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Vertebral Artery Origin Stenosis: Epidemiology and Natural History

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Disclosure Information

- Financial Disclosures
  - Counsultant for Boerhinger Ingelheim,

ACCF/AHA/ASA Guidelines 2011

Noninvasive imaging by CTA or MRA for detection of vertebral artery disease

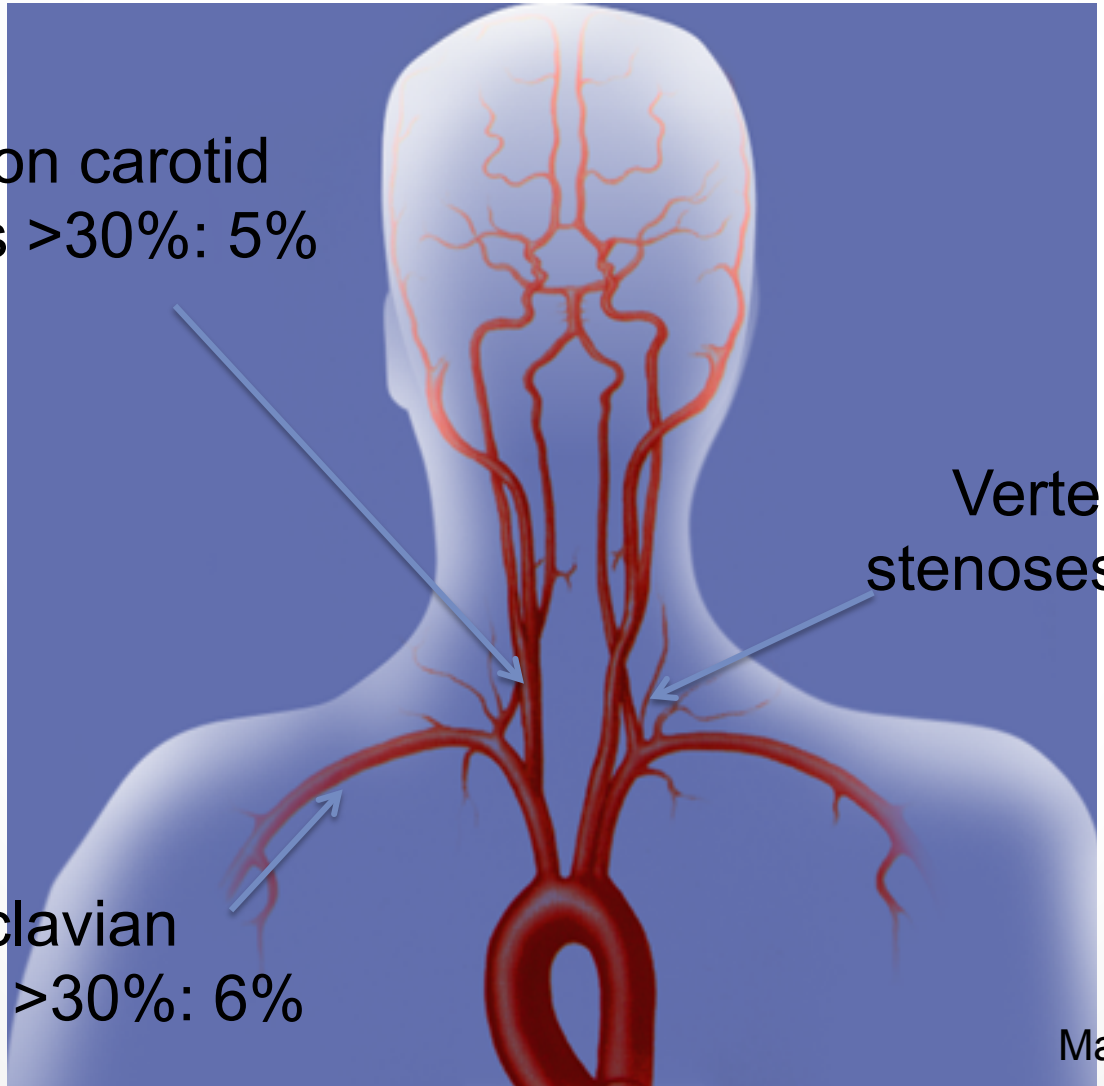
- should be part of the initial evaluation of patients with neurological symptoms referable to the posterior circulation (Level of Evidence: C)
- should be performed in patients with asymptomatic bilateral carotid occlusions or unilateral carotid artery occlusion and incomplete circle of Willis. (Level of Evidence: C)
- Antiplatelet drug therapy is recommended …

  ischemic stroke or TIA associated with extracranial vertebral atherosclerosis. (Level of Evidence: B)

