

# Patients with carotid artery stenosis had a high risk for stroke, and some types of stroke were not prevented by endarterectomy

Barnett HJ, Gunton RW, Eliasziw M, et al. Causes and severity of ischemic stroke in patients with internal carotid artery stenosis. *JAMA*. 2000 Mar 15;283:1429-36.

## QUESTION

In patients with internal carotid artery (ICA) stenosis, what are the causes and severity of stroke for varying degrees of stenosis?

## DESIGN

Cohort study using data from the North American Symptomatic Carotid Endarterectomy Trial (NASCET) with mean follow-up of 5 years.

## SETTING

106 centers mostly in North America.

## PATIENTS

2885 patients (median age 67 y, 70% men) with ICA stenosis.

## ASSESSMENT OF RISK FACTORS

ICA stenosis measured by angiography and duplex ultrasonography; categories of stenosis were < 60%, 60% to 69%, and 70% to 99%.

## MAIN OUTCOME MEASURES

Ischemic strokes were classified as large-artery, lacunar, or cardioembolic (possible

or probable) strokes. Severity was also assessed (nondisabling, disabling, or fatal).

## MAIN RESULTS

During follow-up, 749 patients had 1039 strokes: 67% were large-artery strokes, 20% were lacunar strokes, 11% were of cardioembolic origin, and 2% were intracerebral or subarachnoid hemorrhages. The 5-year risk for stroke was 20% for large-artery stroke, 7% for lacunar stroke, and 3% for cardioembolic stroke. The risk for large-artery stroke increased with increasing stenosis; other categories of stroke were not related to degree of stenosis (Table). The proportion of disabling or

fatal strokes was 68% in cardioembolic stroke, 17% in lacunar stroke, and 33% in large-artery stroke.

## CONCLUSION

A high proportion of patients with symptomatic and asymptomatic carotid artery stenosis had cardioembolic and lacunar strokes as well as large-artery stroke.

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### Kaplan-Meier risks for cause-specific stroke at 5 years for patients with carotid artery stenosis

Disorder	Stenosis < 60%	Stenosis 60% to 69%	Stenosis 70% to 99%
Symptomatic stenosis			
Large-artery stroke	11.8%	17.3%	25.4%
Lacunar stroke	5.8%	6.8%	4.5%
Cardioembolic stroke	1.6%	3.5%	1.2%
Asymptomatic stenosis			
Large-artery stroke	5.4%	9.8%	10%
Lacunar stroke	1.9%	4.1%	7.2%
Cardioembolic stroke	1.2%	3.5%	1.2%

## COMMENTARY

The study by Barnett and colleagues describes for the first time the long-term outcome, in terms of the risk for and cause of subsequent stroke, of 2885 patients with ICA stenosis who were enrolled in a clinical trial of carotid endarterectomy (CE). As expected, these patients had a high rate (20%) of subsequent large-artery ischemic stroke after 5 years, despite half having had treatment with CE.

Perhaps less expected, another 10% had a stroke caused by another disease, such as small-vessel disease (7%) or embolism from the heart (3%). These results highlight the fact that among patients with severe carotid stenosis, whether symptomatic or asymptomatic, a large minority of subsequent strokes are caused by diseases other than carotid stenosis that are unlikely to be prevented by CE. The results also explain why CE reduces the relative risk for stroke by "only" half: CE prevents most or all subsequent ipsilateral strokes caused by large-artery disease, but it does not prevent the other half of strokes that are caused by contralateral carotid stenosis, intracranial small-vessel disease, and embolism from the heart.

The benefit of CE in a patient with severe carotid stenosis depends on his or her absolute risk for subsequent ipsilateral large-artery ischemic stroke (which CE can prevent) and the risk for perioperative stroke or death (which CE can cause). Only a few patients with severe carotid stenosis ultimately benefit from CE—mainly men with recent nondisabling carotid ischemic events of the brain (as opposed to the eye) who have severe carotid stenosis (> 70% using the NASCET criteria), carotid plaque irregularity, systolic blood pressure < 180 mm Hg, and no evidence of peripheral vascular disease (1).

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## Reference

1. Rothwell PM, Warlow CP. Prediction of benefit from carotid endarterectomy in individual patients: a risk-modeling study. *Lancet*. 1999;353:2105-10.