Carotid Endarterectomy Techniques and Results

Juan Carlos Jimenez MD, MBA
Professor of Surgery
Division of Vascular Surgery
David Geffen School of Medicine at UCLA
History: First Carotid Intervention 1954

H.H.G Eastcott

Eastcott HHG, Pickering GW, Rob CG. Lancet 1954
First Carotid Endarterectomy: Dr. Cooley or DeBakey?


DeBakey ME. Successful carotid endarterectomy for cerebrovascular insufficiency: nineteen-year follow-up. 1975;233:1083-1085

Performed and Reported in 1956

1953, Reported in 1975
Dear Dr. Friedman,

I enjoyed your historical review of CAT and the point you made about the durability of the procedure during the past 50 years. Mr. Eastcott, who was a pioneer in these operations, often referred to our report as the first endarterectomy. I am forwarding a copy to which may interest you. Some doubt exists regarding the validity of the article from Houston dated 1975.

Respectfully yours,

Denton Cooley
Medical Management Prior to CEA: SVS Guidelines

- Treatment of hypertension, hypercholesterolemia and smoking cessation reduce cardiovascular risk and risk of stroke (Grade 1A)
- Antiplatelet therapy in asymptomatic patients is recommended to reduce cardiovascular morbidity but not shown to be effective in primary prevention of stroke (Grade 1A)
- Aspirin or Plavix recommended for secondary stroke prevention (Grade 1B)
- Perioperative medical management should include blood pressure control, beta blockade, and statin therapy (Grade 1B)

General vs. Regional Anesthesia for Carotid Endarterectomy?

- Study using ACS NSQIP
- 24,716 patients undergoing CEA
- No difference in 30-day stroke/MI/death rate based on anesthesia type
- Regional anesthesia associated with:
  - Shorter operative and anesthesia times
  - More likely to be discharged next day
- **Type of anesthesia used should be based on surgeon/anesthesiologist/institutional comfort level

Preoperative Considerations: Ultrasound Evaluation of Carotid Plaque

Carotid Plaque
Immediate Preoperative Ultrasound Evaluation of Plaque

- Localization of carotid bifurcation
  - Minimize length of neck incision
- Assess degree of calcification
- Ensure no significant change from prior pre-operative imaging
Preoperative Considerations: Positioning and Surgical Incision

- Supine
- Shoulder Roll
- Mild contralateral neck extension
- Landmarks - Cervical incision
  - Cranial - Mastoid Process
  - Caudal - Sternal notch
- Transverse
  - Adjust based on level of bifurcation
CEA: Superficial Dissection

- Dissection through skin and subcutaneous tissue
- Incise platysma muscle
- Control muscle bleeding with electrocautery
CEA Technique: Mobilization of SCM Muscle

- Posteromedial dissection of SCM
- Avascular plane developed
- Lateral retraction of SCM to expose
  - Internal jugular vein
  - Carotid sheath
CEA: Technique for Exposure of Carotid Sheath

- Anteromedial edge of jugular vein dissected
- Common facial vein ligated and divided
- IJ is retracted laterally
- CCA mobilized and Rumel tourniquet placed
CEA: Technique for Exposure of Carotid Sheath

Greater Auricular nerve

Common facial vein

IJ

CCA

Ligate common facial vein
CEA Techniques: Place Rumel tourniquet around CCA
Hypoglossal nerve

Vagus nerve

Ansa

Hypoglossal nerve

Vagus nerve
Superior thyroid artery divided

Nerve to carotid sinus divided

Allows for more distal mobilization of the ICA!
CEA Techniques: Carotid Exposure Prior to Clamping

- Mobilize ICA to distal “soft spot” beyond plaque
- Distal clamp – Ideally on artery free of disease
- Systemic anticoagulation
- Clamp ICA first
- Rotate CCA prior to clamping so arteriotomy is opposite flow divider
CEA Techniques: Arteriotomy

- Arteriotomy- Start in disease free CCA and extend cranially distal to ICA plaque
- If EEG changes, place shunt
CEA: Technique for Plaque Endarterectomy

- Freer-elevator used to elevate plaque from adventitia
- Begin in bulkiest portion of plaque
- Proximal endpoint can be established at CCA
- Develop distal ICA endpoint carefully where disease free intima is present
- Remove plaque from ECA
CEA Techniques: Patch Angioplasty

• Patch angioplasty with two separate suture lines at both ends
• 5-0 Prolene
• Dacron, bovine pericardium or vein patch
• Upon completion, restore flow to ECA first, then ICA
Completion Angiogram:

- Transverse arteriotomy in ECA
- Removal of residual ECA plaque
- Filling defect at ECA origin
- Flow to ICA preserved
Closure and Postoperative Monitoring:

- Irrigation and hemostasis
- Closure
  - Platysma layer - 3-0 absorbable
  - Skin - 4-0 monocryl subcuticular
- Neurologic evaluation postoperatively
- Overnight admission to monitored unit
- ICU may be required: Hemodynamic lability most common
Carotid Shunts:
Carotid Shunts:

• We practice selective shunting based on continuous EEG monitoring
• No consensus
• Routine shunting and selective shunting both associated with low stroke rates¹
• Surgeon comfort and experience

Eversion Endarterectomy: Technique

a) ICA is disconnected from bulb with oblique incision
b) ICA is everted and plaque is removed
c) Arteriotomy on CCA is extended proximally
d) Endarterectomy of the ECA and CCA
e) ICA reconnected to carotid bulb with continuous prolene suture
Eversion Endarterectomy:

**Advantages:**
- Potential for faster op time
- No patch angioplasty required
- No synthetic material
- Facilitates management of redundant ICA
- Optimal for setting of non-recurrent laryngeal nerve

**Disadvantages:**
- More extensive dissection of carotid bulb and ICA required
- Shunting is difficult
- Distal ICA lesions may be difficult with this technique
Non-Recurrent Laryngeal Nerve: Anatomy
Non-Recurrent Laryngeal Nerve

• The presence of NRLN:
  • Frequently overlies the carotid bifurcation
  • Increased risk of injury

• Failure to recognize this anatomic variation increases the risk of NRLN injury
Internal Carotid Artery

Vagus Nerve

Mandible

Non-recurrent laryngeal nerve

Common carotid artery

Larynx
Surgical Technique

- Careful sharp dissection and anteromedial mobilization of the vagus nerve
Alternate surgical techniques:

• Surgical dissection of the artery itself with cranial-caudal mobilization

• Eversion endarterectomy
Thank You!

UCLA Health

David Geffen School of Medicine