

CAROTID ARTERY STENOSIS

Background

1. Definition: Narrowing of internal carotid artery. Potentially increases risk for thrombotic stroke. Stenosis of 60-99% felt to be clinically significant.
2. General Information: Pair of internal carotid arteries provides main blood supply to brain. These may become narrowed by atherosclerotic plaque composed of necrotic cells, lipids and cholesterol crystals with potential medical consequences.

Pathophysiology

1. Pathology of disease: Atherosclerotic process leading to narrowing of internal carotid arteries.
 - Asymptomatic unless plaque ruptures, which causes stroke (CVA).
2. Incidence & Prevalence:
 - Younger than 70 years of age: 1 to 6% of population has stenosis greater than 60%.
 - Older than 70 years of age: Poorly defined; prevalence known to increase with age.
3. Risk factors
 - Advanced age
 - i. M>F under age 75
 - ii. F>M age greater than 75
 - Smoking - primary preventable risk factor
 - Hypertension - most important, prevalent, treatable risk factor for stroke.
 - Atrial fibrillation
 - Dyslipidemia
 - Diabetes and insulin resistance
 - Obesity
 - Family history of cardiovascular disease
4. Morbidity and mortality:
 - Morbidity and mortality due to thrombotic ischemic cerebrovascular events secondary to rupture of atherosclerotic plaque.

Diagnostics

1. History: asymptomatic. Review risk factors...especially treatable/avoidable
2. Physical:
 - Carotid bruits: Conflicting data regarding clinic relevance.
 - If found in asymptomatic adults, carotid bruit has higher predictive value for coronary artery disease than cerebrovascular disease.
3. Further Testing:
 - Not recommended in asymptomatic patients (see below)
 - Recommended only with CVA
 - Carotid duplex ultrasonography (DUS), magnetic resonance angiography (MRA), contrast-enhanced MRA (CEMRA), computed tomographic angiography (CTA) all used with minimal differences.

- Carotid duplex ultrasonography often preferred given relative cost, availability and low invasiveness
- 3. Diagnostic criteria:
 - Stenosis between 60 – 99% - felt clinically significant.
 - Complete occlusion of carotid arteries is contraindication to surgical intervention.

Therapeutics

1. For symptomatic patients (patient with TIA or CVA)
 - Risk reduction reduces recurrence: smoking cessation, BP control, statins, aspirin/aspirin-dipyridamole/clopidogrel
 - Carotid Endarterectomy (CEA) Surgery yields benefits in patients with stenosis of more than 70%.
 - NASCET trial found NNT=6 to prevent one major CVA at two years (7)
 - Decision aides may help patients decide:
<http://www.healthwise.net/cochrane/decisionaid/Content/StdDocument.aspx?DOCHWID=aa43099> (Accessed 3.3.2012)
 - Best outcomes occur when performed in centers with low perioperative stroke and death rates (<7%), when done within two weeks of the CVA, and performed on surgically fit patients.
 - For stenosis <70%, surgical benefit less; could be considered given other risk factors, especially if additional risk factor reduction cannot reasonably be achieved.
 - Inconsistent evidence on the benefit of carotid artery stenting (CAS) when compared to CEA.
 - CAS considered minimally invasive, less healing time, minimal surgical scarring, less non-stroke perioperative morbidity
 - Per American Heart Association/American Stroke Association (AHA/ASA) guidelines, CAS may be considered for patients with symptomatic severe (>70 percent) carotid stenosis and difficult surgical access.
 - CEA noninferior to CAS and continues to be treatment of choice for those who choose operative intervention
2. For asymptomatic patients
 - Greatest risk to health is cardiovascular, not neurologic
 - CEA or CAS for asymptomatic patients may be beneficial in certain circumstances; generally if facility perioperative stroke and death rates are <3%.
 - Consider for patients with stenosis between 60 to 99%
 - ACAS and ACST trials found NNT= 33 to prevent one major CVA at three years for endarterectomy
 - Benefit emerge only after several years
 - No high quality randomized controlled trials comparing CEA with CAS have focused exclusively on asymptomatic patients.

Screening

1. Several expert groups, including United States Preventive Services Task Force , American Academy of Family Physicians and AHA/ASA recommend against screening

for asymptomatic carotid artery stenosis in general population (Grade D recommendation).

2. Screening asymptomatic individuals who have a carotid bruit “may be considered” for asymptomatic patients with known atherosclerotic disease (peripheral arterial disease, coronary disease, or aortic aneurysm) or with two or more risk factors for atherosclerotic disease

Follow-Up

1. Risk factor reduction should be major focus in reducing CVA/TIA risk .
 - For those at higher risk, ASA 81-325/day reduces risk.
2. Medication: Lower-dose aspirin (81 to 325 mg daily) recommended for all patients intending to have CEA.
 - Aspirin should be started prior to surgery and continued for at least three months after surgery.
3. Return to Office: Cardiac risk factors should be continuously monitored and periodic clinic visits advised. No specific recommendation for interval between visits.
4. Refer to Specialist: Amongst patient with substantial carotid artery stenosis, defined by hemodynamic compromise, but no recent neurological symptoms (stroke or transient ischemic attack), no guidelines for referrals currently exist.
5. Admit to Hospital: Currently no indication for immediate admission of patients with asymptomatic carotid artery stenosis.
6. Surgery: Insufficient evidence to recommend universal surgical intervention for patient with asymptomatic carotid artery stenosis.
 - Carefully selected patients may derive benefit from invasive intervention, provided they are good candidates.

Prognosis

1. Carotid artery disease—prognosis depends on other risk factors and absolute degree of stenosis
2. Carotid Endarterectomy
 - Surgical risk of stroke or death of about 2-4% in best institutions.
 - Reduction of major stroke and death in appropriately selected patients, even after surgical death and stroke taken into account.
 - Certain patient characteristics increase risk of stroke with medical treatment and surgical treatment. These include: advanced age, smoking, poorly controlled blood pressure, severe COPD, class III or IV heart failure, EF<30%, left main or multivessel CAD, recent MI.
 - Absolute benefit varies depending on patient characteristics, surgeon expertise and institutional excellence.

Patient Education

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