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## EVIDENCE CENTRE CRITICAL APPRAISAL

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Is carotid stenting for carotid stenosis effective for stroke prevention compared with carotid endarterectomy?

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## **SUMMARY STATEMENT:**

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**Publication of materials** – please use the following format when citing this article: Is carotid stenting for carotid stenosis effective for stroke prevention compared with carotid endarterectomy? Southern Health Care Network/Monash Institute of Public Health & Health Services Research, Clayton, 2000.

## **REQUEST:**

Is carotid stenting for carotid stenosis effective for stroke prevention compared with carotid endarterectomy?

REQUESTED BY:

**Winston Chong**, Director of Interventional Radiology, Diagnostic Imaging, Monash Medical Centre, Clayton

## **METHODOLOGY**

### **Search Strategy**

The Centre for Clinical Effectiveness defined the ‘best available evidence’ as that research we can identify that is least susceptible to bias. We determine this according to pre-defined NHMRC criteria (see Appendix).

First we search for systematic reviews, evidence-based clinical practice guidelines, or health technology assessments, and randomized controlled trials. If we identify sound, relevant material of this type, the search stops. Otherwise, our search strategy broadens to include studies that are more prone to bias, less generalizable, or have other methodologic difficulties. We include case-control and longitudinal cohort studies in our critical appraisal reports. While we cite observational and case series studies, and narrative reviews and consensus statements, in our reports we do not critically appraise them. Some studies can produce accurate results but they are generally too prone to bias to allow determination of their validity beyond their immediate setting.

### *Search terms:*

The following search terms were used to scour electronic databases and websites:

Table 1. Search terms used in the retrieval of articles from electronic databases and websites

<b>Field of focus</b>	<b>Search term</b>
<b>Patient-related</b>	Carotid stenosis
<b>Intervention-related</b>	Carotid stent/s/ing, stent/s/ed/ing
<b>Comparison-related</b>	Carotid endarterectomy, endoluminal

### *Resources Searched*

We searched the following databases:

Cochrane Library CD-ROM, 2000, Issue 3

OVID Best Evidence, 1995 – March/April 2000

OVID Medline, 1995 – October Week 3 2000

OVID CINAHL, 1995 – July 2000

Journals@Ovid- 1 September, 2000

Ovid Current Contents, 1995 Week 26 to 2000 Week 37

Pre-Medline- September 1, 2000

SUMsearch- September 4, 2000

### **Refinements, Searching & Reporting Constraints:**

We included items of evidence that were available to us on 4 September, 2000. We only included articles published in English. Due to the identification of high level evidence published in the last 2-3 years the search was restricted to the last 5 years.

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## RESULTS:

From our sources we identified 15 articles which we categorised as follows:

Table 2. Study designs of articles retrieved by search

<b>Study Design</b>	<b>Number included</b>
<b>Systematic reviews or meta-analyses</b>	<b>2</b>
<b>Evidence-based clinical practice guidelines</b>	<b>2</b>
<b>Randomised controlled trials</b>	<b>3</b>
Controlled trials, cohort or case-control analytic studies	0
Descriptive studies	3
Consensus reports, non-evidence-based clinical practice guidelines	0
Narrative reviews	5
Total	15

Table 3. Reasons for exclusion of articles retrieved by search

<b>Reason for exclusion</b>	<b>Number</b>
<b>Level IV evidence</b>	<b>8</b>

This left 7 studies available for critical appraisal- 2 systematic reviews, 2 evidence based guidelines, and 3 randomised controlled trials. Availability was limited to abstracts only for two of the randomised controlled trials so the appraisal is based on these. We are reasonably confident these articles represent the most important findings published to date based on our refinements, searching and reporting constraints.

## REFERENCES

1. National Health and Medical Research Council. A Guide to the Development, Implementation and Evaluation of Clinical Practice Guidelines. Canberra: Commonwealth of Australia, 1999.

## ARTICLES CRITICALLY APPRAISED FOR THIS REPORT

Bean, J. R. and Brooks, W et al. (2000). "Early Results Comparing Stenting with Endarterectomy for Treatment of Symptomatic Carotid Stenosis: A Randomized Community Hospital-based Trial." Neurosurgery August **47**(2): 500.

