

Technique of Carotid Endarterectomy Using Regional Anesthesia

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Overview

Preoperative Care
Anesthetic Choice & Technique
Positioning & Draping
Skin Incision
Superficial Exposure
Deep Exposure
Endarterectomy
Closure of Arteriotomy
Closure of Wound
Postoperative Care

Preoperative Care

- Detailed explanation of procedure in office
- Usual medications on day of surgery
- Aspirin 81mg and clopidogrel 75mg daily preoperatively, day of surgery and postoperatively for six weeks

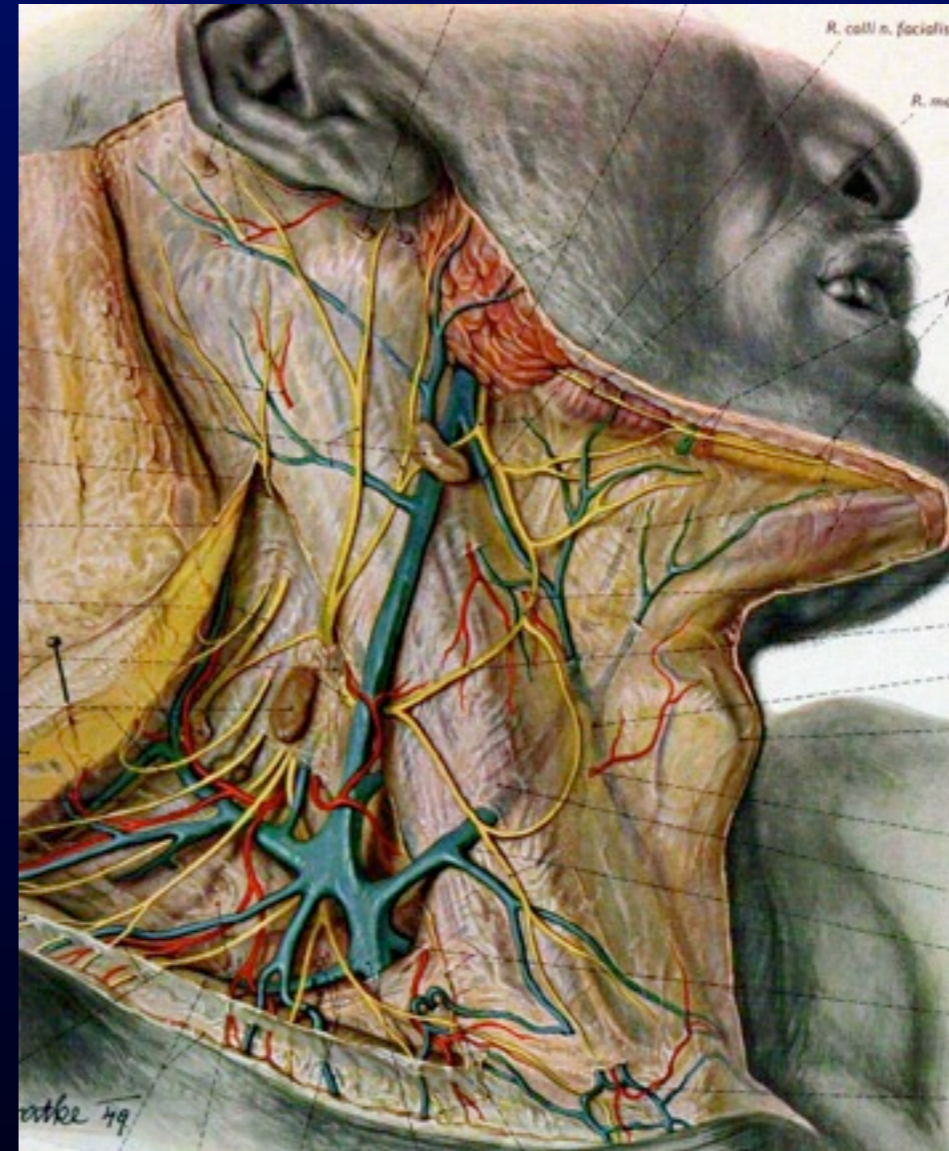
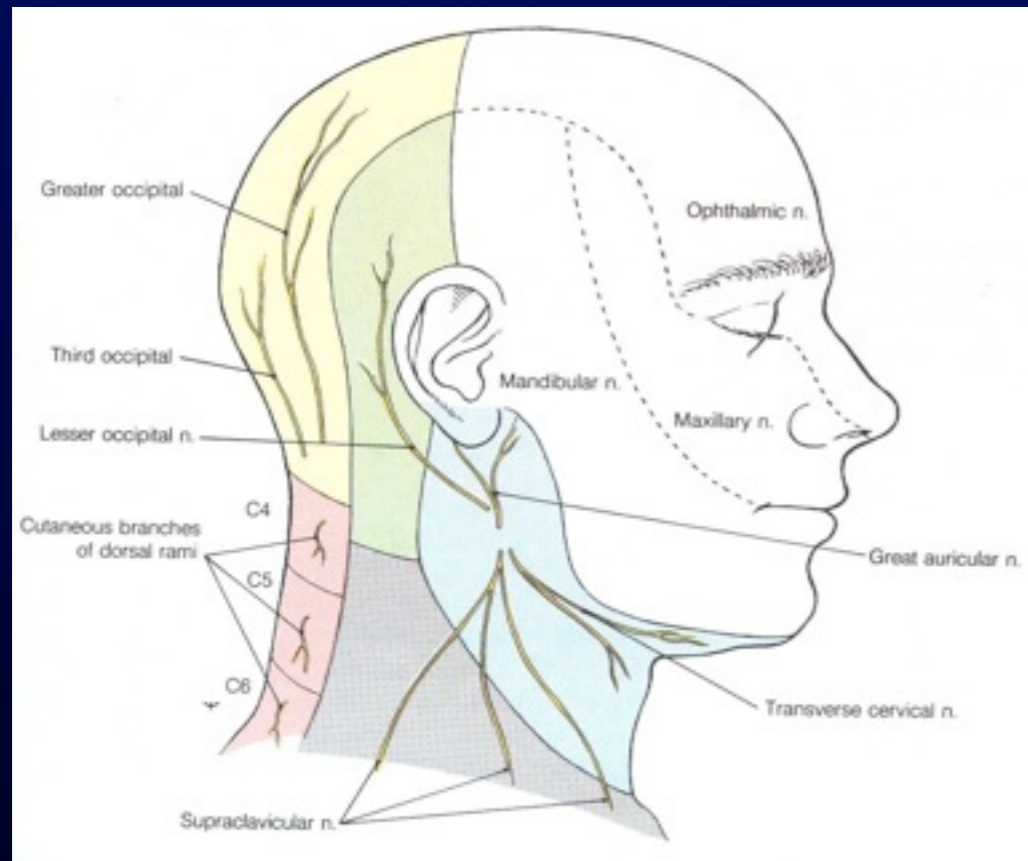
Monitoring and Lines

