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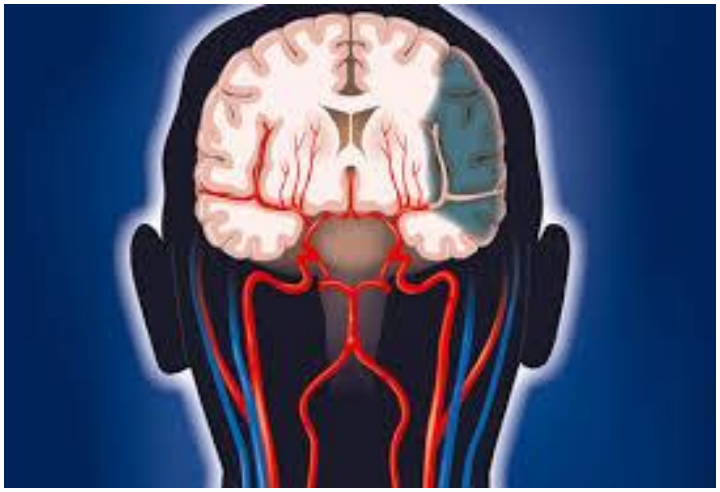

Cerebrovascular disease and how to perform a carotid endarterectomy

Professor Mark E. O'Donnell

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Northern Ireland Vascular Trainee Teaching Program – 29th November 2017

Royal Victoria Hospital

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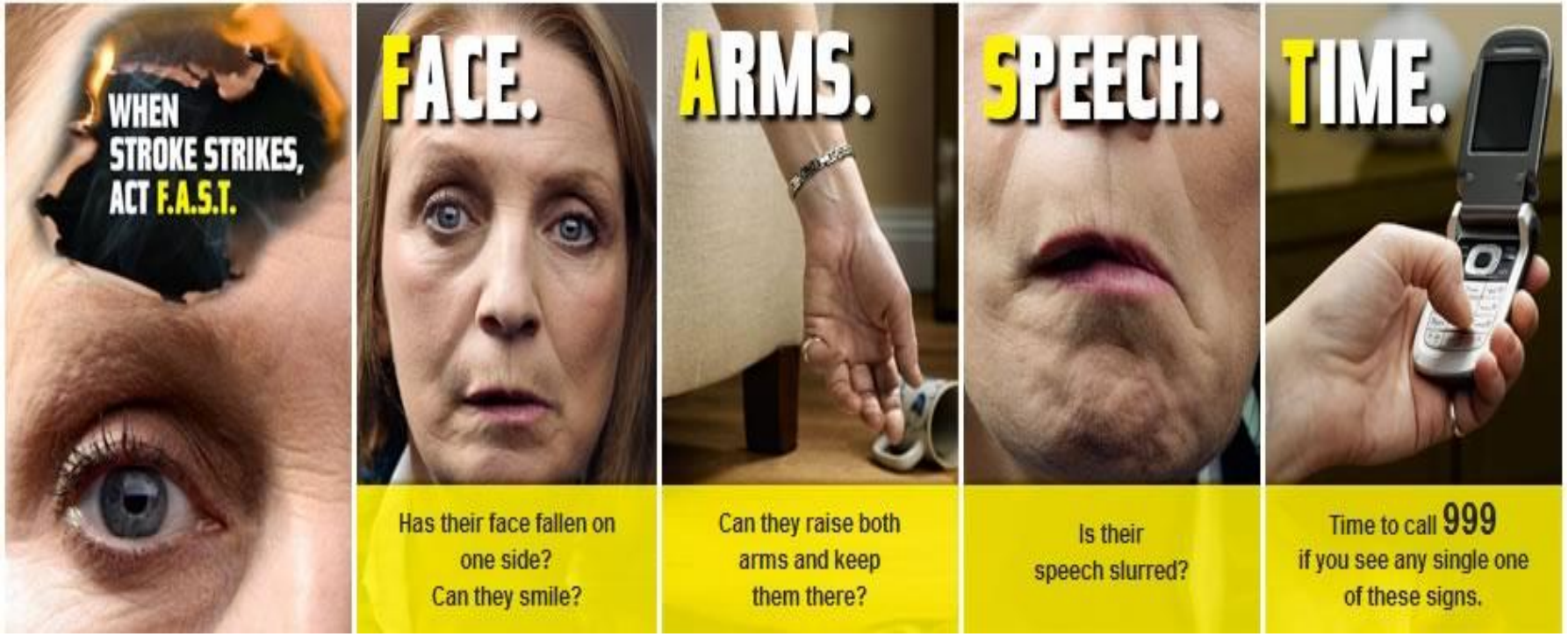
Stroke - Act **F.A.S.T**



