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Carotid Artery Stenosis in CABG Patients with History of Neurologic Event

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Disclosures

All the authors have no conflicts to disclose.

History of Neurologic Event

is a risk factor for neurologic complications after CABG

Newman, Circulation 1996;94:II74
McKhann, Ann Thorac Surg 1997;63:516
Stamou, Stroke, 2001;32:1508
Filsoufi, Ann Thorac Surg, 2008;85:862
Halkos, Ann Thorac Surg 2008;86:504
Tarakji, JAMA 2011;305:381

Carotid Artery Stenosis in CABG

D'Agostino et al. Ann Thorac Surg 1996

28 patients with symptomatic carotid disease underwent isolated CABG, and ipsilateral stroke occurred in only one.

Li et al. Arch Neurol 2009

Among 239 patients (234 asymptomatic) with ≥50 percent carotid stenosis, perioperative ischemic stroke occurred in 18 (7.5 percent). However, only four of these strokes occurred in the ipsilateral territory.

Mahmoudi et al. Stroke 2011

117 patients with asymptomatic carotid stenosis (≥75 percent) and 761 patients without carotid stenosis had similar rates of in-hospital stroke (3.4% vs 3.6%).

Background

Significance of CAS is not clear in patients who have previous history of NE and undergo CABG.

Objective

To assess the significance of CAS in patients with NE who undergo CABG

- Is CAS an independent risk factor?
- Could any surgical procedures reduce the risk to these patients?

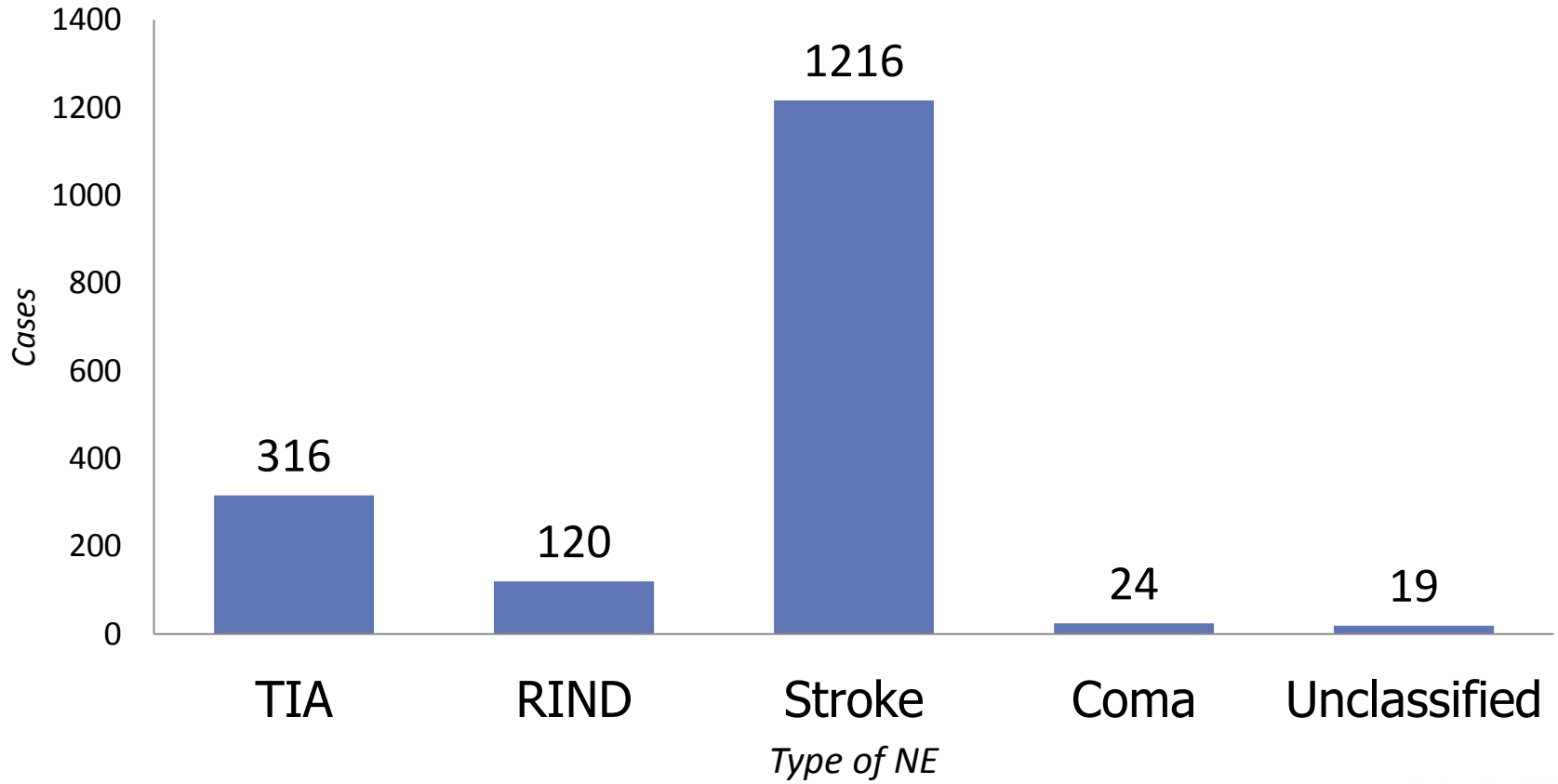
JACVSD

Motomura et al. Ann Thorac Surg. 2008;86.
Motomura et al. Circulation. 2008;118:S.