- Noninvasive BP monitoring
- Single IV
- No arterial or central venous lines
- No urinary catheter
- No compression devices on legs

Anesthetic Technique

- Regional/Local Anesthetic
 - Superficial cervical block
 - Infiltration along incision
 - Supplement intraoperatively prn
- Minimal sedation
 - Sedation is often poorly tolerated and interferes with neurological monitoring

Superficial Anatomy



Regional Anesthetic Technique



Benefits of Regional Anesthesia

- Less disruptive to patient's homeostatic mechanisms
 - Immediate postoperative mobilization
 - No coughing or erratic blood pressure swings as often occurs with general anesthesia
- Neurological monitoring intraoperatively and immediately postoperatively

Problems with Regional Anesthesia: Real and Mythological

- Real
 - Intra-arterial injection of anesthetic agent
 - Only with deep block
 - Seizure (carotid) or obtundation (vertebral)
 - Need for supplementation may be annoying
 - Patients don't tolerate excessively long procedures
- Mythological -
 - Anxious patients will not tolerate it
 - Can't teach residents
 - Can't use a microscope because of patient movement
 - Agitation with ischemia

Patient Positioning

- Supine with head on gel ring and turned slightly contralaterally
- Patient comfort is essential
- Tape over forehead
- High tech neuromonitoring device (squeak toy) in contralateral hand
- Elevated drapes or face exposed

Skin Incision

- Transverse incision in a dominant skin crease
- Medial limit – 1cm from midline
- Lateral limit – 1 to 2cm lateral to angle of mandible
- Curve cephalad laterally



Superficial Exposure

- Platysma
 - Monopolar
 - Cut Transverse Cervical N.
 - Spare Greater Auricular and Lesser Occipital NN
 - Warn patient about muscle contraction
- Define anterior/medial aspect of SCM
 - Monopolar - parallel to SCM
- Switch to blunt-toothed retractors, DeBakey forceps