ACCF/AHA/ASA Guidelines 2011

- Percutaneous endovascular angioplasty and stenting is reasonable for patients with symptomatic posterior cerebral or cerebellar ischemia caused **by subclavian artery stenosis** (subclavian steal syndrome) who are at high risk of surgical complications. (Level of Evidence: C)
- Asymptomatic patients with asymmetrical upper-limb blood pressure, periclavicular bruit, or flow reversal in a vertebral artery caused by **subclavian artery stenosis should not undergo** revascularization unless the internal mammary artery is required for myocardial revascularization. (Level of Evidence: C)

Proximal atherothrombosis prevalence



Mazighi et al Stroke 2009

Proximal atherothrombosis Association with other locations

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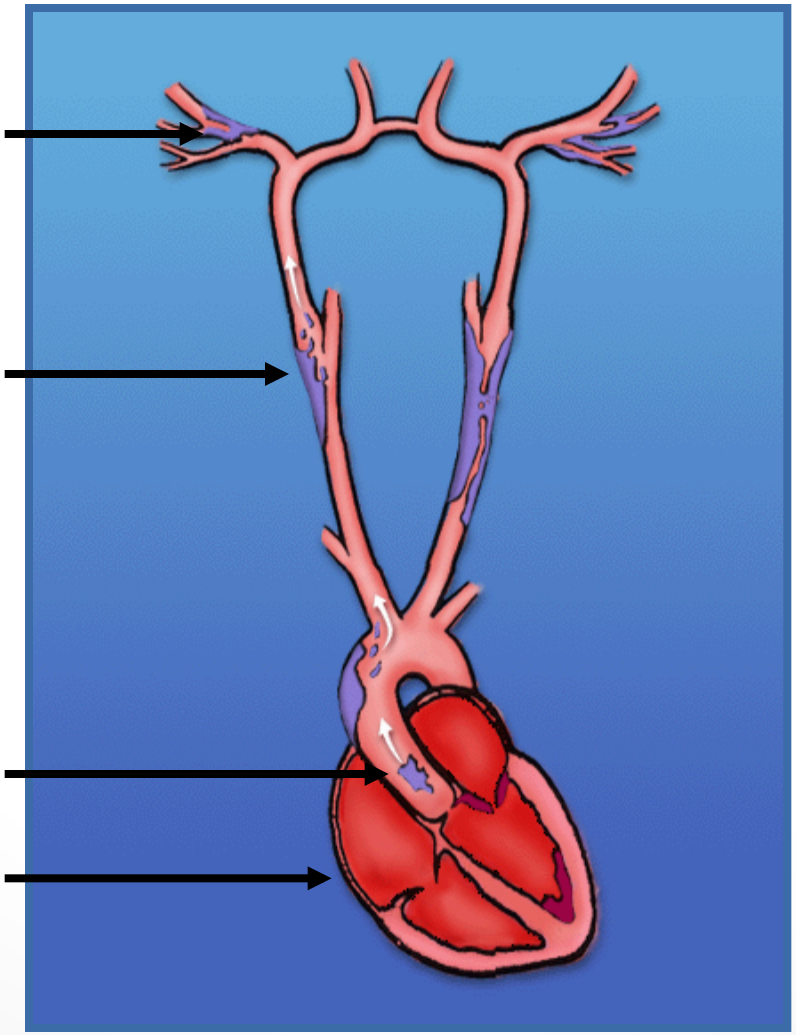