Brown, M. M. (1999). "Results of the carotid and vertebral artery transluminal angioplasty study." British Journal of Surgery **86**: 710-711.

Crawley, F. and Brown, M. M. (2000). "Percutaneous transluminal angioplasty and stenting for carotid artery stenosis." Cochrane Database of Systematic Reviews Issue 3 2000.

**BACKGROUND:** Carotid percutaneous transluminal angioplasty may be a useful non-surgical procedure for carotid stenosis, particularly for lesions not suitable for surgery. **OBJECTIVES:** The objective of this review was to assess the effect of carotid percutaneous transluminal angioplasty compared with carotid endarterectomy (in patients suitable for surgery) or medical therapy (in patients not suitable for surgery). **SEARCH STRATEGY:** We searched the Cochrane Stroke Groups trials register (to August 1997). We contacted researchers in the field and balloon catheter manufacturers. **SELECTION CRITERIA:** Randomised trials of carotid percutaneous transluminal angioplasty (with or without stenting) compared with carotid endarterectomy, or percutaneous transluminal angioplasty plus best medical therapy compared with best medical therapy alone, in people with carotid artery stenosis (symptomatic or asymptomatic). **DATA COLLECTION AND ANALYSIS:** Two reviewers independently applied the inclusion criteria. **MAIN RESULTS:** No completed trials were found. Two trials are underway. **REVIEWER'S CONCLUSIONS:** There is no evidence as yet to assess the relative effects of carotid percutaneous transluminal angioplasty in people with carotid stenosis. [References: 21]

Golledge, J. Mitchell, A. et al. (2000). "Systematic comparison of the early outcome of angioplasty and endarterectomy for symptomatic carotid artery disease." Stroke **31**(6): 1439-1443.

**Background and Purpose-**Endoluminal treatment is being increasingly used for carotid artery disease. The aim of this study was to compare the stroke and death risk within 30 days of endovascular treatment or endarterectomy for symptomatic carotid artery disease. **Methods-**A systematic comparison of the 30-day outcome of angioplasty with or without stenting and endarterectomy for symptomatic carotid artery disease reported in single-center studies, published since 1990, was performed. **Results-**Thirty-three studies (13 angioplasty and 20 carotid endarterectomy) were included in this analysis. Carotid stents were deployed in 44% of angioplasty patients. Mortality within 30 days of angioplasty was 0.8% compared with 1.2% after endarterectomy (OR 0.68, 95% CI 0.43 to 1.05; P=0.6). The stroke rate was 7.1% for angioplasty and 3.3% for endarterectomy (OR 2.22, CI 1.62 to 3.04; P<0.001), while the risk of fatal or disabling stroke was 3.2% and 1.6%, respectively (OR 2.09, CI 1.3 to 3.33, P<0.01). The risk of stroke or death was 7.8% for angioplasty and 4% for endarterectomy (OR 2.02,

CI 1.49 to 2.75;  $P < 0.001$ ), while disabling stroke or death was 3.9% after angioplasty and 2.2% after endarterectomy (OR 1.86, CI 1.32 to 2.84;  $P < 0.01$ ). Conclusions-In the treatment of symptomatic carotid artery disease, the risk of stroke is significantly greater with angioplasty than carotid endarterectomy. At present, carotid angioplasty is not recommended for the majority of patients with symptomatic carotid artery disease. [References: 47]

Naylor, A. R. and Bolia, A. et al. (1998). "Randomized study of carotid angioplasty and stenting versus carotid endarterectomy: A stopped trial." Journal of Vascular Surgery August **28**(2): 326-334.