Superficial Dissection

- Avoid the posterior surface of the sternocleidomastoid
 - Accessory nerve
- Jugular chain lymph nodes - dissect medially and eventually retract with the internal jugular vein
- Identify common facial vein

Common Facial Vein

- Circumferential dissection
 - Hypoglossal nerve
- Ligate & divide main trunk
- Exposes carotid bifurcation

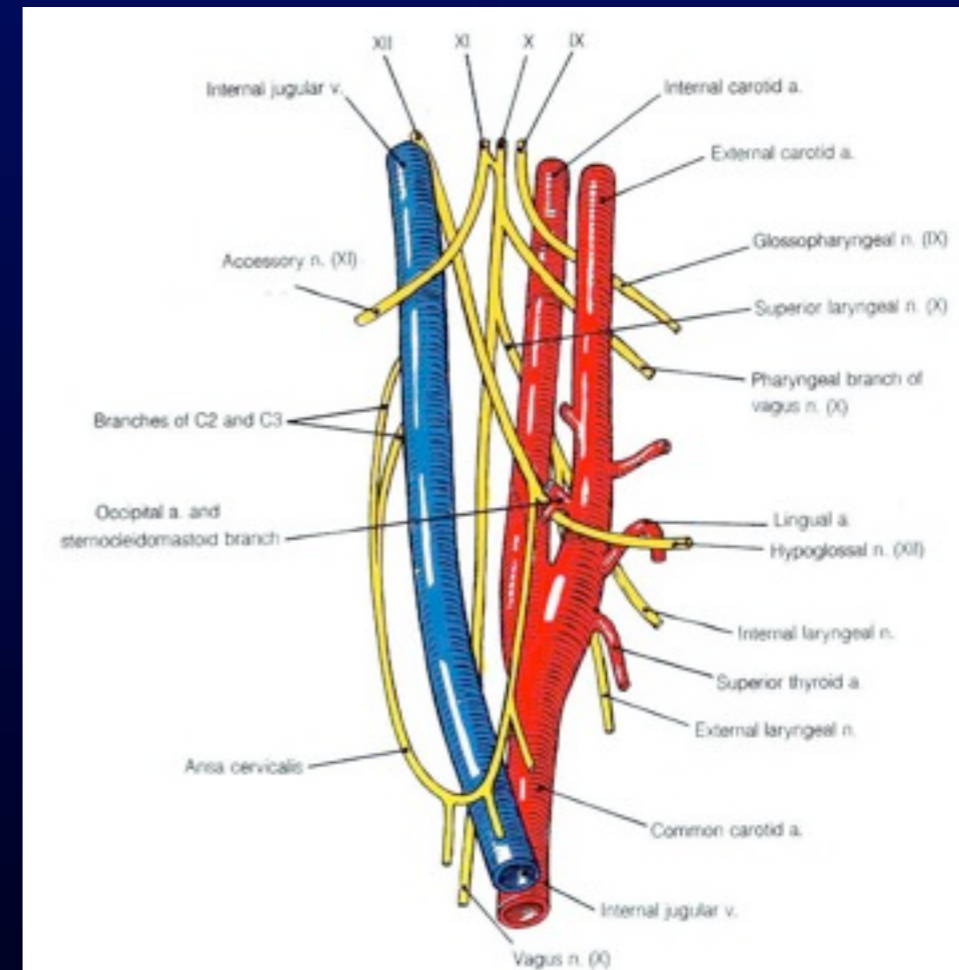


Deep Dissection

- 5000 U Heparin IV
- Develop plane between the CCA and the IJV
- Carotid sheath dissection may cause jaw or ear pain requiring additional lidocaine
- Place lateral retractor blades between CCA and IJV
- Place medial retractor blades superficially
 - Recurrent laryngeal nerve
- Cloward retractor with smooth blades under omohyoid and digastric muscles