2000	started in 5 institutions
2002	21 institutions, 2,000 cases
2003	64 institutions, 5,100 cases
2005	112 institutions, 22,000 cases
2007	Japan SCORE began
2008	176 institutions, 76,000 cases
2010	244 institutions, 105,000 cases
2012	456 institutions, 176,000 cases

Study Patients

13109 patients undergoing isolated CABG between 2008 and 2009 were enrolled into JACVSD. Of them, all the patients with previous history of NE were analyzed (n=1695, 368 cases had CAS).



Patient Profile

	NE history n=1695	No NE history n=11414	P
Age	**70.2±8.2**	67.9±9.7	<.001
Body mass index	**23.3±3.3**	23.7±3.4	<.001
Thoracic aortic disease (%)	**2.9**	2.1	.023
Peripheral arterial disease (%)	**29.6**	14.4	<.001
CAS ≥ 75% (%)	**21.7**	6.1	<.001
NE onset within 2weeks (%)	**4.1**	N/A	N/A
Renal impairment (%)	**15.7**	12.4	<.001
Hemodialysis (%)	8.2	7.0	.085
Smoking within one month (%)	16.0	17.9	.057

Cardiac Profile

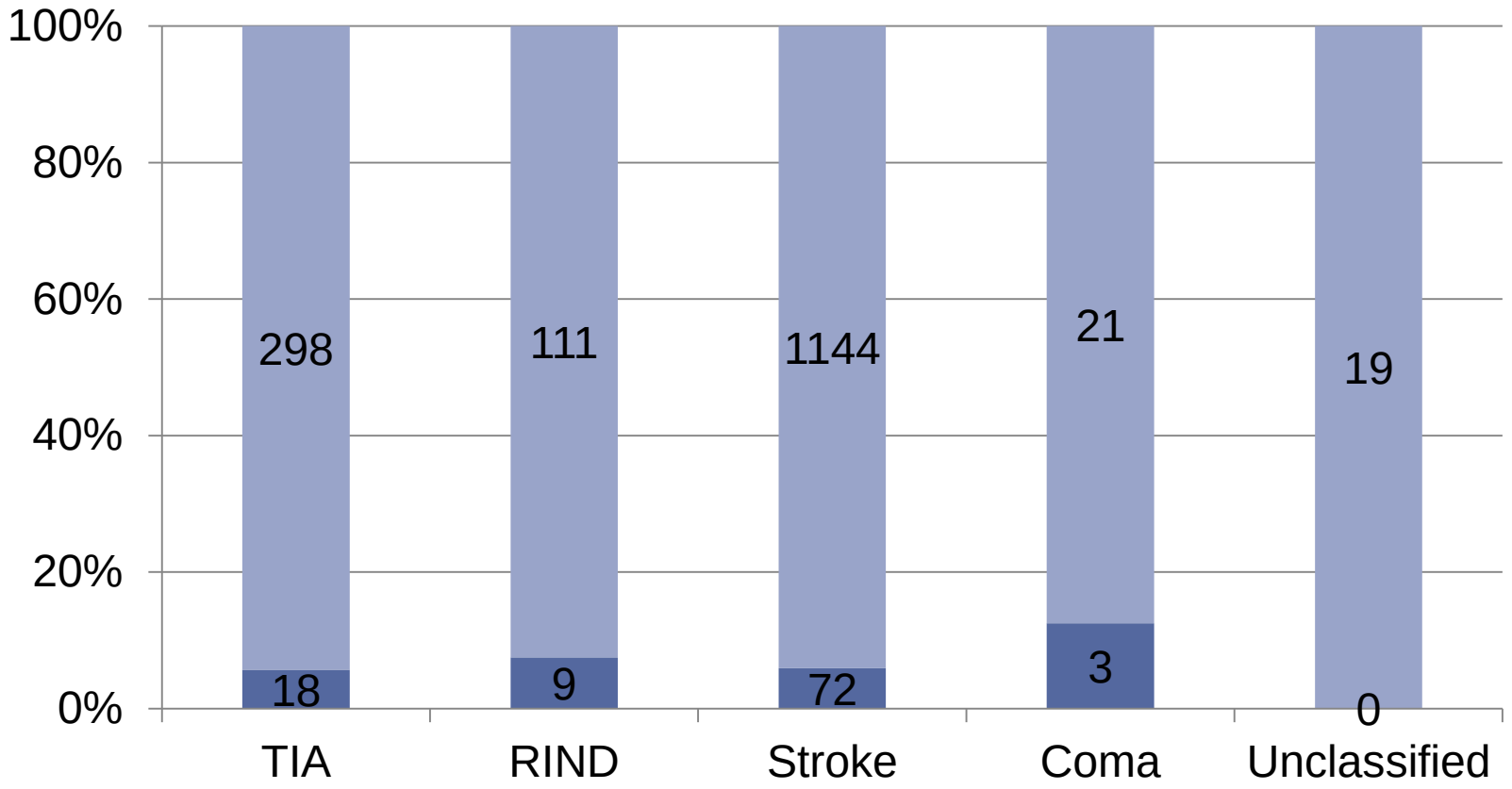
	NE history n=1695	No NE history n=11414	P
3VD(%)	**73.7**	68.5	<.001
CHF(%)	**15.1**	11.3	<.001
NYHA ≥ III (%)	**25.6**	21.3	<.001
Arrhythmia (%)	**12.3**	7.5	<.001
MI(%)	39.2	36.8	.059
Prior cardiac surgery(%)	1.8	2.0	.570
Emergent Surgery(%)	5.7	6.9	.088

