Clinical and angiographic predictors of stroke and death from carotid endarterectomy: systematic review

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Authors' objectives
To identify the risk factors for operative stroke and death from carotid endarterectomy.

Searching
MEDLINE was searched from 1980 to 1996 using the search terms 'carotid endarterectomy' and 'carotid surgery'. The database of the Cochrane Stroke Group and the reference lists of the retrieved articles were also searched. Unpublished data on 1,729 patients in the European carotid surgery trial (see Other Publications of Related Interest nos.1-2) were also included.

Study selection
Prospective or retrospective (case note review) studies which fulfilled the following criteria:

- reported numbers of strokes and deaths within 30 days of surgery;
- defined operative risks per operation;
- stratified operative risk of stroke and death by baseline characteristics; and
- showed no evidence of a systematic policy for patients with different characteristics to be operated upon by different surgeons or at different institutions.

Specific interventions included in the review
Carotid endarterectomy.

Participants included in the review
Patients undergoing carotid endarterectomy for stenosis (symptomatic or asymptomatic), but not explicitly for acute stroke.

Outcomes assessed in the review
Operative risk of stroke and death was assessed.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the authors performed the selection.

Assessment of study quality
The authors do not state that they assessed validity.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the authors performed the data extraction.

Methods of synthesis
How were the studies combined?
The relative odds of stroke and death for one pre-operative characteristic versus another were calculated using the Mantel-Haenszel method.

How were differences between studies investigated?
Differences between the studies in terms of the relationship between each clinical characteristic and operative risk were assessed using the chi-squared test for heterogeneity. Data from the 1,729 patients in the European carotid surgery trial were used to perform a multiple regression analysis, in order to identify which of the potential risk factors identified in the review were independent predictors of operative stroke and death.

Results of the review
Thirty-five published studies and the European carotid surgery trial were included. The total number of participants was 8,626.

The operative risk of stroke and death was about 5%. Five clinical characteristics were associated with a significantly increased risk:

- surgery for cerebral symptoms (stroke or transient ischaemic attack) compared with monocular ischaemia;
- female gender;
- an age of 75 years;
- a systolic blood-pressure of greater than 180 mmHg; and
- peripheral vascular disease.

There was no significant heterogeneity between the studies in terms of the odds of stroke and death in relation to these risk factors.

Three angiographic characteristics were associated with increased risk: contralateral internal carotid artery occlusion; and stenosis of the intracranial portion of the ipsilateral external carotid artery and of the ipsilateral internal carotid artery. There was no significant relationship with diabetes, angina, recent myocardial infarction, plaque surface irregularity, or current smoking. There was no overall difference between risk associated with stroke or transient ischaemic attack, although there was significant heterogeneity (p=0.04). The pooled odds ratio (OR) from six published studies suggested that stroke was associated with an increased risk (OR 1.46, 95% confidence interval, CI: 1.04, 2.04), whereas data from the European carotid surgery trial suggested a significantly lower risk (OR 0.62, 95% CI: 0.42, 0.91).

Of the fourteen risk factors entered into the multiple logistic regression analysis of data from the European carotid surgery trial, four were found to be independent predictors of operative stroke or death. These were ocular versus cerebrovascular symptoms, female gender, systolic hypertension of greater than 180 mmHg, and peripheral vascular disease.

Authors' conclusions
This review defined several clinical and angiographic characteristics that were associated with an increased risk of stroke and death from carotid endarterectomy. This may help clinicians to estimate the potential operative risks for individual patients, and will facilitate adjustment for case-mix in comparisons between surgeons or institutions. These risk factors should be validated on a large independent dataset before they can be used routinely in clinical practice.

CRD commentary
The review would be enhanced by an examination of the effects of study design (prospective versus retrospective), a description of how the inclusion criteria were applied, and greater detail of the primary studies.
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Other publications of related interest

This additional published commentary may also be of interest. Faris I. Review: stroke and death from carotid endarterectomy are predicted by 5 clinical and 3 angiographic factors. Evid Based Med 1998;3:92.

Indexing Status
Subject indexing assigned by NLM

MeSH
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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.