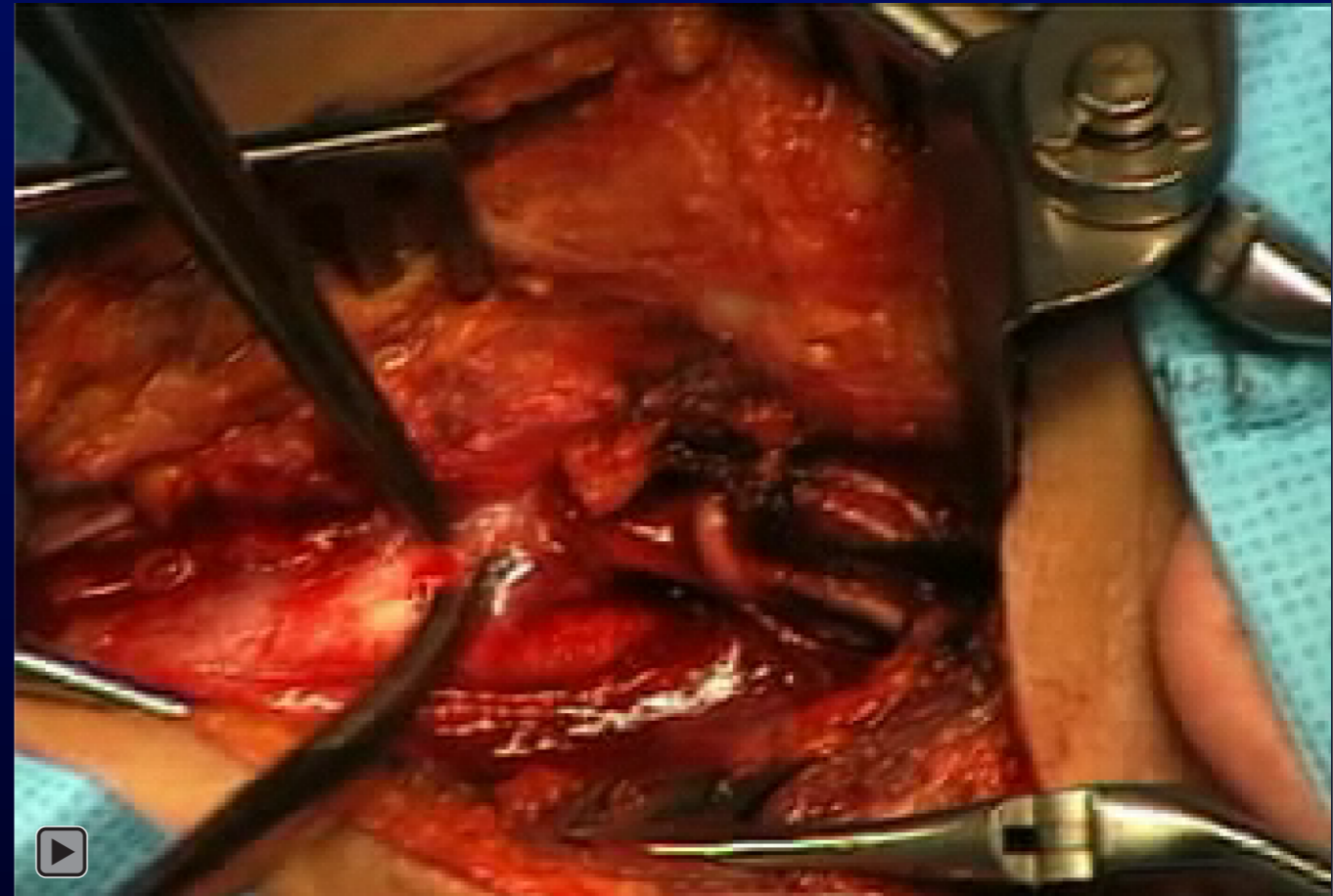
Deep Dissection

- Bipolar only
- Dissect medially along CCA to STA and ECA
- Identify Hypoglossal nerve
- CCA, ECA, ICA
 - Circumferential dissection
 - Stay in adventitia
 - Superior laryngeal nerve
 - Vagus nerve



Deep Dissection

- Between ECA & ICA
 - Ascending pharyngeal artery.
 - Glossopharyngeal nerve and pharyngeal branches of Vagus
- Inject bifurcation if needed