Definition

- Transient Ischaemic Attack (TIA):
  - Acute loss of focal cerebral function with symptoms lasting less than 24 hours.

- Stroke:
  - Acute loss of focal cerebral function with symptoms lasting more than 24 hours.

Definition

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  - Acute loss of focal cerebral function with symptoms lasting less than 24 hours.

- Stroke:
  - Acute loss of focal cerebral function with symptoms lasting more than 24 hours.
  - Presence of a cerebral infarct regardless of symptomatic resolution.

Stroke Epidemiology

- Third most common cause of death responsible for 12% of UK deaths.
- Annual UK incidence of first-ever stroke is 2.4 per 1000 and TIA is 0.5 per 1000.
- 125,000 people suffer their first stroke each year while 36,000 suffer a TIA each year.
- Half of strokes affect patients greater than 75 years of age.
- Accounts for 10% of in-patient beds and 5% of health care expenditure.

Aetiology

- 80% due to ischaemia:
  - Large vessel thrombosis
    - Blood vessel injury – Hypertension, atherosclerosis, vasculitis.
    - Stasis/turbulent blood flow - Atherosclerosis, atrial fibrillation, valvular disease.
    - Hypercoagulable state - Increased number of platelets, deficiency of anti-coagulation factors, cancer.
  - Large vessel emboli
    - Heart - Valve diseases, atrial fibrillation, dilated cardiomyopathy, atrial myxoma.
    - Arterial circulation - Atherosclerosis of carotid artery, arterial dissection, vasculitis.
    - Venous Circulation – Patent foramen ovale, systemic emboli.

Aetiology

- 20% due to haemorrhage:
  - Traumatic.
  - Spontaneous
    - Hypertension.
    - Amyloid angiopathy.
    - Aneurysmal rupture.
    - Arteriovenous malformation rupture.
    - Bleeding into tumor.
    - Cocaine and amphetamine use.

Clinical Presentation

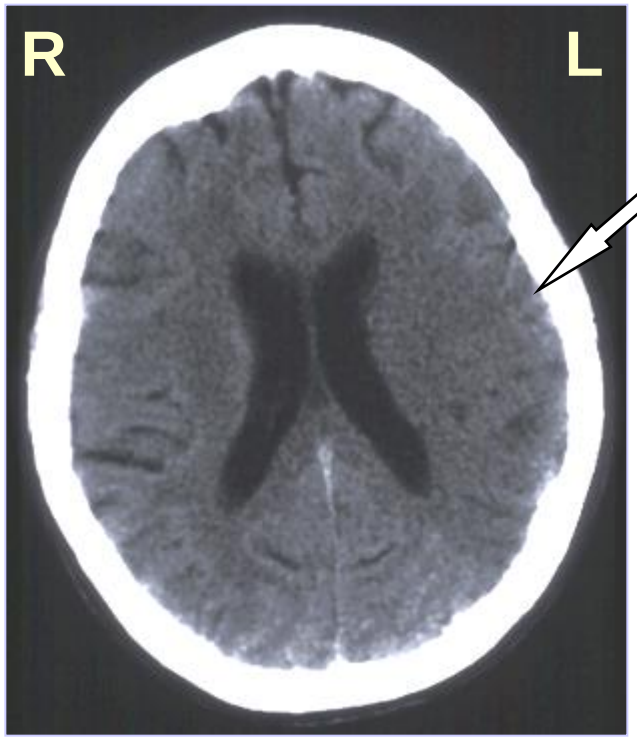
- