On-line Table 1: Clinical-radiologic data of the 38 patients included in the study[a]

Patient No.	Sex	Age at Clinical Onset (yr)	Symptoms	Side	Suzuki Classification	Surgical Procedure	Age Time Point 1 (yr)	Age Time Point 2 (yr)	Interval between Time Points (mo)	Postoperative Outcome	MRA Outcome
1	M	1	Right hemiparesis	Left	III	EDAMS	1	5	53	Excellent	↓ Deep CV and ↑ Pial CV
				Right	II	EDAMS	1	5	47		↓ Deep CV and ↑ Pial CV
2	F	2	Aphasia, hypotonia	Left	III	EDAMS	2	4	15	Fair	↑ Pial CV
3	F	4	Central retinal artery occlusion	Left	III	EDAMS	4	8	36	Excellent	↑ Pial CV
				Right	III	EDAMS	4	8	43		↓ Deep CV
4	F	13	Right hemiparesis	Left	II	EDAMS	13	17	35	Excellent	↓ Deep CV and ↑ Pial CV
				Right	III	EDAMS	13	17	50		↓ Deep CV and ↑ Pial CV
5	M	11	TIA, right facial nerve deficit	Left	IV	EDAMS	11	14	38	Good	↑ Pial CV
				Right	III	EDAMS	11	14	41		↑ Pial CV
6	M	6	TIA	Right	III	EDAMS	6	7	12	Fair	Unchanged
7	M	1	Seizure	Left	III	EDAMS	1	3	22	Good	↑ Pial CV
				Right	II	EDAMS	1	3	27		↓ Deep CV and ↑ Pial CV
8	M	5	TIA, headache	Left	III	EDAMS	5	6	11	Fair	↓ Deep CV
9	F	7	Headache	Left	III	EDAMS	7	10	36	Good	↓ Deep CV and ↑ Pial CV
10	F	13	Right hemiparesis	Left	III	EDAMS	13	18	52	Excellent	↓ Deep CV and ↑ Pial CV
				Right	III	EDAMS	13	18	48		↓ Deep CV and ↑ Pial CV
11	F	8	TIA	Right	IV	EDAMS	8	9	11	Fair	↓ Deep CV
12	F	1	Seizure	Right	III	EDAMS	1	6	62	Excellent	↓ Deep CV and ↑ Pial CV
				Left	III	EDAMS	1	6	58		↓ Deep CV and ↑ Pial CV
13	F	1	Seizure	Right	IV	EDAMS	1	2	5	Fair	Unchanged
14	M	1	Headache	Left	III	EDAMS	1	2	5	Excellent	↓ Deep CV
15	F	2	Seizure	Right	II	EDAMS	1	2	5	Excellent	↑ Pial CV
16	M	13	Right hemiparesis	Right	III	EDAMS	13	18	64	Excellent	↓ Deep CV and ↑ Pial CV
				Left	III	EDAMS	13	18	57		↓ Deep CV and ↑ Pial CV
17	F	1	TIA	Left	IV	EDAMS	1	4	36	Excellent	↓ Deep CV and ↑ Pial CV
18	F	1	Headache	Left	II	EDAMS	1	2	14	Excellent	↓ Deep CV and ↑ Pial CV
19	M	1	Headache	Left	III	EDAMS	1	3	30	Fair	↓ Deep CV
20	F	11	TIA/seizure	Left	IV	EDAMS	11	16	56	Good	↑ Pial CV
21	F	12	Headache	Right	III	EDAMS	12	15	43	Good	↓ Deep CV
				Left	III	EDAMS	12	15	40		↑ Pial CV
22	M	1	Headache	Left	II	EDAMS	1	2	11	Excellent	↓ Deep CV and ↑ Pial CV
23	F	12	Left hemiparesis	Left	IV	EDAMS	12	15	42	Excellent	↓ Deep CV and ↑ Pial CV
24	F	6	TIA, headache	Left	II	EDAMS	6	8	18	Good	↑ Pial CV
25	M	1	Quadriplegia	Right	II	EDAMS	1	4	33	Good	↓ Deep CV and ↑ Pial CV
				Left	II	EDAMS	1	4	33		↑ Pial CV
26	M	1	TIA	Left	III	EDAMS	1	1	5	Fair	Unchanged
27	F	1	TIA	Left	III	EDAMS	1	2	11	Excellent	↓ Deep CV and ↑ Pial CV
28	F	1	Headache	Right	III	EDAMS	1	1	5	Excellent	↓ Deep CV
29	M	10	Mild headache	Right	II	–	10	14	52	–	↑ Deep CV
				Left	II	–	10	14	52		Unchanged
30	F	13	Drug-responsive seizure	Right	II	–	13	17	41	–	Unchanged
				Left	II	–	13	17	41		↑ Deep CV
31	F	5	Mild headache	Right	III	–	5	8	35	–	Unchanged
				Left	II	–	5	8	35		Unchanged
32	F	2	Drug-responsive seizure	Right	III	–	2	3	12	–	Unchanged
				Left	III	–	2	3	12		Unchanged
33	M	14	Drug-responsive seizure	Right	II	–	14	15	15	–	↑ Deep CV
				Left	I	–	14	15	15		↑ Deep CV
34	F	3	Mild headache	Right	I	–	3	6	36	–	Unchanged
				Left	II	–	3	6	36		Unchanged
35	F	1	Mild headache	Right	II	–	1	5	52	–	Unchanged
				Left	I	–	1	5	52		Unchanged
36	M	3	Mild headache	Right	II	–	3	7	41	–	↑ Deep CV
				Left	I	–	3	7	41		Unchanged
37	M	8	Mild headache	Right	II	–	8	11	35	–	↑ Deep CV
				Left	II	–	8	11	35		↑ Deep CV
38	F	10	Mild headache	Right	II	–	10	11	12	–	Unchanged
				Left	I	–	10	11	12		Unchanged

Note:—CV indicates collateral vessels; –, not operated; ↑, increased; ↓, decreased.

[a] The Moyamoya vasculopathy is classified, according to the Suzuki classification, into 6 stages based on the findings of conventional angiography: I, stenosis of the intracranial bifurcation of the internal carotid artery; II, first appearance of Moyamoya vessels (dilation of the intracerebral arteries); III, increase of Moyamoya vessels (disappearance of the middle cerebral and anterior cerebral arteries); IV, minimization of Moyamoya vessels (disappearance of the middle cerebral and anterior cerebral arteries); V, shrinking of Moyamoya vessels (disappearance of the intracerebral arteries); and VI, disappearance of Moyamoya vessels and dominance of collateral circulation from only the external carotid system.

On-line Table 2: Comparison of DSC CBF-related parameters at first MRI and at last follow-up between surgical and nonsurgical brain hemispheres

Index		Surgical		Nonsurgical		P[a]
Central nCBF (mean)	Before the operation	1.806 ± 1.001	First MRI	1.820 ± 0.916		.969
	Last follow-up	1.107 ± 0.835	Last follow-up	1.856 ± 0.863		.005[b]
% Variance central nCBF		−33.8%		10%		<.001[b]
Cortical nCBF (mean)	Before the operation	1.224 ± 0.693	First MRI	1.328 ± 0.663		.772
	Last follow-up	2.811 ± 2.298	Last follow-up	1.363 ± 0.612		.011[b]
% Variance cortical nCBF		152.1%		12.1%		.001[b]
Mean nCBF	Before the operation	1.515 ± 0.814	First MRI	1.574 ± 0.777		.921
	Last follow-up	1.959 ± 1.474	Last follow-up	1.610 ± 0.725		.334
% Variance mean nCBF		47.4%		11%		.121
hdSD (mean)	Before the operation	1.515 ± 0.364	First MRI	1.359 ± 0.233		.173
	Last follow-up	0.454 ± 0.239	Last follow-up	1.342 ± 0.241		<.001[b]
% Variance hdSD		−68.8%		−1.2%		<.001[b]

[a] Significance level of 1-way analysis of covariance used to compare CBF-related parameters in surgical and nonsurgical brain hemispheres.
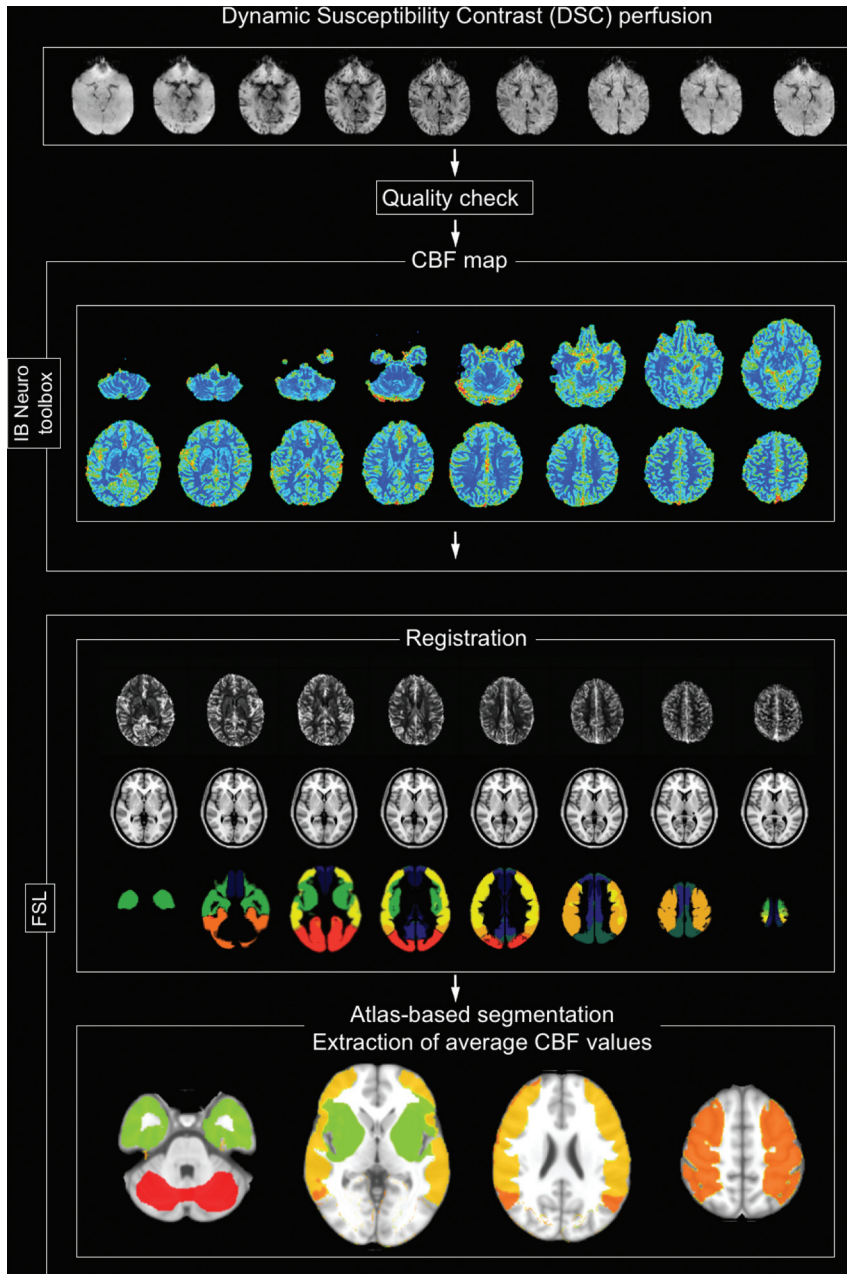[b] Significant.

On-line Table 3: Pairwise post hoc comparisons of CBF-related parameters that were different for clinical outcome categories
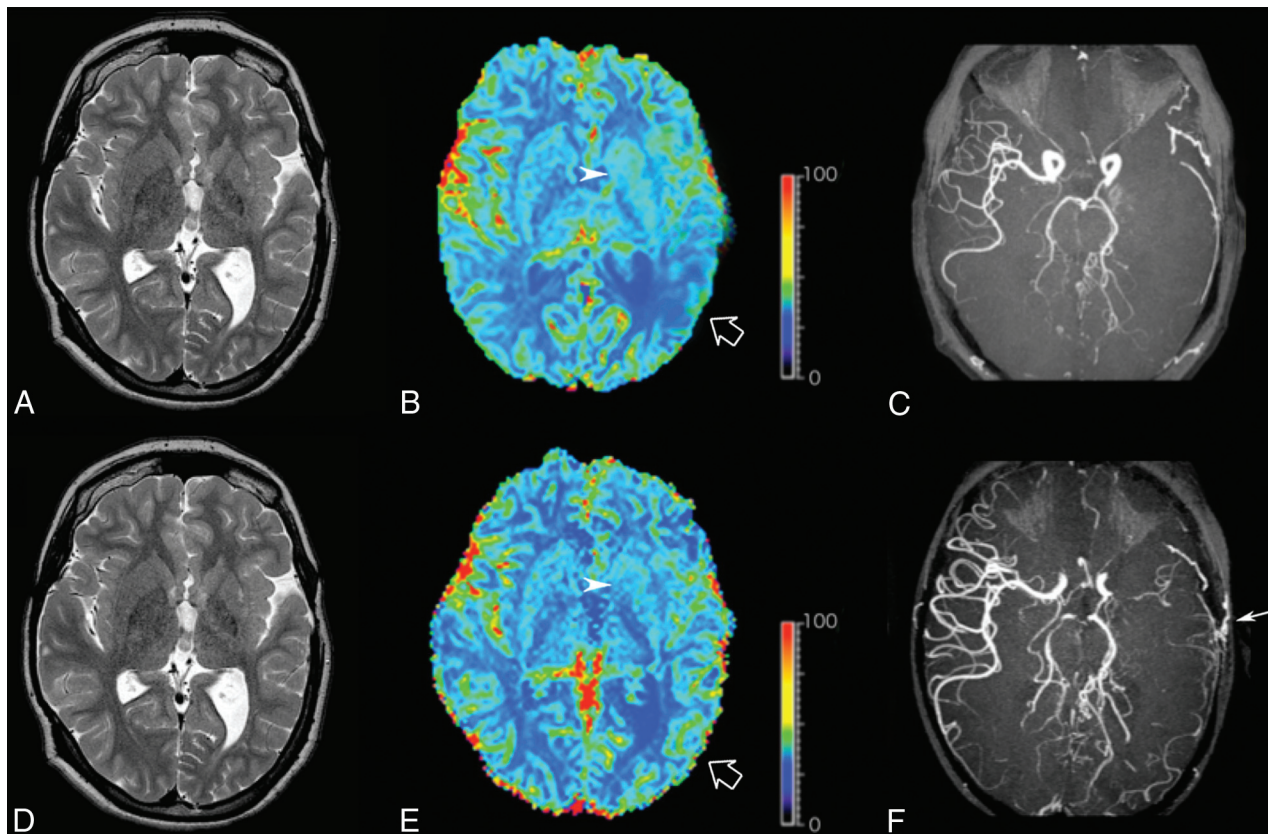
Perfusion Index	(I) Clinical Category	(J) Clinical Category	Mean Difference (I − J)	SD	P[a]	95% Confidence Interval Lower Limit	Upper Limit
DSC hdSD TP2	Fair	Good	0.191	0.129	.380	−0.133	0.514
		Excellent	0.361	0.119	.014[b]	0.062	0.661
	Good	Fair	−0.191	0.129	.380	−0.514	0.133
		Excellent	0.171	0.099	.255	−0.078	0.419
	Excellent	Fair	−0.0361	0.119	.014[b]	−0.661	−0.062
		Good	−0.171	0.099	.255	−0.419	0.078
DSC hdSD TP3	Fair	Good	0.22	0.074	.017[b]	0.032	0.407
		Excellent	0.455	0.069	<.001[b]	0.282	0.629
	Good	Fair	−0.22	0.074	.017[b]	−0.407	−0.032
		Excellent	0.236	0.057	.001[b]	0.092	0.379
	Excellent	Fair	−0.455	0.069	<.001[b]	−0.629	−0.282
		Good	−0.236	0.057	.001[b]	−0.379	−0.092
Early DSC % variance hdSD	Fair	Good	18.766	7.026	.035[b]	1.096	36.436
		Excellent	27.578	6.513	.001[b]	11.196	43.959
	Good	Fair	−18.766	7.026	.035[b]	−36.436	−1.096
		Excellent	8.812	5.398	.300	−4.764	22.388
	Excellent	Fair	−27.578	6.513	.001[b]	−43.959	−11.196
		Good	−8.812	5.398	.300	−22.388	4.764
Late DSC % variance hdSD	Fair	Good	19.552	3.677	<.001[b]	10.303	28.801
		Excellent	33.275	3.409	<.001[b]	24.7	41.849
	Good	Fair	−19.552	3.677	<.001[b]	−28.801	−10.303
		Excellent	13.723	2.825	<.001[b]	6.616	20.829
	Excellent	Fair	−33.275	3.409	<.001[b]	−41.849	−24.7
		Good	−13.723	2.825	<.001[b]	−20.829	−6.616
Early DSC % variance cortical nCBF	Fair	Good	−42.236	44.024	.718	−152.959	68.487
		Excellent	−72.700	40.814	.232	−175.348	29.948
	Good	Fair	42.236	44.024	.718	−68.487	152.959
		Excellent	−30.464	33.825	.755	−115.537	54.608
	Excellent	Fair	72.700	40.814	.232	−29.948	175.348
		Good	30.464	33.825	.755	−54.608	115.537
Late DSC % variance cortical nCBF	Fair	Good	−76.792	80.044	.718	−278.107	124.523
		Excellent	−132.182	74.207	.232	−318.815	54.451
	Good	Fair	76.792	80.044	.718	−124.523	278.107
		Excellent	−55.39	61.501	.755	−210.067	99.288
	Excellent	Fair	132.182	74.207	.232	−54.451	318.815
		Good	55.39	61.501	.755	−99.288	210.067

[a] Comparisons were made using a 1-way analysis of covariance, and the Sidak correction for multiple comparisons was applied.
[b] Significant.

ON-LINE FIG 1. Flowchart of the pipeline used for DSC-PWI data analysis. The last row of images shows the automated determination of VOIs in the MCA territories overlaid on anatomic T1-weighted images. The average normalized CBF value determined from the green VOI corresponds to the central nCBF (proximal MCA territory). The average nCBF values determined from the yellow and orange VOIs correspond to the cortical nCBF (middle and distal MCA regions). The average CBF value determined from the red VOI at the cerebellar level is used for normalization.

ON-LINE FIG 2. Representative T2-weighted images (*A* and *D*), DSC-CBF (*B* and *E*), and noncontrast MR angiography (*C* and *F*) of pre- (*A–C*) and postoperative (*D–F*) images in a 12-year-old patient with left Moyamoya disease treated with surgical indirect revascularization (EDAMS) (*white arrow*). The *empty arrow* indicates the left temporal region with reduced values of CBF before the operation (*B*). DSC-PWI acquired 42 months after left EDAMS shows improvement in CBF in the left temporal lobe (*empty arrow*, *E*). *Arrowheads* indicate preoperative hyperperfusion of the proximal MCA region (*B*), which returns to normal at postoperative PWI (*E*). The color scale unit of the CBF map is mL/100 mg/min.