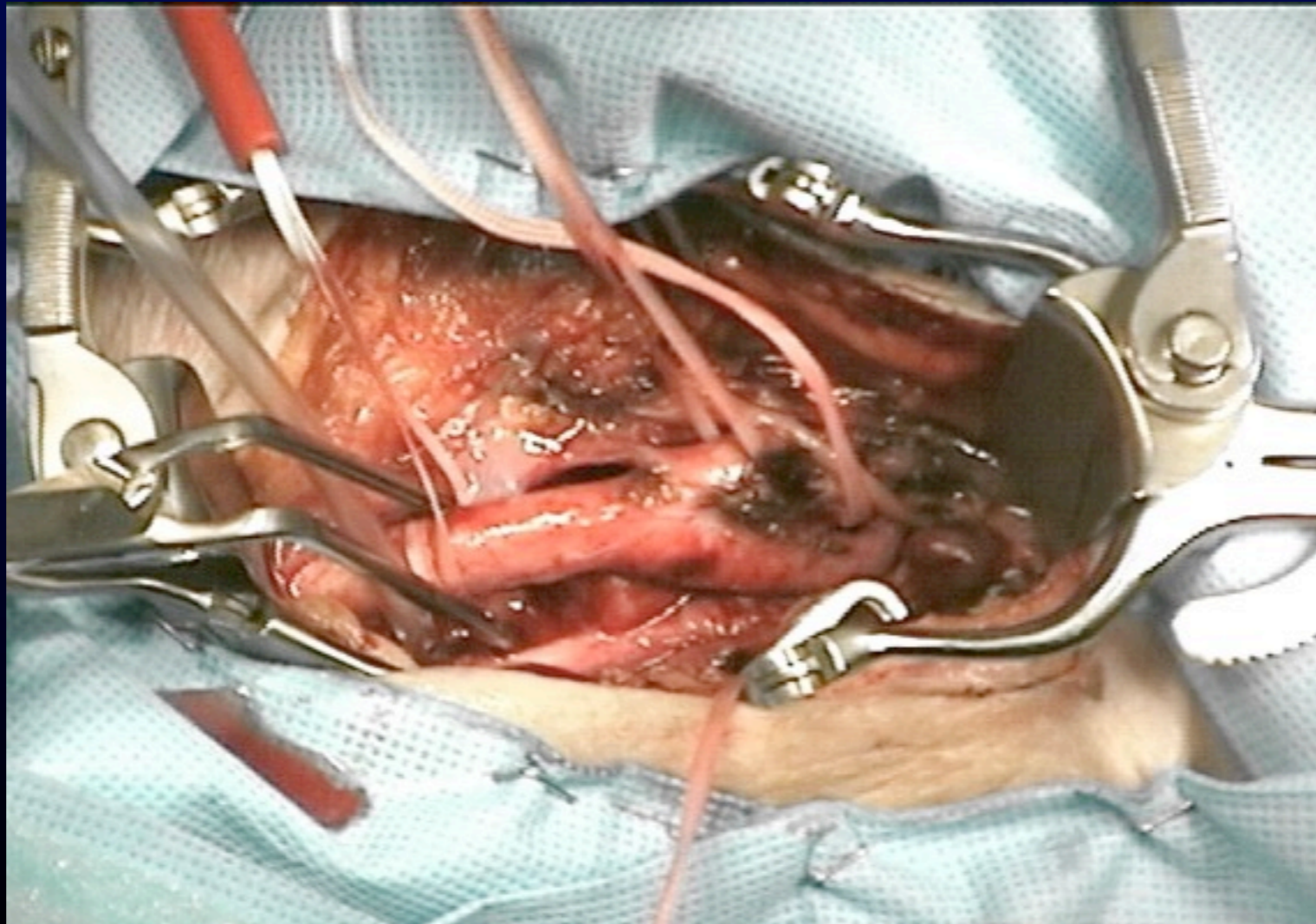
Maximizing Distal Exposure

- Dissect lateral to the hypoglossal nerve
 - Divide artery to SCM, small veins and ansa
- Note: oral intubation with general anesthesia depresses angle of mandible and limits exposure



Preparing for Endarterectomy

- Vessel loops around CCA, ECA, ICA
- Rummel Tourniquet ready on CCA
- Rolled 1 x 3 patty beneath bifurcation
- Shunt available



Vessel Occlusion Sequence

- Superior Thyroid Artery - small aneurysm clip
- Distal ICA - small aneurysm clip
 - Distal to end of plaque
 - Keep hub of clip out of the way
 - Look for neurological changes
- CCA at proximal extent of exposure
 - Atraumatic vascular clamp
- ECA - small aneurysm clip
- Ascending pharyngeal (if in bifurcation – small clip)

Monitoring

- Be prepared for shunt before ICA occlusion
- Check for neurological changes when ICA occluded
- If ischemic symptoms occur elevate systemic blood pressure and place shunt
- No test occlusion because of risk of embolization

Shunt Placement

- Short Sundt shunt 3 or 4 mm
- Place into CCA
- Secure shunt with Rummel tourniquet
- Flush by briefly opening vascular clamp
- Place into ICA and advance after removing aneurysm clip
- Remove CCA vascular clamp
- Re-evaluate neurologically

Instruments

- Scalpel with #11 blade
- Angled Pott's scissors
- Straight Joseph's scissors
- Woodson-Adson (shovel) dissector
- DeBakey forceps
- Mosquito clamp
- Fine ring (grasping) forceps