Background: Carotid angioplasty (CA) has been suggested to be a safer and more cost-effective alternative to carotid endarterectomy (CEA) in the management of symptomatic severe internal carotid artery (ICA) disease. Methods: The study was conducted as a prospective consecutive randomized trial of CEA versus CA for symptomatic severe ICA disease in a university teaching hospital. All patients were assessed before and after surgery by a neurologist. The study consisted of 23 patients with focal carotid territory symptoms and severe ICA stenosis (> 70%) who were randomized to either CEA or CA. However, only 17 had received their allocated treatment before trial suspension. CEA with patching or CA with stenting were used as interventions. The main outcome measures were death or disabling or nondisabling stroke within 30 days. Results: All 10 CEA operations proceeded without complication, but 5 of the 7 patients who underwent CA had a stroke ( $P = .0034$ ), 3 of which were disabling at 30 days., Conclusions: After referral, the Data Monitoring Committee invoked the stopping rule and the trial was suspended. The investigators and the Ethics Committee subsequently concluded that the trial could not be restarted-even in an amended format-primarily because of problems with informed consent. We review many of the ethical dilemmas encountered in the performance of this study. If future trials do suggest a selected role for CA, it is essential that both the inclusion and the exclusion criteria are fully documented. Copyright (C) by the Society for Vascular Surgery, and the North American Chapter, International Society for Cardiovascular Surgery

National Health and Medical Research Council of Australia (1996). "Clinical practice guidelines: Prevention of Stroke."

<http://www.health.gov.au/nhmrc/publicat/cp-home.htm>

Scottish Intercollegiate Guidelines Network (1997). "Management of patients with stroke: Management of carotid stenosis and carotid endarterectomy."

<http://www.show.scot.nhs.uk/sign/>

## ARTICLES NOT CRITICALLY APPRAISED

### Level IV evidence

Joint Officers of the Congress of Neurological Surgeons and the American Association of Neurological Surgeons (1997). "Carotid angioplasty and stent: an alternative to carotid endarterectomy." Neurosurgery **40**(2): 344-5.

American Heart Association (1998). "Carotid Stenting and Angioplasty." AHA Medical/Scientific Statement.

Claggett, G.P. and Barnett, H.J.M. et al. (1997). "The carotid artery stenting versus endarterectomy trial (CASET) [editorial]." Cardiovascular Surgery **5**(5): 454-6.

Hobson II, R.W. and Brott, T. et al. (1997). "CREST: carotid revascularization endarterectomy versus stent trial [editorial]." Cardiovascular Surgery **5**(5): 457-8.

Jordan Jr., W.D. and Roye, G.D. et al. (1998). "A cost comparison of balloon angioplasty and stenting versus endarterectomy for the treatment of carotid artery stenosis." Journal of Vascular Surgery **27**(1): 16-22.

PURPOSE: Percutaneous transluminal angioplasty with stenting (PTAS) of the carotid artery has been advocated as an alternative treatment for high-grade stenosis. Rationale for this approach includes less morbidity, shorter recovery, and lower cost when compared with carotid endarterectomy (CEA). METHODS: The clinical results and hospital charges of patients who underwent elective treatment for carotid stenosis were reviewed. During a concurrent 14-month period, 218 patients were admitted 229 times for 234 procedures for the treatment of 239 carotid bifurcation stenoses, 109 by PTAS and 130 by CEA. Hospital charges were reviewed for each hospitalization and were categorized according to radiology, operating room, cardiac catheterization laboratory, and all other hospital charges. RESULTS: The combined incidence of postprocedure strokes and deaths were: PTAS, eight strokes (7.7%) and one death (0.9%); CEA, two strokes (1.5%) and two deaths (1.5%). Total hospital charges per admission for the two groups were \$30,140 for PTAS and \$21,670 for CEA. The average postprocedure length of stay for PTAS was 2.9 days (median, 2 days) and for CEA was 3.1 days (median, 3 days). Cardiac catheterization laboratory charges for the PTAS group were \$12,968, whereas the operating room charges for the CEA group were \$4263. When hospitalizations that were extended by complications were excluded, the average total charges for the PTAS group (n = 84) dropped to \$24,848 (mean length of stay, 1.9 days) and for the CEA group (n = 111) to \$19,247 (mean length of stay, 2.6 days). CONCLUSIONS: After evaluating hospital charges, PTAS for the treatment of carotid stenosis cannot currently be justified on the basis of reduced costs alone. With future cost-containing measures, total hospital charges can be reduced in both groups.

Jordan Jr., W.D. and Schroeder, P.T. et al. (1997). "A comparison of angioplasty with stenting versus endarterectomy for the treatment of carotid artery stenosis." Annals of Vascular Surgery **11**(1): 2-8.

