Carotid Endarterectomy for Symptomatic Carotid Stenosis

Where do surgeons fit best in secondary stroke prevention?
Plato said that “Of medical science there are five species: The **pharmaceutical** relieves infirmities by means of medicines; the **manual** heals men by cutting and cauterizing; the one which attends to the **diet**, gets rid of diseases by altering and regulating the diet; the fourth produces its effects by a **thorough comprehension of the nature of the disease**; and the last relieves men from suffering by bringing **prompt assistance at the moment**.
Carotid Pathology 101

- External carotid artery (supplies face, scalp and neck)
- Internal carotid artery (supplies blood to brain)
- Cross-section of artery
  - Reduced blood flow
  - Plaque narrows artery

A diagram illustrating the carotid arteries and their relationship to the brain.
Carotid Pathology 102
Is anyone else as amazed as I am that Larry King was able to return to his CNN talk show the Monday following a Friday carotid endarterectomy? The procedure removes plaque buildup in the carotid arteries that have the potential to cause heart attacks or stroke. According to the Baylor College of Medicine (BCM) Dept of Surgery, the procedure takes about two hours and patients spend one or two days in the hospital. Patients usually aren’t ready to resume regular activity for several weeks following the operation. The 73-year-old apparently doesn’t have a moment to waste!
## Variables

<table>
<thead>
<tr>
<th>Cartotid Symptoms</th>
<th>Concurrent diseases</th>
<th>Preferences</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Cerebral</td>
<td>• Prognosis</td>
<td>• MD’s</td>
</tr>
<tr>
<td>• Retinal</td>
<td>• Anesthesia risk</td>
<td>• Patients</td>
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</tbody>
</table>
Options for Carotid Plaque Management

- Leave it where it is
- Compress and exclude it with a stent
- Remove it surgically
Recent News


2. Systematic Review of the Risks of Carotid Endarterectomy in Relation to the Clinical Indication for and Timing of Surgery

3. A Review of the Trials Comparing Carotid Endarterectomy and Carotid Angioplasty and Stenting
Carotid endarterectomy—An evidence-based review: Report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology

S. Chaturvedi, A. Bruno, T. Feasby, R. Holloway, O. Benavente, S. N. Cohen, R. Cote, D. Hess, J. Saver, J. D. Spence, B. Stern and J. Wilterdink: 
*Neurology* 2005;65;794-801

This information is current as of November 18, 2008
Recommendation 1. CE is established as effective for recently symptomatic (within previous 6 months) patients with 70 to 99% ICA angiographic stenosis (Level A). CE should not be considered for symptomatic patients with less than 50% stenosis (Level A). CE may be considered for patients with 50 to 69% symptomatic stenosis (Level B) but the clinician should consider additional clinical and angiographic variables (Level C, see below). It is recommended that the patient have at least a 5-year life expectancy and that the perioperative stroke/death rate should be 6% for symptomatic patients (Level A). Medical management is preferred to CE for symptomatic patients with 50% stenosis (Level A).
**Recommendation 2.** It is reasonable to consider CE for patients between the ages of 40 and 75 years and with asymptomatic stenosis of 60 to 99% if the patient has an expected 5-year life expectancy and if the surgical stroke or death frequency can be reliably documented to be 3% (Level A). The 5-year life expectancy is important since perioperative strokes pose an up front risk to the patient and the benefit from CE emerges only after a number of years.
Recommendation 3. No recommendation can be provided regarding the value of emergent CE in patients with a progressing neurologic deficit (Level U).
Recommendation 4. 4. Clinicians should consider patient variables in CE decision making.

Women with 50 to 69% symptomatic stenosis did not show clear benefit in previous trials. In addition, patients with hemispheric TIA/stroke had greater benefit from CE than patients with retinal ischemic events (Level C).

Clinicians should also consider several radiologic factors in decision making about CE.

For example, contralateral occlusion erases the small benefit of CE in asymptomatic patients whereas in symptomatic patients, it is associated with increased operative risk but persistent benefit (Level C). CE for patients with angiographic near-occlusion in symptomatic patients is associated with a trend toward benefit at 2 years but not associated with a clear long-term benefit (Level C).

