Treatment Considerations for Carotid Artery Stenosis

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Learning Objectives

- Evaluate asymptomatic v. symptomatic carotid artery disease
- Analyze the degree of carotid stenosis
- Identify the medical and surgical management of carotid artery disease
Background

- 80-85% of all stroke is ischemic in nature
- Carotid artery disease has been documented to cause 30-60% of ischemic strokes
- The location most frequently affected is the carotid bifurcation (with extension into the internal carotid artery)
- Atherosclerosis -> stenosis: luminal narrowing often accompanied by ulceration
Atherosclerosis in Carotid Artery Stenosis

- Build up of plaque inside the arteries.
- Plaque is made of cholesterol, fatty substances, calcium, fibrin and cellular waste.
- Over time, this leads to the narrowing of an artery, a total occlusion of blood flow, thrombus formation on the plaque’s surface, or a piece of plaque/thrombus may break off (embolic stroke)
Asymptomatic v. Symptomatic and degree of stenosis

- Asymptomatic: presence of atherosclerotic narrowing without recent stroke or TIA (6 months)

- Symptomatic: with Stroke/TIA - not vertigo, lightheadedness or syncope

- Degree of stenosis:
  - Mild < 50%
  - Moderate 50-69%
  - Severe 70-99%

- Severe carotid stenosis is a strong predictor for stroke
Asymptomatic Management

- Intensive medical management: statins, anti-platelet agents (Aspirin), HTN/DM management, lifestyle modification (AHA/ASA guidelines)

- (Consider CEA if stenosis > 70% and surgical risk is low (<3%))

- Aspirin pre- and post-operatively

- (Prophylactic CAS is considered in selected patients (not recommended by the Society of Vascular Surgery) - and only if in a trial)
CEA and CAS for Asymptomatic disease

- CEA trials, in patient with high-grade, asymptomatic stenosis: VA trial, ACAS, and ACST.
- Delay to benefit, Preoperative complications, gender role (male benefit)
- CAS trials: SAPHIRE and CREST (asymptomatic and symptomatic patients enrolled), ACT I (CEA v. CAS)
- CAS - consider when poor candidates for surgery (conflicting date)
CAS tended to have a greater benefit at younger ages, while CEA has a greater benefit at older ages.

- Gender benefit (male>female) or equal by gender

- CAS is not inferior to CEA in high-risk patients (surgical risk, prior neck surgery/radiation, recurrent stenosis after CEA, contralateral laryngeal nerve palsy, age)

- Identifying high-risk patients:
  - Progression in severity of stenosis
  - Asymptomatic carotid embolism
  - High-risk morphologic features of the carotid plaque
  - Reduced cerebral blood flow reserve
  - Ipsilateral silent embolic infarcts on imaging
Estimated risk (stenosis > 50%) is 0.5-1% annually. Also a marker of increased risk for MI and vascular death.

Intensive medical therapy: Anti-platelet, Statin, HTN/DM control, lifestyle modifications.

Medically stable, with life expectancy > 5 years, and Severe stenosis - consider CEA (if risk <3% by surgeon and center)

CAS - clinic trial, high-risk/special population, <3% risk per center
Symptomatic Management

- Defined as focal neurological symptoms, referable to the appropriate carotid artery distribution, including 1+ TIA, transient monocular blindness, or minor stroke (non-disabling) within the last 6 months.
- CEA > medical management alone
- CEA > CAS if:
  - Surgically accessible lesion
  - No significant cardiac, pulmonary, or other diseases that would greatly increase the risk of surgery
  - No prior ipsilateral CEA
  - Preoperative risk < 6%
  - Aspirin 81-325mg pre- and post-operatively (at least 3 months)
CEA
(Carotid Endarterectomy)

- Incision made in neck, plaque removed, artery closed, neck closed. +/- variable closures and bypass techniques
- NASCET Trial - 1980s, CEA vs. Medical Management. Symptomatic patients: TIA, CVA or monocular blindness + 70-99% stenosis. Ended early - surgery beneficial
- ECST Trial - CEA vs Aspirin, Symptomatic, 70-99%. CEA beneficial. Confirmed results of NASCET.
- VA Trials with similar results.
- Pooled analysis added that CEA also beneficial 50-69% stenosis, but higher risk.
- Cranial nerve assessment post-op: 12th: tongue movement and smile, along with incision and drain assessment
Symptomatic Management - CEA

- Timing of Surgery: within 2 weeks of stroke/TIA had higher benefit, but within first 48 hours had a higher risk.

- CEA with greater benefit for males > females, especially the lower the stenosis %

- Higher preoperative risk with large cerebral infarct - may delay surgery, but perform within 6 weeks.

- Watch for baroreceptor-related changes in blood pressure post-op, along with post-op hyper-perfusion injury.
CAS
(Carotid angioplasty and stenting)

- Peri-procedural (30 day) stroke or death rate is higher with CAS than CEA
- CAS for patient's with stenosis 70-99% and:
  - Lesion location not suitable for surgery
  - Radiation-Induced stenosis
  - Restenosis after CEA
  - Clinically significant cardiac, pulmonary or other disease that increases risk of surgery/anesthesia
  - Contralateral ICA occlusion
- Post-op assessment: groin site, Neuro checks
Symptomatic Management - CAS

- CREST Trial: CAS vs. CEA - asymptomatic and symptomatic enrolled. Long-term outcomes similar for both. Patients > 70 had increased risk with CAS. CAS had lower rates of MI. Genders equal.

- ICSS Trial: Risk of stroke higher with CAS than CEA. Both beneficial.

- SPACE Trial: Europe, stopped early r/t funding/recruitment. CAS not inferior - could not prove. But, distal embolic protection was not mandatory.

- SAPPHIRE Trial: CAS not inferior to CEA, but 70% enrolled were asymptomatic.
Method of Stenosis Measurement

- Most trials used **Catheter Angiography** - best accuracy of stenosis %
- **Carotid Duplex Ultrasound** - Velocity, some accuracy of stenosis
- **MRA** - Less accurate, no radiation
- **CTA** - More accurate, with radiation
AHA/ASA Guidelines 2014

- Symptomatic, Severe stenosis - CEA if surgical risk < 6%
- Symptomatic, Moderate stenosis - CEA if surgical risk < 6%
- Stenosis < 50% - no re-vascularization
- CEA - within 2 weeks
- CAS instead of CEA - if average/low risk, diameter of lumen is reduced by 70% by noninvasive imaging or 50% by catheter angiogram, or > 50% noninvasive imaging with corroboration, and risk < 6%. CAS for special circumstances and higher surgical risk
- Consider patient age (>70 better outcomes with CEA
- Optimal medical therapy: Anti-platelet, Statin and lifestyle modifications
Optimal Medical Therapy

- Cause of Carotid Artery Stenosis:
  - Smoking
  - Hyperlipidemia
  - Hypertension
  - Hyperglycemia

- Populations with increased risk:
  - DM, Family history of CAD, HTN
  - Lack of physical activity, Metabolic syndrome, obesity, smoking, poor diet

- Primary/Secondary Prevention!
- Medications: Aspirin/Plavix, Statin, (Fish Oil, CoQ10, Red Yeast Rice)
Questions?

Thank you!