Carotid endarterectomy has been established as the standard treatment for high-grade carotid stenosis. The results of an ongoing prospective trial for the safety of percutaneous angioplasty with stenting (PTAS) were compared to retrospectively reviewed patients treated with carotid endarterectomy (CEA). During the same 14-month period, 273 patients underwent treatment of 310 carotid bifurcation

stenoses: 107 by PTA with stenting, 166 by CEA. Indications for treatment included stroke 46 (16.8%), transient ischemic attack 109 (39.9%), syncope 7 (2.6%), and high-grade asymptomatic stenosis 111 (40.7%). Combined early stroke and death rates are listed as follows: [table: see text] Important nonneurologic complications were evident in six (5.6%) PTAS patients and two (1.2%) CEA patients. Six-month follow-up data was available for 193 patients (71%) with the following results: seven (6.5%) minor strokes in the PTAS group, one (0.6%) minor stroke in the CEA group, one (0.9%) major stroke in the PTAS group, one (0.6%) major stroke in the CEA group, four deaths (3.7%) in the PTAS group, and six deaths (3.6%) in the CEA group. Early results from PTA with stenting are promising but not safer than CEA for the treatment of carotid artery stenosis. Long-term follow-up is needed to determine the ultimate durability of this new technique. PTA with stenting may be an alternative for the treatment of carotid bifurcation lesions in selective high-risk surgical patients.

Lees, K.R. and Bath, P.M.W. et al. (2000). "Secondary prevention of transient ischaemic attack and stroke." BMJ April 8 **320**(7240): 991-994.

Pelz, D.M. and Lownie, S.P. (2000). "Carotid angioplasty and stenting: current status." CMAJ May 16 **162**(10): 1451-1454.

Carotid angioplasty and stenting has recently emerged as a popular alternative to endarterectomy for the treatment of carotid atherosclerosis. Carotid endarterectomy has been scientifically validated, but many believe carotid angioplasty and stenting to be a less invasive, less expensive and equally safe and effective method of treatment. The evidence for and against the use of each procedure will be discussed., (C) 2000 Canadian Medical Association; Association medicale canadienne.

# APPENDIX

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## Levels Of Evidence

As Defined By "A Guide To The Development, Implementation And Evaluation Of Clinical Practice Guidelines" (National Health & Medical Research Council, Canberra, 1998):

Level I		Evidence obtained from a systematic review or meta-analysis of all relevant randomised controlled trials.
Level II		Evidence obtained from at least one properly designed randomised controlled trials.
Level III	-1	Evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method).
	-2	Evidence obtained from comparative studies with concurrent controls and allocation not randomised (cohort studies), case control studies or interrupted time series with a control group.
	-3	Evidence obtained from comparative studies with historical control, two or more single-arm studies or interrupted time series without a parallel control group.
Level IV		Evidence obtained from case series (either post-test or pre-test and post-test), opinions of respected authorities (narrative reviews), descriptive studies, reports of expert (i.e. consensus) committees, case studies.