Mazighi et al Stroke 2009

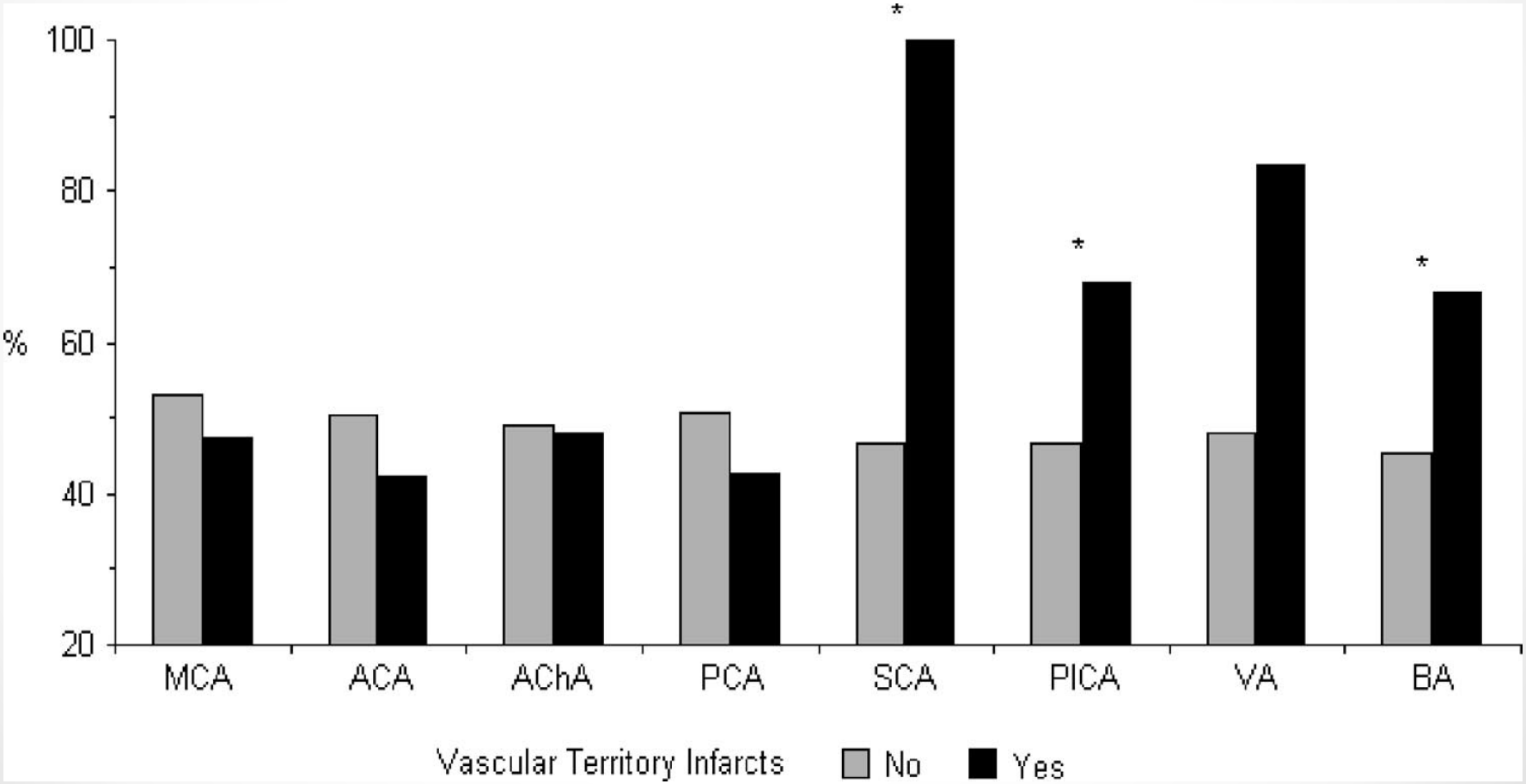
Autopsy Prevalence of Proximal Extracranial Atherosclerosis in Patients with Fatal Stroke

- 339 consecutive autopsies of fatal stroke patients

Severity	No. of Patients (%)			
	Any Artery	CCA	I/SA	VA
None	180 (53.1)	260 (76.7)	271 (79.9)	259 (76.4)
Non stenotic plaques	92 (27.1)	61 (18.0)	48 (14.2)	37 (10.9)
Stenosis 30–74%	42 (12.4)	18 (5.3)	14 (4.1)	22 (6.5)
Stenosis 75–99% or with occlusion	25 (7.4)	0 (0.0)	6 (1.8)	21 (6.2)

