

Supplemental Materials

MRI Analysis

All evaluation of intracranial aneurysms was performed on maximal intensity projection images (MIP). However, in case of tiny aneurysm (< 3 mm), source images were referred. The locations of aneurysms were categorized as follows: internal carotid artery (ICA); anterior, middle, and posterior cerebral arteries (ACA, MCA, and PCA, respectively); anterior and posterior communicating arteries; and vertebral and basilar arteries (VA and BA, respectively). The degree and location of extra- and intracranial artery stenoses were documented. For measuring carotid bulb stenosis, NASCET criteria was used.¹ For measuring intracranial artery stenosis, the percentage decrease in the diameter of most stenotic portion compared to that of proximal normal artery was calculated.²

References

- 1 Ferguson, G. G. *et al.* The North American symptomatic carotid endarterectomy trial: surgical results in 1415 patients. *Stroke* **30**, 1751-1758 (1999).
- 2 Samuels, O. B., Joseph, G. J., Lynn, M. J., Smith, H. A. & Chimowitz, M. I. A standardized method for measuring intracranial arterial stenosis. *American journal of neuro radiology* **21**, 643-646 (2000).

Supplemental Tables

eTable 1. Characteristics of patients between the groups that underwent and did not undergo TOF-MRA.

Characteristics	Patients with cognitive impairment who underwent TOF-MRA (n = 1753)	Patients with cognitive impairment who did not undergo TOF-MRA (n = 5897)	P value
Sex (n)			.002
Female	1044 (59.6%, 1044/1753)	3778 (64.1%, 3778/5897)	
Male	709 (40.4%, 704/1753)	2119 (35.9%, 2119/5897)	
Age (years)	70.2 ± 10.6	69.9 ± 10.9	.36
Education (years)	9.7 ± 5.4	9.9 ± 5.3	.21
MMSE (0–30 points)	23.9 ± 5.5	23.5 ± 5.4	.02
GDS (1–7 scales)	3.2 ± 2.1	3.2 ± 1.1	.42
CDR (0–3 scales)	0.6 ± 0.5	0.6 ± 0.5	.35
Vascular risk			
Hypertension	980 (58.7%, 980/1669)	2748 (50.4%, 2748/5454)	< .001
Diabetes	513 (31.1%, 513/1651)	1338 (24.8%, 1338/5393)	< .001
Dyslipidemia	567 (38.1%, 567/1490)	1659 (32.5%, 1659/5101)	< .001
Smoking	419 (27.1%, 419/1548)	1236 (24.5%, 1236/5046)	.08
Alcohol	555 (36.3%, 555/1529)	1861 (37.0%, 1861/5025)	.60
Obesity	59 (3.9%, 59/1501)	117 (2.3%, 117/5021)	.002
Previous stroke	110 (7.6%, 110/1453)	417 (8.4%, 417/4961)	.36
Ischemic heart disease	127 (8.8%, 127/1448)	380 (7.8%, 380/4852)	.36

Note.—Values denote mean ± standard deviation and number (%). Due to missing data, the denominators for each vascular risk factor were different. MMSE = Mini-Mental State Examination. GDS = Global Deterioration Scale. CDR = Clinical Dementia Rating

eTable 2. Characteristics of the treated aneurysms

Patients	Number of aneurysms	Size (mm)	Location	Bleb	Treatment
#1	1	4.5	MCA	Absent	Coiling
#2	1	3	ICA	Absent	Coiling
#3	1	6.5	MCA	Absent	Coiling
#4	1	5	MCA	Absent	Coiling
#5	3	6, <3, <3	Pcom, ICA	Absent	Coiling
#6	2	12, 8	Pcom	Present	Clipping and coiling
#7	1	4	MCA	Absent	Coiling
#8	1	4.5	ACA	Absent	Coiling
#9	1	8	ICA	Absent	Coiling
#10	1	3.5	ACA	Absent	Coiling
#11	2	8, 3	BA, Acom	Absent	Coiling

MCA = middle cerebral artery. ICA = internal carotid artery. Pcom = posterior communicating artery. ACA = anterior cerebral artery. BA = basilar artery. Acom = anterior communicating artery.

eTable 3. Characteristics of the treated stenoses

Patients	Location	Grade	Treatment
#1	Carotid bulb	Severe stenosis	Endarterectomy
#2	Carotid bulb	Moderate stenosis	Endarterectomy
#3	Carotid bulb	Severe stenosis	Endarterectomy
#4	Carotid bulb	Occlusion	Endarterectomy

eTable 4. Sequence parameters for MR protocols

Parameter	3D T1WI	T2WI	T2 FLAIR	SWI	DTI	TOF-MRA (Intracranial vessels)	TOF-MRA (Neck vessels)
Sequences	3D, FFE	2D, TSE	2D, TSE	3D, FFE	EPI	3D, FFE	3D, FFE
TE (ms)	2.9	3000	125	7.2	78	3.5	3.5
TR (ms)	6.5	80	9000 (TI* 2500)	31	4013	21	25
Flip angle (°)	9	90	90	17	90	20	20
FOV (mm) (RL × AP × FH) [†]	211 × 256 × 256	220 × 220	220 × 220	179 × 220 × 146	224 × 224 × 140	200 × 200 × 108	150 × 150 × 100
Voxel (pixel) size (mm)	1.0 × 1.0 × 1.0	0.4 × 0.4	0.9 × 0.9	0.4 × 0.4 × 2.0	1.8 × 1.8 × 2.0	0.4 × 0.4 × 0.6	0.3 × 0.3 × 1.0
Number of slices	211	38	38	73	70	180	100
Slice orientation	Sagittal	Axial	Axial	Axial	Axial	Axial	Axial
Slice thickness (mm)	1	4	4	2	2	0.6	1

Note.—* Inversion time. † Right/left; anterior/posterior; and foot/head. TOF-MRA = time-of-flight magnetic resonance angiography. T1WI = T1-weighted image. T2WI = T2-weighted image. FLAIR = fluid-attenuated inversion recovery image. SWI = susceptibility-weighted image. DTI = diffusion tensor image. FFE = fast field echo. TSE = turbo spin echo. EPI = echo-planar imaging. TE = echo time. TR = repetition time. FOV = field of view