<b>Evidence Summary Systematic Review</b>  <div style="border: 1px solid black; padding: 5px; width: fit-content;">           Is carotid stenting for carotid stenosis effective for stroke prevention compared with carotid endarterectomy?         </div>	<b>Study 1</b>  <u>Golledge J et al, 2000</u> <u>Systematic comparison of the early outcome of angioplasty and endarterectomy for symptomatic carotid artery disease</u>	<b>Study 2</b>  <u>Crawley F, 1997</u> <u>Percutaneous transluminal angioplasty and stenting for carotid artery stenosis</u>
<b>STUDY DESIGN &amp; NHMRC LEVELS OF EVIDENCE</b>	Systematic review Level I evidence	Systematic review Level I evidence
<b>DESCRIPTION:</b> Subjects, Interventions, Comparisons, Outcomes, Inclusion & Exclusion Criteria	<b>Patients:</b> Patients with symptomatic carotid artery disease <b>Intervention:</b> Angioplasty (with or without stenting) <b>Comparison:</b> Endarterectomy <b>Outcomes:</b> stroke and death risk within 30 days <b>Exclusion criteria:</b> studies published earlier than 1990, studies that did not report the number of strokes occurring within 30 days of procedure. Studies were included if they a single centre study.	<b>Patients:</b> people with carotid artery stenosis <b>Intervention:</b> Carotid percutaneous transluminal angioplasty (with or without stenting) <b>Comparison:</b> carotid endarterectomy <b>Outcomes:</b> risk of stroke or death, restenosis rates, other complications, length of hospital stay. <b>Exclusion criteria:</b> Studies excluded if they were not randomised controlled trials.
<b>VALIDITY:</b> Methodology, rigour, selection, opportunity for bias	<b>Search strategy:</b> Search strategy was outlined, PUBMED was searched for articles published between 1990 and 1999. There was no mention of the search being restricted by language. <b>Assessed validity:</b> Reviewers did not assess the quality of the included studies. There were not two independent reviewers. <b>Consistent results:</b> No discussion of consistency, just a pooling/ averaging of results. <b>Potential for bias:</b> The studies on angioplasty may not include the same patients as the studies on endarterectomy. The review included studies that were not randomised and the quality of these studies was not assessed.	<b>Search strategy:</b> This review drew on the search strategy developed for the Stroke Group as a whole. Ongoing trials have been identified by personal contact with individuals active in the field. <b>Assessed validity:</b> Reviewers planned to assess validity <b>Consistent results:</b> No studies identified. Two studies in progress were identified. <b>Potential for bias:</b> None identified
<b>RESULTS:</b> Generally favourable or unfavourable, specific outcomes of interest, estimate of experimental effect and precision if appropriate	Mortality within 30 days of angioplasty was 0.8% compared with 1.2% after endarterectomy (p=0.6). The stroke rate was 7.1% for angioplasty and 4% for endarterectomy (p<0.001).	No completed RCTs have been identified as yet. One trial has finished randomising but is not yet analysed, and one is ongoing.
<b>AUTHORS COMMENTS:</b> Risk/benefit, limitations	In the treatment of symptomatic carotid artery disease, the risk of stroke is significantly greater with angioplasty than carotid endarterectomy. At present, carotid angioplasty is not recommended for the majority of patients with symptomatic carotid artery disease.	There is no evidence as yet to support a change in the routine clinical treatment of patients with carotid stenosis to angioplasty with or without stenting. However, the data support the continuing randomisation of patients within clinical trials.
<b>REVIEWER'S COMMENTS:</b> Risk/benefit, methodology, conclusions	Studies on angioplasty were with or without stenting so it is difficult to determine the effect of stenting alone. Results must be interpreted very cautiously due to the unknown quality of the included studies, and due to these studies not being randomised trials. The conclusions, however, seem consistent with other more valid studies and guidelines.	Unable to reach any conclusions from this review due to the failure to locate any relevant trials.