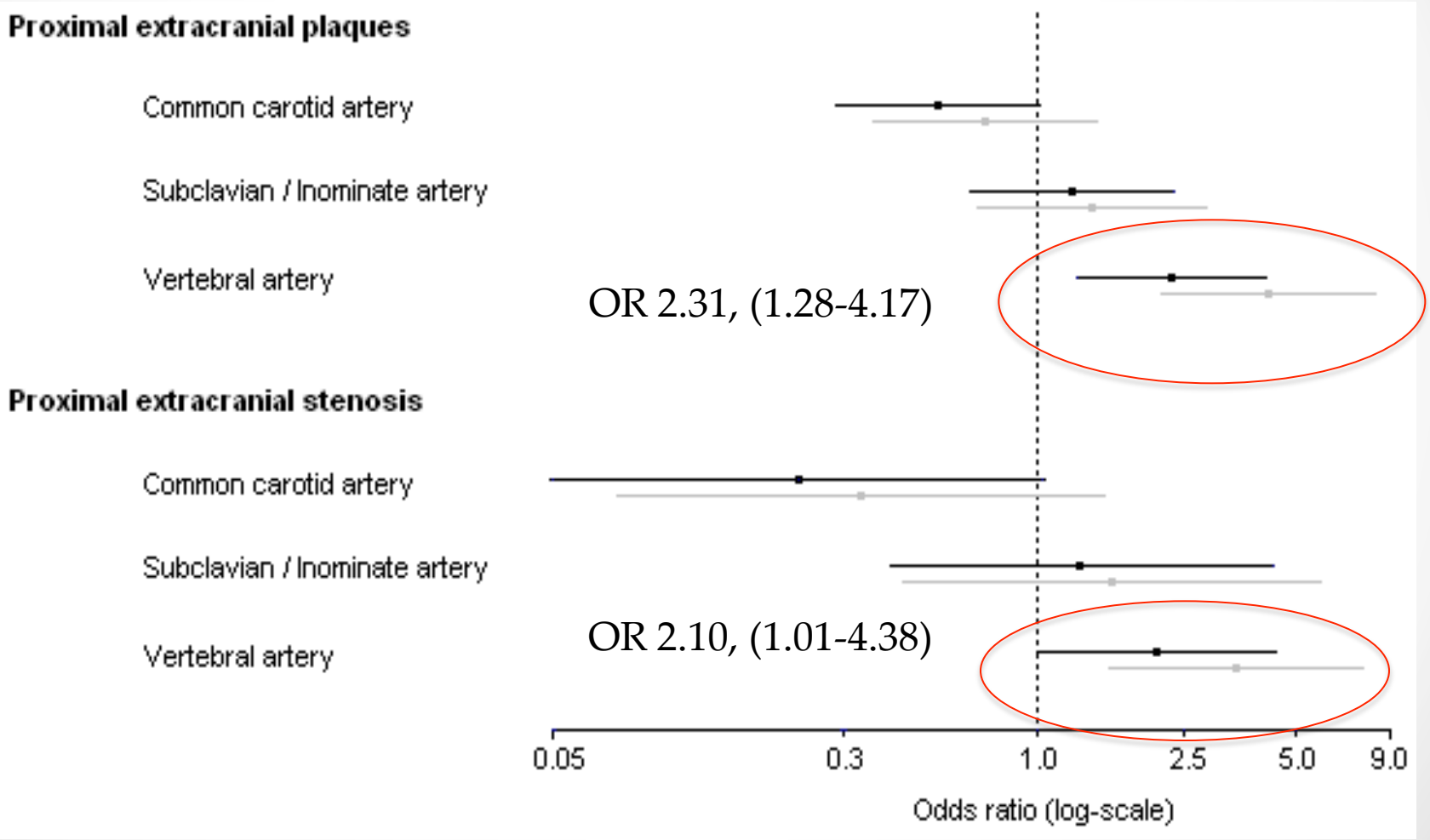
Mazighi et al, Stroke 2009

Proximal atherothrombosis and brain infarction risk



Mazighi et al Stroke 2009

Proximal atherothrombosis and brain infarction risk



Mazighi et al Stroke 2009

Oxford Vascular Study

- 538 TIA or minor stroke patients
- 141 VB TIA/ischemic stroke
- 37 (26.2%) with vertebral or basilar artery stenosis ≥ 50%:

