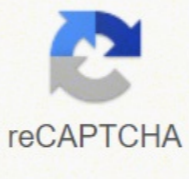




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## AHA Scientific Statement

## Guidelines for Carotid Endarterectomy

## A Statement for Healthcare Professionals From a Special Writing Group of the Stroke Council, American Heart Association

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Since the 1950s carotid endarterectomy has been performed in patients with symptomatic carotid artery stenosis, based on suggestive but inconclusive evidence for its effectiveness. Only during the last 5 years have randomized studies clarified the indications for surgery. In preparing this report, panel members used the same rules of evidence used in the previous report<sup>1,2</sup> (Table).

## Management of Risk Factors

Few studies have analyzed control of risk factors in a randomized, prospective manner following carotid endarterectomy. However, a wealth of data are available regarding the general relationship between risk factor control and stroke risk. These data provide some guidance for the care of endarterectomy patients.

## Hypertension

Hypertension is the most powerful, prevalent, and treatable risk factor for stroke.<sup>3</sup> Both systolic and diastolic blood pressure are independently related to stroke incidence. Isolated systolic hypertension, which is common in the elderly, also considerably increases risk of stroke. Reduction of elevated blood pressure significantly lowers risk of stroke. Meta-analyses of randomized trials found that an average reduction in diastolic blood pressure of 6 mm Hg produces a 42% reduction in stroke incidence.<sup>4,5</sup> Treatment of isolated systolic hypertension in people older than 60 years also reduces stroke incidence by 36% without an excessive number of side effects such as depression or dementia.<sup>5</sup> Long-term care of patients after

endarterectomy should include careful control of hypertension (Grade A recommendation for treatment of hypertension in general; Grade C recommendation for postendarterectomy care).

Perioperative treatment of hypertension after carotid endarterectomy represents a special situation. Poor control of blood pressure after endarterectomy increases risk of cerebral hyperperfusion syndrome.<sup>6-9</sup> This complication is characterized by unilateral headache, seizures, and occasionally altered mental status or focal neurological signs. Neuroimaging may show intracerebral hemorrhages<sup>10-12</sup> or white matter edema.<sup>13</sup> Transcranial Doppler ultrasound shows elevated middle cerebral artery blood velocity ipsilateral to the endarterectomy and occasionally in the contralateral middle cerebral artery as well.<sup>12,14,15</sup> The syndrome is thought to arise from impairment of autoregulation. At greatest risk are patients with severe preoperative internal carotid stenosis and chronic hypertension. The risk is increased when a contralateral severe stenosis is present.

Blood pressure should be carefully monitored after carotid endarterectomy, and elevated blood pressure should be aggressively treated, particularly in those with early symptoms of cerebral hyperperfusion syndrome (Grade C recommendation). In patients thought to be at risk for hyperperfusion syndrome, blood pressure should be monitored for several days after surgery and for at least 7 days in patients with headaches or new neurological symptoms. Such monitoring may be performed on an outpatient basis as appropriate (Grade C recommendation).<sup>15</sup> Transcranial Doppler ultrasound shows promise in early identification of the syndrome and possibly for monitoring therapy but has not been rigorously studied.

## Cigarette Smoking

Cigarette smoking substantially increases risk of stroke with relative risk values of 1.5 to 2.2.<sup>16-18</sup> Risk of stroke increases with the number of cigarettes smoked. Smoking cessation promptly reduces risk of stroke.<sup>16,17,19</sup> Cigarette smoking has been identified as a risk factor for carotid stenosis. Although no prospective studies have specifically assessed smoking cessation after carotid endarterectomy, efforts directed at smoking cessation should be part of the postoperative care of these patients (Grade C recommendation).

## Blood Lipids

Increased serum lipid levels have not been clearly related to the overall incidence of stroke in individual population studies,

"Guidelines for Carotid Endarterectomy" was approved by the American Heart Association Science Advisory and Coordinating Committee in August 1997.

This statement is being published simultaneously in the February issue of *Stroke*.