Arteriotomy

- Stab incision through vessel & plaque to CCA lumen
 - 5-10 mm
 - If bleeding, check clamp/clips, look for ascending pharyngeal artery
- Extend incision toward ICA
- Avoid the bifurcation

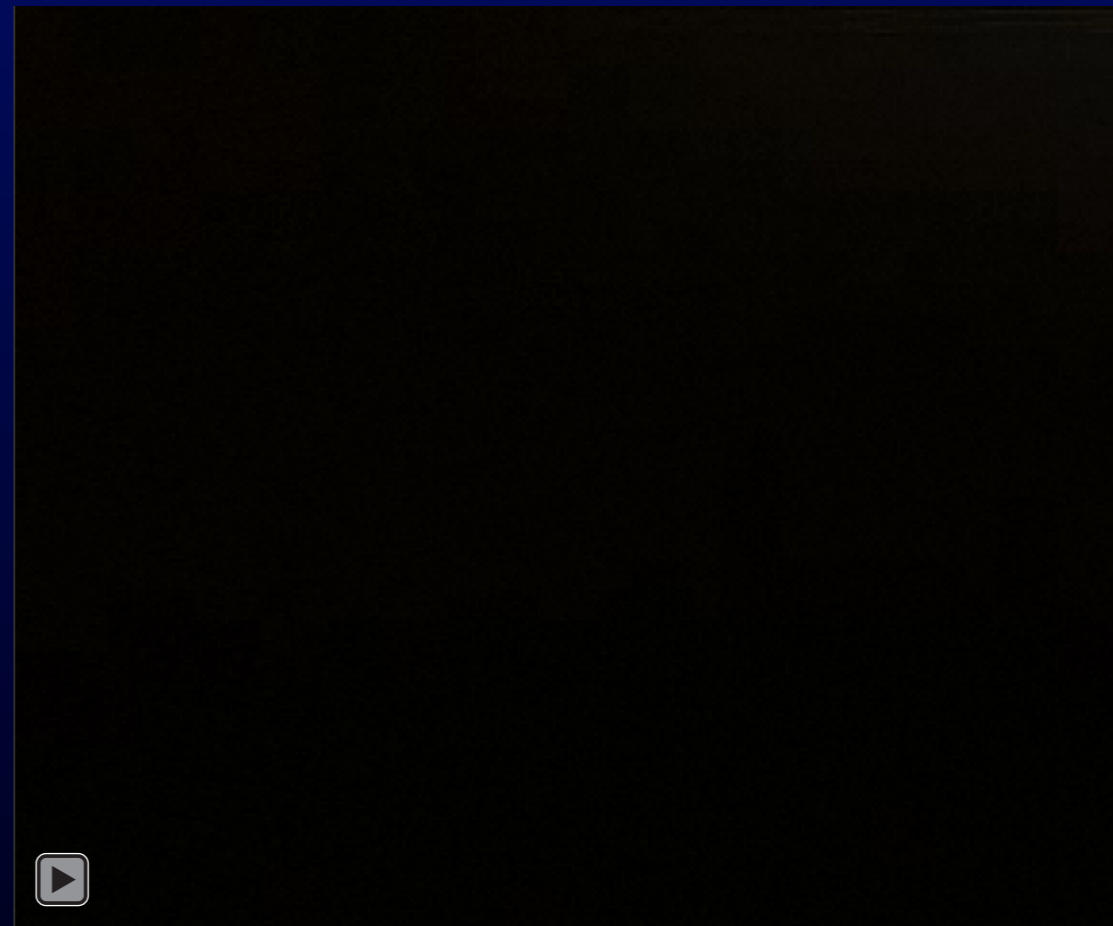
Arteriotomy

- Extend incision in ICA well beyond plaque
- Avoid spiral incision
- Extend CCA arteriotomy proximally