  23 (62%) : extracranial vertebral artery (V1:16)

  11 (30%) : intracranial vertebral artery

  3 (8%) : basilar artery

Marquardt et al, Brain 2009

Oxford Vascular Study

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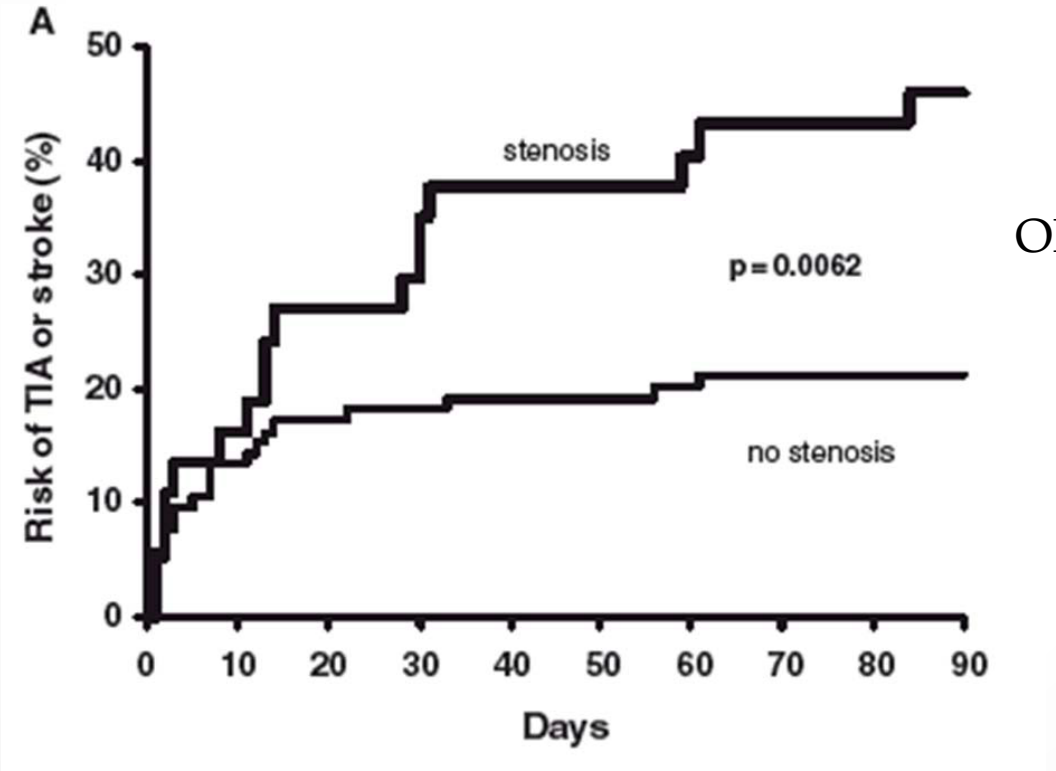
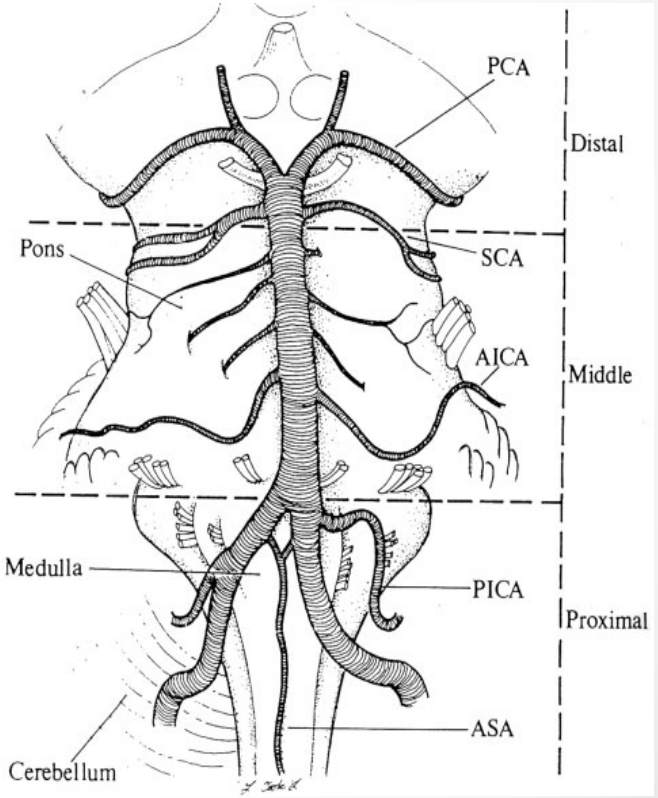