Surgical Profile

	NE history	No NE history	P
	n=1695	n=11414	
Operation time (min)	321±105	321±169	.968
On-pump CABG (%)	**27.8**	32.7	<.001
CPB time (min)	142±57	138±53	.213
Distal anastomosis	3.0±1.2	3.1±1.2	.079
ITA use (%)	93.4	93.3	.913
Intraoperative VF (%)	0.1	0.3	.425

Study Endpoint: Neurologic Complications

Type of preoperative NE did not affect the incidence.



Fisher's Exact Test P =.471

Methods

1. Preoperative risk factor analysis

   to identify independent risk factors

2. Surgical factor analysis

   to evaluate impact of surgical procedures

Variables in Preoperative Risk Factor Analysis

Age

Renal impairment

Hemodialysis

NE onset within 2 weeks

Vascular disease

Thoracic aortic disease

Congestive heart failure

Unstable angina pectoris

Cardiogenic shock

Newly observed arrhythmia

Prior cardiac surgery

Emergent surgery

NYHA class ≥ III

LVEF < 30%

CAS ≥ 75%

Variables Added in Surgical Factor Analysis

Operation time (per min)

On pump CABG

CPB time ≥ 180 min

Non-use of ITA

Distal anastomoses 3

Distal anastomoses 4-5

Distal anastomoses ≥ 6

Inrtaoperative VF

Operative Outcomes

Outcome(%)	**NE history** n=1695	No NE history n=11414	P
Neurologic complications	**6.0**	2.8	<.001
Stroke	**3.0**	1.3	<.001
TIA	**2.7**	1.2	<.001
Paraparesis	0.4	0.2	.269
Coma	0.9	0.5	.077
Mortality	**2.9**	1.9	.009

CAS and Neurologic Complications

Study Patients	**w/ CAS**	w/o CAS	P
n=1695	n=368	n=1327	
Neurologic complications (%)	**8.7**	5.3	.018

Result 1.
Preoperative independent risk factors

	OR	95 % CI	P
Prior cardiac surgery	**3.80**	1.45-10.00	.007
NE onset within 2 weeks	**2.90**	1.43-5.90	.003
Emergent surgery	**2.76**	1.48-5.14	.001
Carotid artery stenosis	**1.93**	1.24-3.02	.004
Age	**1.18**	1.02-1.37	.023
Thoracic aortic disease	2.25	0.94-5.37	.067
Hemodialysis	1.91	0.99-3.68	.052

Result 2.
No surgical predictors were found.

	OR	95 % CI	P
Operation time (per min)	1.00	0.999-1.003	.381
On pump CABG	1.02	0.61-1.72	.936
CPB time ≥ 180 min	1.40	0.59-3.30	.443
Non-use of ITA	0.78	0.35-1.76	.551
Distal anastomoses 3	0.89	0.52-1.52	.662
Distal anastomoses 4-5	1.15	0.67-1.98	.616
Distal anastomoses ≥ 6	1.30	0.28-5.94	.739
Intraoperative VF	7.69	0.27-220.65	.233

Discussion

Symptomatic carotid artery stenosis

- Sudden onset
- Referable to the appropriate distribution (ipsilateral)
- Occurrence within the previous six months

N Engl J Med 1991; 325:445

Unconsidered surgical factors in this study

- Aortic manipulation
- Hemodynamic management
- etc.

Other approaches

- Carotid revascularization
- Percutaneous coronary intervention
- etc.

Summary

- CAS, regardless of whether it was symptomatic or not, was an independent risk factor for neurologic complications among the patients with NE history.
- No surgical procedures, evaluated in this study, were associated with the neurologic complications.

Conclusion

- The evaluation of carotid artery should be performed prior to CABG for patients who have history of NE.
- Prophylactic carotid revascularization and/or other approaches are worth considering in the presence of history of NE and CAS.