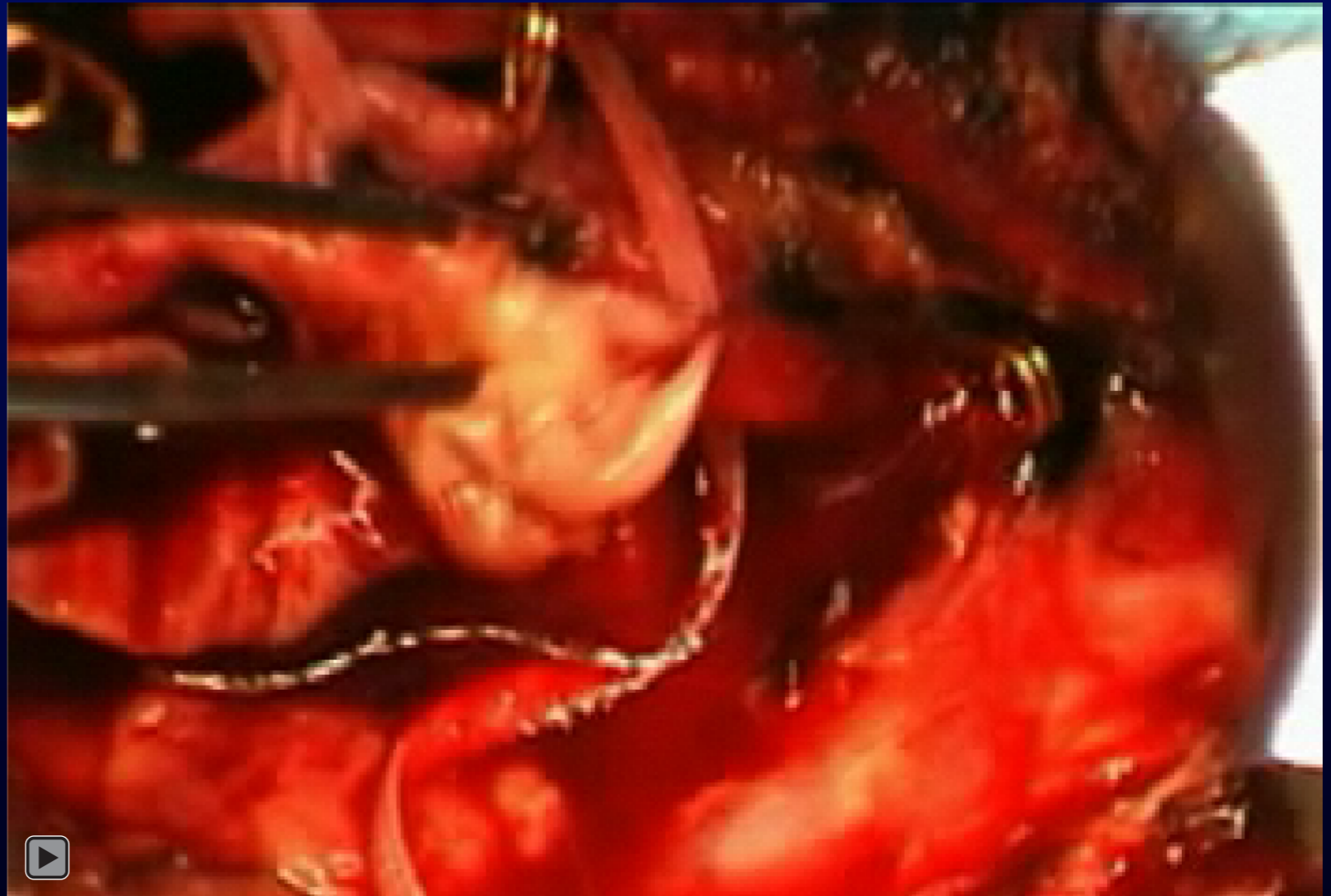
Removal of Plaque

- Choose area of separation
- Plaque almost always “feathers out” distally along ICA
- Meticulous plaque removal
- Proximal sharp transection
- Evert ECA
- Irrigate with heparinized saline
- Inspect with magnified vision



Closure of Arteriotomy

- Magnified vision
- 6-0 Prolene
- Distal to proximal
- 1mm deep
- 1mm apart
- More liberal proximally
- Intima-intima



Patch graft

- Hemoshield
 - Rough and smooth surfaces
- Double armed prolene “outside-in” on patch and “inside-out” at apex of arteriotomy



Shunt Removal

- Allow adequate length of arteriotomy
- Clamp CCA with vascular clamp
- Loosen Rummel tourniquet
- Remove CCA end of shunt
- Pull shunt out of ICA
- Place clip on ICA
- Continue with closure