OR: 9.29, 2.31-37.27

Marquardt et al, Brain 2009

New England Medical Center Posterior Circulation Registry

- 407 patients,
  - 59%: strokes without TIAs
  - 24%: TIAs then strokes,
  - 16% : only TIAs
- 148 patients: stenosis>50%



Ann Neurol 2004;56:389–398

NEMC Posterior Circulation Registry

- 407 TIA or VB stroke patients
- 148 patients with 50% Luminal Stenosis

Artery	N
Innominate	2
Subclavian	5
Vertebral artery origin	131 (29 bilateral)
Intracranial vertebral artery	132 (36 bilateral)
Basilar artery	109
Posterior cerebral artery	38 (4 bilateral)
Posterior inferior cerebellar artery	14
Anterior inferior cerebellar artery	2
Superior cerebellar artery	10

Caplan et al, Ann Neurol 2004

New England Medical Center Posterior Circulation Registry

- Vertebral Artery Origin stenosis (50%)
  - 131 patients, bilateral in 29
  - Dissections: 6
- **Artery-to-artery embolism**
- Commonest recipient site intracranial VA

Ann Neurol 2004;56:389–398

« benignity » of vertebral origin lesions

- Collateral reconstitution of extracranial VA
- Two viable arteries that join together intracranially, with contralateral compensation if necessary
- Slow development of luminal compromise by

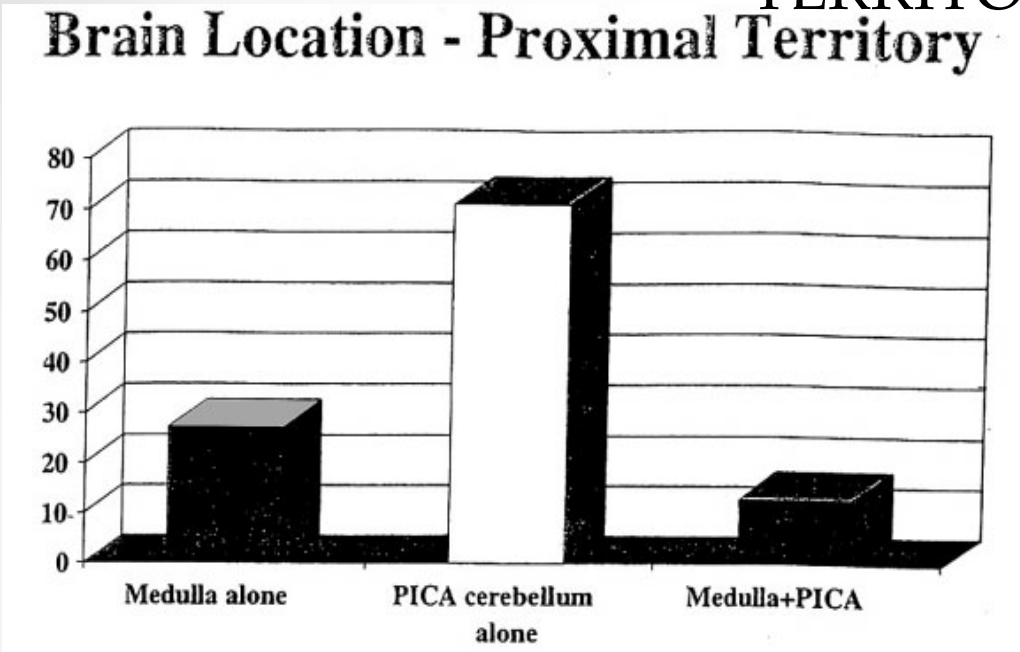
atherosclerotic plaques allowing time for collateral development.

