Assessing Risk
Associated With Carotid Endarterectomy

A Statement for Health Professionals by an
Ad Hoc Committee on Carotid Surgery Standards
of the Stroke Council, American Heart Association

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This position statement provides guidelines for assessing risk associated with carotid endarterectomy and defines the point at which risk is too high to perform surgery for specific indications described below. Morbidity and mortality levels are discussed. This statement does not address indications for surgery or merits of specific medical or surgical treatments. Results of current studies that compare relative risk of various treatments for carotid artery disease are not yet available. (Circulation 1989;79:472–473)

Carotid endarterectomy for arteriosclerotic occlusive disease of the carotid artery bifurcation and the internal carotid artery has been widely used as a method of reducing stroke risk. There is a variable risk that surgery may induce the condition it is designed to prevent, stroke due to cerebral infarction. Incidence of this complication varies among surgeons and medical institutions.

The risk of carotid endarterectomy should properly influence the indication for surgery. If the risk of operating on a patient is low in relation to the risk of not operating, then the benefit of carotid endarterectomy as a least-risk strategy may be proportionately great and worthwhile. The converse is also true. If morbidity and mortality of carotid endarterectomy are excessive in proportion to the natural history of the untreated or nonoperatively treated lesion, surgery should be avoided.

The ad hoc committee recognizes there are insufficient data to define acceptable morbidity and mortality limits for carotid endarterectomy for various indications. Nevertheless, the committee believes the upper limits of morbidity and mortality that should prompt individual peer review can be defined.

These recommendations are based on current data and are likely to change.

Categories of Indications for Operation

Morbidity and mortality limits are categorized by clinical indications for operation, which are defined as follows:

- Absence of symptoms: No symptoms, either transient or permanent, referable to the carotid artery lesion. Thus, surgery for nonhemispheric, nonclassic symptoms such as dizziness falls in this category.
- Transient ischemic attack: An episode 1) that produces a distinct neurological deficit such as paresis, paresthesia, or dysphasia that clears in less than 24 hours, and after which the patient’s clinical status returns to what it was before the attack, and that is referable to the carotid artery; or an episode 2) in which the patient has transient loss of vision in one eye.
- Ischemic stroke: A focal ischemic neurological deficit that does not clear in 24 hours.
- Recurrent carotid disease: Recurrence of disease in an artery after carotid endarterectomy.

Upper Limits of Morbidity and Mortality

In this position statement, morbidity refers specifically to stroke that occurs during or after endarterectomy. It does not include other nonspecific complications or adverse effects that may be associated with surgical procedures.
The 30-day mortality rate from all causes for all carotid endarterectomies should not exceed 2%.

Combined morbidity and mortality due to stroke during or after carotid endarterectomy is categorized by indication for surgery and listed below:

<table>
<thead>
<tr>
<th>Indication</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absence of symptoms</td>
<td>&lt;3%</td>
</tr>
<tr>
<td>Transient ischemic attack</td>
<td>&lt;5%</td>
</tr>
<tr>
<td>Ischemic stroke</td>
<td>&lt;7%</td>
</tr>
<tr>
<td>Recurrent carotid disease in the same artery after endarterectomy</td>
<td>&lt;10%</td>
</tr>
</tbody>
</table>

A small minority of patients will have indications for surgery outside these categories and should be evaluated individually.

The lowest expected morbidity and mortality levels for each category are not known; a more direct comparison of surgical and nonsurgical treatment may be needed, requiring further revision of these limits. The scientific councils of the American Heart Association will continue to monitor these levels and make appropriate revisions as necessary.

**Monitoring Surgery Results**

The Ad Hoc Committee on Carotid Surgery Standards recommends that all medical institutions that treat extracranial arterial occlusive disease continually monitor results of surgery through a formal, ongoing audit, which should be made in comparison with these limits and definitions.

For the purposes of the audit, either of the two following methods for establishing an adequate data base are recommended:

1. For experienced surgeons, 100 consecutive cases should be reviewed retrospectively, and afterward a consecutive moving average of 100 total cases categorized by indication for operation evaluated as an ongoing audit.
2. For less experienced surgeons whose smaller caseload does not permit such analysis, available cases should be brought to 100 of total cases without morbidity. Thus, a beginning surgeon would be assigned 100 trouble-free cases as a theoretical statistical basis. For example, 75 cases without morbidity or mortality would be added proportionately by indication categories to a beginning surgeon’s 25 cases to form a statistical basis of 100 total cases. From that point on, a consecutive moving average of all additional cases belonging to that surgeon, categorized by indication for operation, would constitute the data base.

If the morbidity and mortality limits suggested in this position statement are exceeded in any category, the Ad Hoc Committee on Carotid Surgery Standards recommends that individual hospital quality of care procedures be used to determine the appropriate action.

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