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This is a summary of the American Academy of Neurology (AAN) evidence-based guideline reviewing all of the evidence on the efficacy of carotid endarterectomy (CE) for stroke prevention in asymptomatic and symptomatic patients with internal carotid artery (ICA) stenosis. The updated statement provides additional clinical information.

Please refer to the full guideline for detailed findings and supporting evidence at [www.aan.com/professionalguidelines/index.cfm](http://www.aan.com/professionalguidelines/index.cfm)

#### USE OF CAROTID ENDARTERECTOMY IN ASYMPTOMATIC PATIENTS

Stenosis (%)	Recommendation
70-99%	<ul style="list-style-type: none"> <li>CE is considered an option for asymptomatic patients to modify patients with 70-99% ICA stenosis (Level A).</li> </ul>
50-69%	<ul style="list-style-type: none"> <li>CE may be considered for patients with 50-69% stenosis (Level B) but the clinician should consider additional clinical and prognostic variables (Level C). See table below.</li> <li>It is recommended that the patient have a stroke-free history and that the preoperative stroke risk should be only for asymptomatic patients (Level A).</li> </ul>
<50%	<ul style="list-style-type: none"> <li>CE should not be considered for asymptomatic patients with &lt;50% stenosis (Level A).</li> <li>Medical management is preferred to CE for asymptomatic patients with &lt;50% stenosis (Level A).</li> </ul>

#### USE OF CAROTID ENDARTERECTOMY IN SYMPTOMATIC PATIENTS

Stenosis (%)	Recommendation
60-99%	<ul style="list-style-type: none"> <li>CE is considered an option for patients between the ages of 40 and 70 years and with hemodynamically significant stenosis (70-99%) of the ipsilateral ICA on duplex ultrasound and if the target stroke (stroke frequency) can be reduced (approximately 1% (Level A)). The clinician should consider the patient's stroke-free history and the target stroke frequency (stroke-free history) as well as the patient's and the benefit/risk of surgery (only after a number of years).</li> </ul>

#### PATIENTS UNABLE TO UNDERGO CAROTID ENDARTERECTOMY OR STENTING

Patient variable	Recommendation
Stenotic lesion	<ul style="list-style-type: none"> <li>Patients with 50-69% stenosis should not undergo CE (Level C).</li> <li>Patients with stenosis 70-99% should undergo CE (Level A).</li> <li>Clinical expert assessment for each of these but CE will reduce stroke greater benefit than CE (Level C).</li> </ul>
Progressing neurologic deficit	<ul style="list-style-type: none"> <li>No recommendation can be provided regarding the value of emergent CE in patients with a progressing neurologic deficit (Level C).</li> </ul>



Table. Recommendations and Guidelines About Screening for Asymptomatic Carotid Stenosis

Guideline Sponsor	General Population Screening	Selected Subgroup Screening
US Preventive Services Task Force <sup>20</sup>	No	Not addressed
American Stroke Association and American Heart Association <sup>21</sup>	No	Not addressed
Multisociety guideline on management of patients with asymptomatic carotid disease <sup>22</sup>	No	<ul style="list-style-type: none"> <li>"Reasonable" if carotid bruit</li> <li>"May be considered" in asymptomatic patients with asymptomatic vascular disease elsewhere</li> <li>"Might be considered" in patients with 50 risk factors</li> <li>"Appropriate" for patients with carotid bruit</li> </ul>
Multisociety appropriate use criteria <sup>23</sup>	Not discussed explicitly but reference	<ul style="list-style-type: none"> <li>"Appropriate" for patients with disease in the carotid neck</li> <li>"Uncertain" for patients with intermediate or high risk Framingham score</li> <li>No for patients with carotid bruit but no risk factors</li> <li>"Should be considered" in patients with multiple risk factors, including patients with clinically significant peripheral vascular disease</li> </ul>
Society for Vascular Surgery <sup>24</sup>	No	Not addressed
American College of Preventive Medicine <sup>25</sup>	No	Not addressed