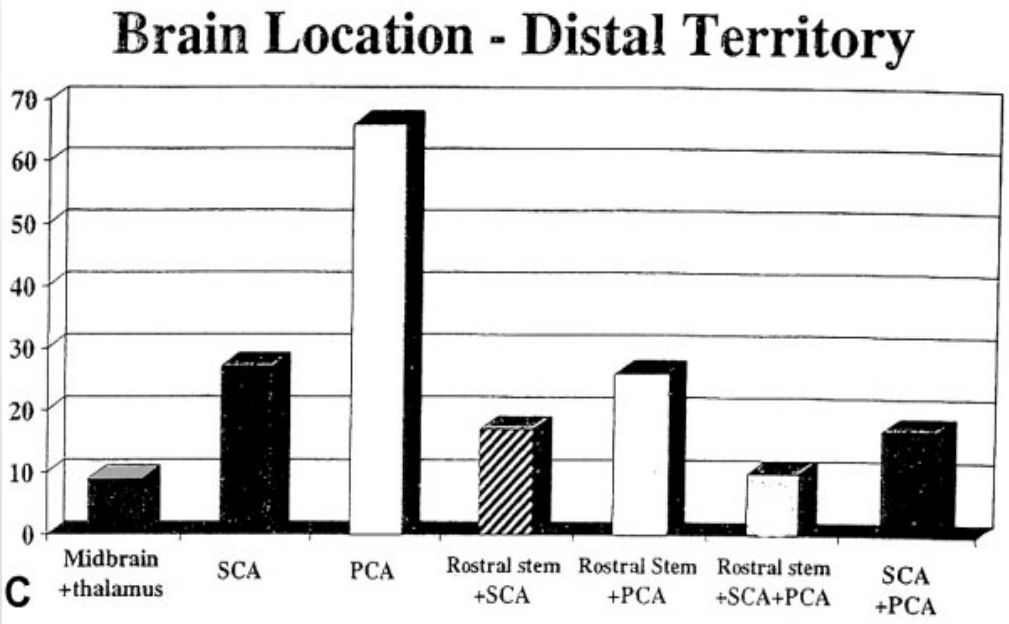
BUT

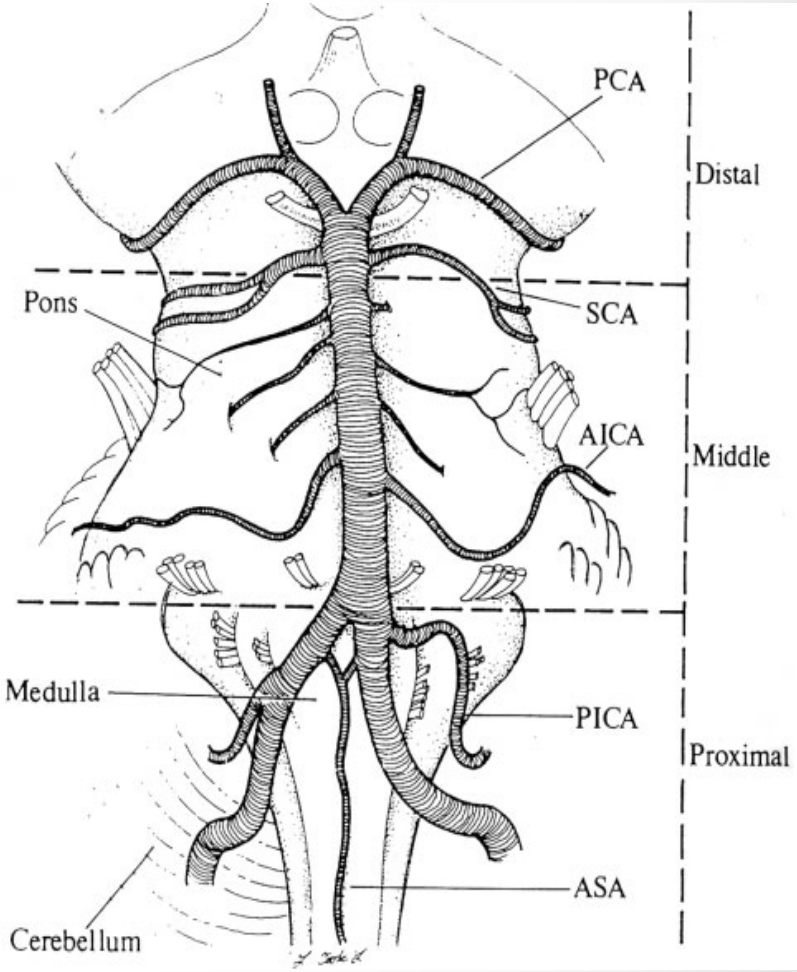
- observation of VA origin specimen showing ulcerated plaque in patient with repeated posterior circulation TIAs