<b>Evidence Summary Therapy</b>  <div style="border: 1px solid black; padding: 5px; width: fit-content;">           Is carotid stenting for carotid stenosis effective for stroke prevention compared with carotid endarterectomy?         </div>	<b>Study 1</b>  <b><u>Naylor AR et al. 1998</u></b> Randomized study of carotid angioplasty and stenting versus carotid endarterectomy: A stopped trial	<b>Study 2</b>  <b><u>Brown MM et al. 1999</u></b> Results of the carotid and vertebral artery transluminal angioplasty study
<b>STUDY DESIGN &amp; NHMRC LEVELS OF EVIDENCE</b>	Randomised controlled trial Level II evidence	Randomised controlled trial Level II evidence
<b>DESCRIPTION:</b> Subjects, Interventions, Comparisons, Outcomes, Inclusion & Exclusion Criteria	<b>Patients:</b> patients with symptomatic severe internal carotid artery disease. <b>Intervention:</b> Carotid angioplasty <b>Comparison:</b> Carotid endarterectomy <b>Outcome:</b> rate of embolism, number of strokes, and death rate at 30 days. <b>Incl &amp; Excl Criteria:</b> Inclusion- patients with territory symptoms and evidence of an ipsilateral 70-99% ICA stenosis. Exclusion- patients with asymptomatic disease, symptomatic 0-69% stenosis, crescendo transient ischemic attack or stroke in evolution, and vertebrobasilar or nonhemispheric symptoms.	<b>Patients:</b> patients with carotid stenosis <b>Intervention:</b> angioplasty <b>Comparison:</b> surgery <b>Outcome:</b> disabling stroke or death within 30 days of treatment <b>Incl &amp; Excl Criteria:</b> Not specified
<b>VALIDITY:</b> Methodology, rigour, selection, opportunity for bias	<b>Randomisation:</b> Yes. Random treatment methods were numbered and sealed in opaque envelopes and allocated on a consecutive basis starting with envelope 1. <b>All patients accounted for:</b> Yes. Six patients did not receive the treatment that they were allocated before trial suspension, 3 were excluded after randomisation, 3 patients were awaiting admission when the trial was suspended and 2 patients declined. <b>Patients treated equally:</b> Yes <b>Similar groups:</b> Groups appeared similar in age, sex and presenting diagnosis (difficult to determine due to small sample size) <b>Potential for bias:</b> Small sample size, possibility of type II error	<b>Randomisation:</b> Stated but evidence of randomisation technique is not described. <b>All patients accounted for:</b> Unable to determine (due to availability of abstract only) <b>Patients treated equally:</b> Unable to determine (due to availability of abstract only) <b>Similar groups:</b> Unable to determine (due to availability of abstract only) <b>Potential for bias:</b> Possible that the groups were not similar at the beginning of the trial, that the two groups were treated differently and that there was a degree of drop out in one or both groups. Would need to view a more detailed report to be able to determine.
<b>RESULTS:</b> Generally favourable or unfavourable, specific outcomes of interest, estimate of experimental effect and precision if appropriate	<b>Endarterectomy:</b> all patients were discharged home on day 5, no deaths occurred within 30 days. The median number of cerebral emboli detected was 12. None of the patients suffered perioperative stroke. <b>Carotid angioplasty:</b> Median duration of the CA was 45 minutes. The median number of cerebral emboli was 284 (significantly higher than for endarterectomy $p=0.0015$ ). None of the patients dies within 30 days but 5 of the 7 patients suffered an ipsilateral stroke, 3 of which were disabling at 30 days.	Mean carotid stenosis by the common carotid method was 87%. Safety analysis by intention to treat showed no difference in the primary outcome measure of disabling stroke or death within 30 days of treatment. Cranial nerve injury and myocardial ischaemia were only reported at the time of treatment in the surgical group. Long term survival curves showed no difference in ipsilateral stroke during follow up.
<b>AUTHORS COMMENTS:</b> Risk/benefit, limitations	Although carotid angioplasty had attractive theoretical benefits over endarterectomy, our trial suggests that it cannot be used routinely in patients with symptomatic carotid artery disease who would otherwise undergo endarterectomy.	Carotid surgery and angioplasty are equivalent in safety and efficacy, but angioplasty had advantages with respect to nerve injury and cardiac complications.
<b>REVIEWER'S COMMENTS:</b> Risk/benefit, methodology, conclusions	Severe limitation is the small sample size due to the trial being stopped. We also suggests that the risks of carotid angioplasty in this patient group need to be very carefully considered.	Stents were only used in 26% of angioplasties. Therefore very difficult to determine the effect of stenting. Appraisal is based on abstract only due to availability.