Final Closure of Arteriotomy

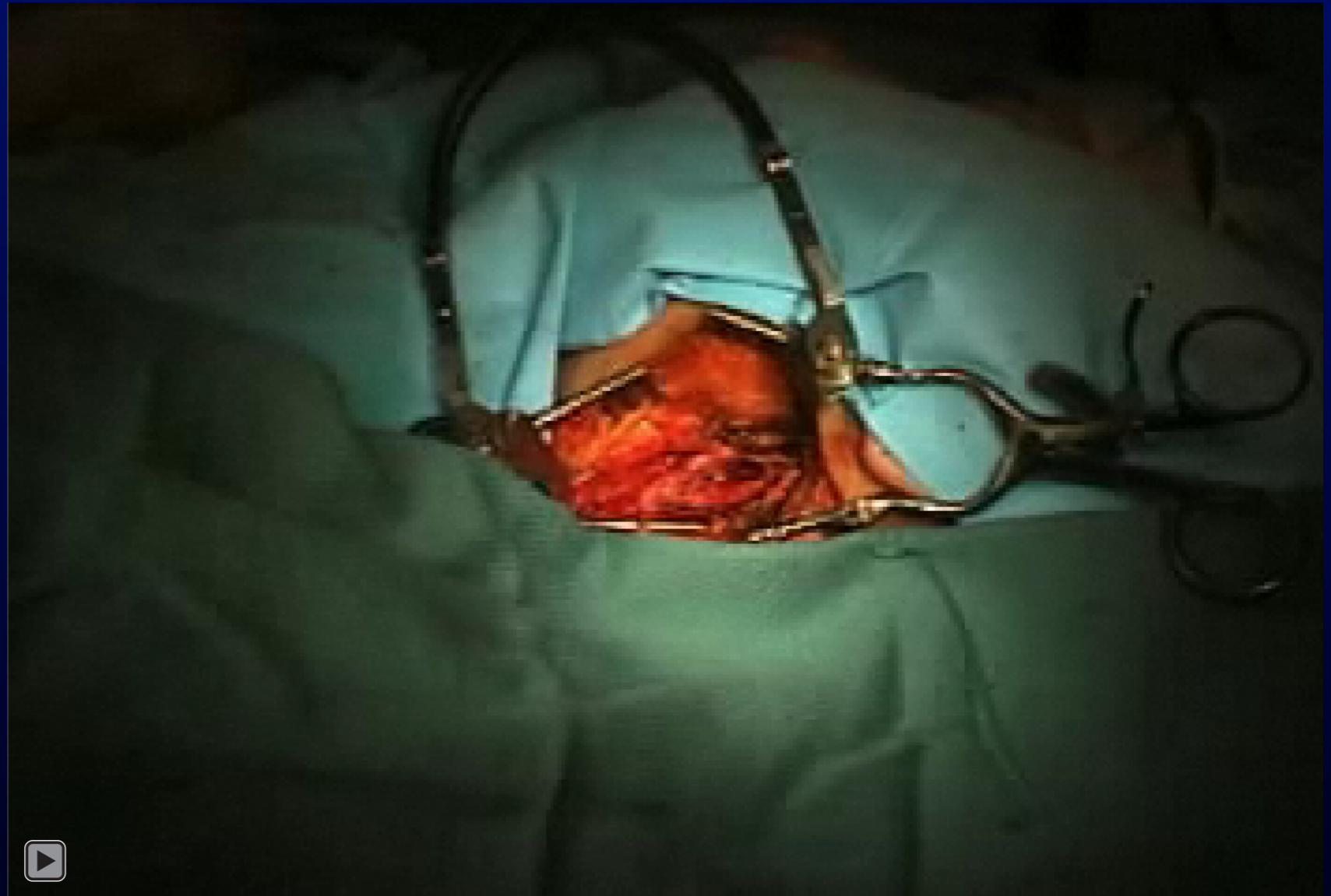
- Check for backflow when 2 – 3 stitches remain for closure
- Irrigate with heparinized saline
- Release ICA clip and evaluate flow
- If not adequate – reopen vessel
- If adequate – reapply ICA clip
- Place final stitches

Reperfusion Sequence

- Remove and Reapply ICA clip
- Remove ECA clip and CCA clamp
- Forward flush the ECA for 10 seconds
- Remove the ICA clip
- Examine the patient frequently after reestablishing ICA flow
- Additional sutures if needed

Wound Closure

- Irrigation
- Hemostasis
- Check flow
- Tisseal or Flo-Seal
- Platysma
- Subcuticular
- Dermabond



Postoperative Care

- Reverse heparin
- 1 - 2 hours in recovery room
- Neuro checks and BP checks Q2-4 hours overnight
- Mobilize immediately
- Hypertension is dangerous
- Hypotension is usually not a problem and does not require aggressive treatment
 - Check EKG
- Home next day

Follow-up

- 6 weeks with interim history and clinical exam
- 6 and 18 months with duplex

Thank You for Your Attention