Patients operated on within 2 weeks of their last TIA or mild stroke derive greater benefit from CE (Level C).
**Recommendation 5.** Symptomatic and asymptomatic patients undergoing CE should be given aspirin (81 or 325 mg/day) prior to surgery and for at least 3 months following surgery to reduce the combined endpoint of stroke, myocardial infarction, and death (Level A). Although data are not available, it is recommended that aspirin (81 or 325 mg/day) be continued indefinitely provided that contraindications are absent. Aspirin at 650 or 1,300 mg/day is less effective in the perioperative period. The data are insufficient to recommend the use of other antiplatelet agents in the perioperative setting.
Recommendation 6. At this time the available data are insufficient to declare either CE before or simultaneous with CABG as superior in patients with concomitant carotid and coronary artery occlusive disease (Level U).
**Recommendation 7.** For patients with severe stenosis and a recent TIA or nondisabling stroke, CE should be performed without delay, preferably within 2 weeks of the patient’s last symptomatic event (Level C). There is insufficient evidence to support or refute the performance of CE within 4 to 6 weeks of a recent moderate to severe stroke (Level U).
Conclusions—Risk of stroke and death resulting from CEA is highly dependent on the clinical indication. Audits of risk should be stratified accordingly, and patients should be informed of the risk that relates to their presenting event. (Stroke. 2003;34:2290-2303.)
1. Most published reports of the risks of CEA do not stratify their results by indication.
2. Our analyses show that the risk of stroke and death resulting from CEA is highly dependent on the clinical indication, and reports of surgical risk should be stratified accordingly.
3. Categorization of patients as symptomatic or asymptomatic is an oversimplification and is of limited use in predicting operative risk.
4. There are clinically important differences in risk between the different symptomatic indications, and patients with only ocular ischemic events are closer in risk to patients with asymptomatic stenosis.
5. The operative risk of CEA in the acute phase of ongoing cerebral ischemia is probably too high to be justified in routine clinical practice, but surgery in the subacute phase in patients with a stable neurological syndrome is not associated with a higher operative risk than later surgery.
This review will summarize the results of randomized controlled trials (CAVATAS, WALLSTENT, SAPPHIRE, EVA-3S, SPACE, and CaRESS) as well as pivotal carotid registry studies (ARCHeR, BEACH, CAPTURE, CASES-PMS, CREATE, and CABernET) intended to evaluate the safety and efficacy of CEA and CAS in treatment of carotid stenosis. In addition, it will provide a preview of the current ongoing and future trials examining the safety, applicability, and indications of CAS and CEA (CREST, CAVATAS-2, ACT 1, and TACIT).
A Review of the Trials Comparing Carotid Endarterectomy and Carotid Angioplasty and Stenting
Joseph J. Ricotta, II and Rafael D. Malgor
Perspect Vasc Surg Endovasc Ther 2008; 20; 299 originally published online Sep 25, 2008

Table 3. Thirty-Day and 1-Year Morbidity and Mortality Analysis (Randomized Controlled Trials)

<table>
<thead>
<tr>
<th>Trial</th>
<th>N, CEA/CAS = Total</th>
<th>Thirty-Day Stroke, Death, or MI</th>
<th>One-Year Death or Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>% CEA</td>
<td>% CAS</td>
</tr>
<tr>
<td>Leicester,12 1998</td>
<td>12/11 = 23</td>
<td>0 (0/12)</td>
<td>45.5 (5/11)</td>
</tr>
<tr>
<td>CAVATAS,13 2001</td>
<td>253/251 = 504</td>
<td>11.1 (28/253)</td>
<td>10 (25/251)</td>
</tr>
<tr>
<td>Kentucky A,16 2001</td>
<td>51/53 = 104</td>
<td>2 (1/51)</td>
<td>0 (0/53)</td>
</tr>
<tr>
<td>Kentucky B,17 2004</td>
<td>42/43 = 85</td>
<td>0 (0/42)</td>
<td>0 (0/43)</td>
</tr>
<tr>
<td>SAPPHIRE,18,19 2004</td>
<td>167/167 = 334</td>
<td>9.6 (16/167)</td>
<td>4.8 (8/167)</td>
</tr>
<tr>
<td>CaRESS,20 2003</td>
<td>254/143 = 397</td>
<td>4.3 (11/254)</td>
<td>2.1 (3/143)</td>
</tr>
<tr>
<td>EVA-3S,22 2006</td>
<td>262/265 = 527</td>
<td>4.6 (12/262)</td>
<td>9.8 (26/265)</td>
</tr>
<tr>
<td>SPACE,21 2006</td>
<td>595/605 = 1200</td>
<td>6.5 (38/595)</td>
<td>7.7 (46/605)</td>
</tr>
</tbody>
</table>

NOTES: CEA = carotid endarterectomy; CAS = coronary artery stenting; MI = myocardial infarction; CAVATAS = Carotid and Vertebral Artery Transluminal Angioplasty Study; SAPPHIRE = Stenting and Angioplasty with Protection in Patients at High Risk for Endarterectomy; CaRESS = Carotid Revascularization using Endarterectomy or Stenting Systems; EVA-3S = Endarterectomy Versus Angioplasty in Patients With Symptomatic, Severe Carotid Stenosis; SPACE = Stent-Protected, Percutaneous Angioplasty Versus Carotid Endarterectomy.
In the last decade, carotid stenting has developed into a safe and efficacious therapy for carotid artery stenosis. Several trials and carotid stent registries as well as recent Cochrane review and meta-analysis have suggested that there is no significant difference between CAS and CEA for treatment of severe CS in high-surgical-risk patients. However, several questions still remain about the safety and efficacy of CAS in symptomatic patients and in low-risk patients. The exact role and indications for CAS is yet to be determined.
Technical Options for CEA

Local vs General Anesthesia
EEG monitoring
Stump pressure monitoring
Intra-operative ultrasound
CAUTION

THIS SIGN HAS SHARP EDGES

DO NOT TOUCH THE EDGES OF THIS SIGN

ALSO, THE BRIDGE IS OUT AHEAD

Smoking
HBP
CAD
Obesity
Inactivity
Care for Symptomatic Carotid Stenosis Patients: What can Surgeons Contribute?

- Plaque Management
- Smoking Cessation
- BP Management
- Lipids
- Fitness Maintenance
- Heart Assessment & Protection
- Best Meds
- Stress & Mood Management
- Diabetes, other
Organizational Challenges

Identify patients at risk
- Symptomatic
- Asymptomatic

Get them to appropriate team
- Stroke Neurology
- Surgeon/Stenter

Bring best treatment(s)
- Hospital
- OR

Take care of risk factors, stressors, disabilities, knowledge needs, monitoring arrangements
Access a Challenge...
Discussion