<p><b>Evidence Summary Therapy</b></p> <p>Is carotid stenting for carotid stenosis effective for stroke prevention compared with carotid endarterectomy?</p>	<p><b>Study 3</b></p> <p><b>Bean JR et al, 2000</b></p> <p>Early results comparing stenting with endarterectomy for treatment of symptomatic carotid stenosis: a randomised community hospital-based trial</p>	
<p><b>STUDY DESIGN &amp; NHMRC LEVELS OF EVIDENCE</b></p>	<p>Randomised controlled trial Level II evidence</p>	
<p><b>DESCRIPTION:</b> Subjects, Interventions, Comparisons, Outcomes, Inclusion &amp; Exclusion Criteria</p>	<p><b>Patients:</b> patients with symptomatic carotid stenosis, with 6 weeks of carotid ischemia. <b>Intervention:</b> carotid percutaneous transluminal angioplasty and stenting <b>Comparison:</b> carotid endarterectomy <b>Outcome:</b> risk, length of stay, costs and patient preferences <b>Incl &amp; Excl Criteria:</b> Not specified</p>	
<p><b>VALIDITY:</b> Methodology, rigour, selection, opportunity for bias</p>	<p><b>Randomisation:</b> Stated but evidence of randomisation technique is not described. <b>All patients accounted for:</b> Yes. 3 patients crossed over from angioplasty to endarterectomy when stents could not be deployed. No indication of patient refusal to participate. <b>Patients treated equally:</b> Unable to determine (due to availability of abstract only) <b>Similar groups:</b> Yes <b>Potential for bias:</b> Groups may not have been treated equally. Potentially small sample size. Not clear exactly which patients were included and excluded and what the characteristics were of any patients who refused to take part in the study.</p>	
<p><b>RESULTS:</b> Generally favourable or unfavourable, specific outcomes of interest, estimate of experimental effect and precision if appropriate</p>	<p>One death occurred with endarterectomy, none with angioplasty. Endarterectomy complications included cranial nerve injury and incision. Angioplasty complications were temporary carotid sinus related and access site problems. Hospital stay for angioplasty was 1.8 days compared to 2.7 for endarterectomy. Angioplasty with any complications stayed 13.3 days while endarterectomy with complications stayed 3.0 days. Average hospital costs for angioplasty were 28% higher.</p>	
<p><b>AUTHORS COMMENTS:</b> Risk/benefit, limitations</p>	<p>Angioplasty and endarterectomy are similarly effective for symptomatic carotid stenosis. However, angioplasty complications significantly prolong hospital stay and recovery periods.</p>	
<p><b>REVIEWER'S COMMENTS:</b> Risk/benefit, methodology, conclusions</p>	<p>In light of the risks associated with complications endarterectomy may be the more effective treatment. Findings may not translate to asymptomatic stenosis. Due to the availability of abstract only it was not possible to ascertain all potential biases.</p>	

**Is carotid stenting for carotid stenosis effective for stroke prevention compared with carotid endarterectomy?  
Evidence Based Guidelines**

Title and Agency	Rigour of development	Identification and Interpretation of Evidence	Objectives	Recommendations			Notes
				Recommendations	Level of recommendation	Specific therapies	
National Health and Medical Research Council Australia 1996. Clinical practice guidelines: Prevention of stroke.	There is a clearly defined development group	Description of sources is clearly defined.  Uses a grading system for levels of evidence (NHMRC, 1995).	Improve patient outcomes and help clinicians and patients to make informed decisions about stroke prevention. Particular focus on carotid endarterectomy.	1. Carotid endarterectomy is the treatment of choice for people with 70-99% symptomatic stenosis who are fit for and willing to undergo surgery, and possible for some people with severe asymptomatic stenosis. 2. Carotid angioplasty is currently being investigated as a treatment for carotid stenosis, but is not yet widely used.	Level I  Level II  Level IV	Studies are currently underway. It is recommended that the procedure be undertaken only as part of trials.	Very thorough guideline. It has not, however, been updated since December 1996.
Scottish Intercollegiate Guidelines Network 1997. Management of carotid stenosis and carotid endarterectomy.	There is a clearly defined development group	Description of sources is clearly defined.  Used Grades A-C to rank evidence (according to grading recommendations from the US agency for Health Care Policy and Research).	To assist individual clinicians, hospital departments, hospitals and purchasers of health care to produce local protocols for appropriate use of carotid endarterectomy.	1. Patients who have had a TIA or ischaemic stroke during the last 6 months and are found to have severe stenosis should be considered for carotid endarterectomy. 2. Carotid angioplasty should only be undertaken in the context of randomised controlled trials	Grade A  Grade C (equates to NHMRC Level IV)	Death occurs in 1-2% of patients undergoing endarterectomy, but there are wide variations between centres.  The procedure is currently being evaluated. It is not yet clear how risky the procedure is.	Very thorough guideline. It has not been updated since May 1997.