	0.008
Valve-sparing root replacement, n (%)	221 (49.0)	217 (50.3)	4 (20.0)	0.008
Arch procedure, n (%)	145 (32.2)	132 (30.6)	13 (65.0)	0.001
Hemimarch	100 (22.2)	94 (21.8)	6 (30.0)	0.410
Total arch	45 (10.0)	38 (8.8)	7 (35.0)	0.002
Conventional	13 (2.9)	13 (3.0)	0 (0.0)	1.000
FET	32 (7.1)	25 (5.8)	7 (35.0)	<0.001
Simplified FET technique	14 (3.1)	12 (2.8)	2 (10.0)	0.124
Concomitant surgery, n (%)				
CABG	61 (13.5)	53 (12.3)	8 (40.0)	0.002
TVR	6 (1.3)	6 (1.4)	0 (0.0)	1.000
MVR	20 (4.4)	20 (4.6)	0 (0.0)	1.000
VAD implantation	2 (0.4)	2 (0.5)	0 (0.0)	1.000

FET, frozen elephant trunk; CABG, coronary artery bypass grafting; TVR, tricuspid valve replacement; MVR, mitral valve repair; VAD, ventricular assist device.

**Table S23** Intraoperative data of patients undergoing root surgery

Intraoperative data	All (n=451)	No stroke (n=431)	Stroke (n=20)	P value
Aortic surgeon (>20 aortic procedures per year), n (%)	301 (66.7)	289 (67.1)	12 (60.0)	0.513
Time of surgery, n (%)				
Weekend surgery	14 (3.1)	13 (3.0)	1 (5.0)	0.475
Night-time surgery	51 (11.3)	41 (9.5)	10 (50.0)	<0.001
ECC time (min), mean ± SD	219.0±77.7	214.5±70.8	318.5±138.7	0.004
Aortic clamp time (min), mean ± SD	142.0±49.4	140.4±47.5	178.0±71.8	0.036
HCA with SACP, n (%)	124 (27.5)	113 (26.2)	11 (55.0)	0.005
Circulatory arrest time (min), mean ± SD	35.2±31.3	33.2±27.8	52.1±51.5	0.181
CP time (min), mean ± SD	39.8±35.3	36.6±30.2	70.7±60.2	0.065
Deepest body temperature (°C), mean ± SD	29.5±3.4	29.7±3.3	26.5±4.1	<0.001
Site of arterial cannulation, n (%)				
Ascending aorta or aortic arch	346 (76.7)	336 (78.0)	10 (50.0)	0.011
Innominate artery	55 (12.2)	52 (12.1)	3 (15.0)	0.723
Subclavian artery	39 (8.6)	32 (7.4)	7 (35.0)	0.001
Femoral artery	4 (0.9)	4 (0.9)	0 (0.0)	1.000

ECC, extracorporeal circulation; SD, standard deviation; HCA, hypothermic circulatory arrest; SACP, selective antegrade cerebral perfusion; CP, cerebral perfusion.

**Table S24** Outcome parameters of patients undergoing root surgery

Parameters	All (n=451)	No stroke (n=431)	Stroke (n=20)	P value
In-hospital-/30-day mortality, n (%)	17 (3.8)	12 (2.8)	5 (25.0)	<0.001
One-year mortality, n (%)	25 (10.6)	15 (6.8)	10 (66.7)	<0.001
Transient ND, n (%)	10 (2.2)	10 (2.3)	–	–
Resternotomy for bleeding or tamponade, n (%)	52 (11.5)	42 (9.7)	10 (50.0)	<0.001
Reanimation or shock, n (%)	28 (6.2)	24 (5.6)	4 (20.0)	0.029
Paraplegia, n (%)	2 (0.4)	1 (0.2)	1 (5.0)	0.087
Recurrent nerve palsy, n (%)	6 (1.3)	6 (1.4)	0 (0.0)	1.000
Pneumonia or other respiratory insufficiency, n (%)	51 (11.3)	43 (10.0)	8 (40.0)	0.001
Sepsis, n (%)	8 (1.8)	6 (1.4)	2 (10.0)	0.045
New-onset atrial fibrillation, n (%)	79 (17.5)	76 (17.6)	3 (15.0)	1.000
Myocardial infarction, n (%)	6 (1.3)	5 (1.2)	1 (5.0)	0.239

ND, neurological deficit.

**Table S25** Risk factors for stroke after thoracic aortic surgery of patients undergoing root surgery

Risk factors	OR	95% CI	P value
Advanced age (>70 years)	3.23	1.23–8.48	0.017
Preoperative critical state	–	–	0.668
ATAD	6.58	2.48–17.46	<0.001
Total arch replacement	–	–	0.042

ATAD, acute type A dissection; OR, odds ratio; CI, confidence interval.