Fisher CM. Arch Neurol 1970;22:13–19
Pelouze G-A. Rev Neurol 1989;145:478–481

VERTEBRAL ARTERY ORIGIN LESIONS AND STROKE TERRITORY







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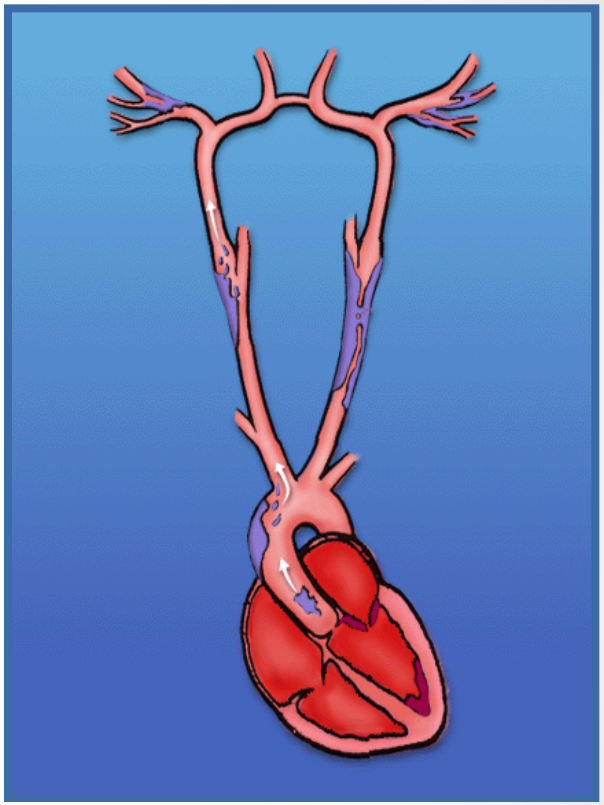
NEMC Posterior Circulation Registry: outcome

- 30-day mortality : 3.6%
- Poor outcome (mortality or severe disability at 30 days) : BA disease
  - 30% had poor outcomes, RR: 3.64 (95%CI, 1.9 –7.0)
- Worst outcomes: BA embolism (58% major deficits)
- Extracranial VA had better outcomes than those with Intracranial VA and BA disease
  - RR: 0.62 for death or severe disability

Ann Neurol 2004;56:389–398

NEMC Posterior Circulation Registry

- Significant frequency of cardiac embolism : 24%,
- Poor outcome associated with cardiac embolism, RR: 1.89
- Coexistent coronary artery disease: 35%



Caplan et al, Ann Neurol 2004

Long-Term Outcome After Angioplasty and Stenting for Symptomatic Vertebral Artery Stenosis Compared With Medical Treatment in the Carotid And Vertebral Artery Transluminal Angioplasty Study (CAVATAS)

- 16 patients with symptomatic vertebral artery stenosis (n=8, n=8)
- No deaths or strokes within the first 30 days.
- Mean follow-up: 4.7 years,
  - No vertebrobasilar territory stroke,
  - 3 patients in each treatment arm died of myocardial infarction or carotid territory stroke.

Coward et al Stroke. 2007;38:1526-1530.)

key points: vertebral artery origin lesions

- Vertebral origin lesions are frequent and significantly associated with vertebro-basilar strokes.
- Artery-to-artery embolism
- Importance of systematic work-up including the evaluation of vertebral origin lesions
- VA origin lesions have better outcomes compared to intracranial VA or BA ones
- Cardiac investigations (cardiac and aortic sources of embolism)