**Table S26** Baseline characteristics of patients undergoing total arch replacement

Characteristics	All (n=203)	No stroke (n=181)	Stroke (n=22)	P value
Age (years), mean ± SD	62.1±14.2	61.9±14.0	64.5±15.7	0.408
Female gender, n (%)	86 (42.4)	77 (42.5)	9 (40.9)	0.884
Obesity (BMI >35 kg/m <sup>2</sup> ), n (%)	7 (3.4)	7 (3.9)	0 (0.0)	1.000
Arterial hypertension, n (%)	179 (88.2)	159 (87.8)	20 (90.9)	1.000
Any atherosclerotic entity, n (%)	102 (50.2)	88 (48.6)	14 (63.6)	0.183
Coronary artery disease	59 (29.1)	49 (27.1)	10 (45.5)	0.073
Extracardiac arteriopathy	67 (33.0)	58 (32.0)	9 (40.9)	0.404
Atrial fibrillation, n (%)	24 (11.8)	21 (11.6)	3 (13.6)	0.730
IDDM, n (%)	7 (3.4)	6 (3.3)	1 (4.5)	0.558
Chronic lung disease, n (%)	33 (16.3)	28 (15.5)	5 (22.7)	0.367
Smoker, n (%)	71 (35.0)	62 (34.3)	9 (40.9)	0.537
Chronic kidney disease, n (%)	85 (41.9)	75 (41.4)	10 (45.5)	0.718
Previous cardiac surgery, n (%)	44 (21.7)	38 (21.0)	6 (27.3)	0.583
EuroSCORE II, mean ± SD	14.9±14.6	14.7±14.8	17.5±13.4	0.390
Preoperative stroke, n (%)	23 (11.3)	22 (12.1)	1 (4.5)	0.478
Linked to aortic syndrome	7 (3.4)	7 (3.9)	0 (0.0)	1.000
Not linked to aortic syndrome	16 (7.9)	15 (8.3)	1 (4.5)	1.000
Preoperative critical state, n (%)	44 (21.7)	40 (22.1)	4 (18.2)	0.790
Preoperative cerebral malperfusion, n (%)	19 (9.4)	14 (7.7)	5 (22.7)	0.039
Genetic aortic syndrome, n (%)	35 (17.2)	33 (18.2)	2 (9.1)	0.380
Malfunction or infection of TEVAR or aortic graft, n (%)	4 (2.0)	2 (1.1)	2 (9.1)	0.059
Aneurysm, n (%)	70 (34.5)	62 (34.3)	8 (36.4)	0.844
ATAD, n (%)	62 (30.5)	54 (29.8)	8 (36.4)	0.530
IMH, n (%)	8 (3.9)	8 (4.4)	0 (0.0)	0.603
PAU, n (%)	8 (3.9)	7 (3.9)	1 (4.5)	1.000
Chronic dissection, n (%)	45 (22.2)	42 (23.2)	3 (13.6)	0.419
Aortic rupture, n (%)	21 (10.3)	16 (8.8)	5 (22.7)	0.059
Maximum thoracic aortic diameter (mm), mean ± SD	5.80±1.38	5.83±1.41	5.59±1.18	0.469
Urgency status, n (%)				
Elective	121 (59.6)	108 (59.7)	13 (59.1)	0.958
Urgent	18 (8.9)	16 (8.8)	2 (9.1)	1.000
Emergent or salvage	64 (31.5)	57 (31.5)	7 (31.8)	0.975

SD, standard deviation; BMI, body mass index; IDDM, insulin-dependent diabetes mellitus; TEVAR, thoracic endovascular aortic repair; ATAD, acute type A dissection; IMH, intramural hematoma; PAU, penetrating atherosclerotic ulcer.

**Table S27** Surgical procedures of patients undergoing total arch replacement

Procedures	All (n=203)	No stroke (n=181)	Stroke (n=22)	P value
Aortic root surgery, n (%)	45 (22.2)	38 (21.0)	7 (31.8)	0.278
Bentall procedure	27 (13.3)	22 (12.2)	5 (22.7)	0.183
Valve-sparing root replacement	18 (8.9)	16 (8.8)	2 (9.1)	1.000
Wheat (supracoronary + AVR), n (%)	11 (5.4)	10 (5.5)	1 (4.5)	1.000
Conventional, n (%)	69 (34.0)	61 (33.7)	8 (36.4)	0.803
FET, n (%)	134 (66.0)	120 (66.3)	14 (63.6)	0.803
Simplified FET technique	70 (34.5)	67 (37.0)	3 (13.6)	0.029
Concomitant surgery, n (%)				
CABG	20 (9.9)	13 (7.2)	7 (31.8)	0.002
TVR	4 (2.0)	4 (2.2)	0 (0.0)	1.000
MVR	3 (1.5)	2 (1.1)	1 (4.5)	0.292

AVR, aortic valve replacement; FET, frozen elephant trunk; CABG, coronary artery bypass grafting; TVR, tricuspid valve replacement; MVR, mitral valve repair.

**Table S28** Intraoperative data of patients undergoing total arch replacement

Intraoperative data	All (n=203)	No stroke (n=181)	Stroke (n=22)	P value
Aortic surgeon (>20 aortic procedures per year), n (%)	159 (78.3)	140 (77.3)	19 (86.4)	0.421
Time of surgery, n (%)				
Weekend surgery	13 (6.4)	11 (6.1)	2 (9.1)	0.637
Night-time surgery	46 (22.7)	39 (21.5)	7 (31.8)	0.286
ECC time (min), mean $\pm$ SD	263.8 $\pm$ 78.5	256.1 $\pm$ 71.8	327.1 $\pm$ 102.5	0.004
Aortic clamp time (min), mean $\pm$ SD	130.5 $\pm$ 54.7	126.7 $\pm$ 50.3	161.1 $\pm$ 77.1	0.053
HCA with SACP, n (%)	195 (96.1)	174 (96.1)	21 (95.5)	1.000
Circulatory arrest time (min), mean $\pm$ SD	55.8 $\pm$ 27.7	54.4 $\pm$ 26.2	68.4 $\pm$ 36.7	0.028
CP time (min), mean $\pm$ SD	74.0 $\pm$ 32.5	72.3 $\pm$ 31.7	88.0 $\pm$ 36.7	0.031
Deepest body temperature ( $^{\circ}$ C), mean $\pm$ SD	24.2 $\pm$ 1.9	24.2 $\pm$ 1.9	23.7 $\pm$ 1.6	0.215
Site of arterial cannulation, n (%)				
Ascending aorta or aortic arch	75 (36.9)	66 (36.5)	9 (40.9)	0.683
Innominate artery	42 (20.7)	36 (19.9)	6 (27.3)	0.411
Subclavian artery	83 (40.9)	76 (42.0)	7 (31.8)	0.360
Femoral artery	4 (2.0)	4 (2.2)	0 (0.0)	1.000

ECC, extracorporeal circulation; SD, standard deviation; HCA, hypothermic circulatory arrest; SACP, selective antegrade cerebral perfusion; CP, cerebral perfusion.

**Table S29** Outcome parameters of patients undergoing total arch replacement

Parameters	All (n=203)	No stroke (n=181)	Stroke (n=22)	P value
In-hospital-/30-day mortality, n (%)	26 (12.8)	14 (7.7)	12 (54.5)	<0.001
One-year mortality, n (%)	34 (28.8)	20 (20.2)	14 (73.7)	<0.001
Transient ND, n (%)	14 (6.9)	14 (7.7)	–	–
Resternotomy for bleeding or tamponade, n (%)	26 (12.8)	19 (10.5)	7 (31.8)	0.011
Reanimation or shock, n (%)	18 (8.9)	13 (7.2)	5 (22.7)	0.031
Paraplegia, n (%)	7 (3.4)	6 (3.3)	1 (4.5)	0.558
Recurrent nerve palsy, n (%)	24 (11.8)	23 (12.7)	1 (4.5)	0.482
Pneumonia or other respiratory insufficiency, n (%)	50 (24.6)	44 (24.3)	6 (27.3)	0.761
Sepsis, n (%)	11 (5.4)	7 (3.9)	4 (18.2)	0.021
New-onset atrial fibrillation, n (%)	21 (10.3)	18 (9.9)	3 (13.6)	0.708
Myocardial infarction, n (%)	1 (0.5)	1 (0.6)	0 (0.0)	1.000

ND, neurological deficit.

**Table S30** Risk factors for stroke after total aortic arch replacement

Risk factors	OR	95% CI	P value
Preoperative cerebral malperfusion	–	–	0.105
Simplified FET	0.28	0.08–1.02	0.053
Concomitant CABG	5.73	1.94–16.9	0.002
High circulatory arrest time (>60 min)	–	–	0.709

FET, frozen elephant trunk; CABG, coronary artery bypass grafting; OR, odds ratio; CI, confidence interval.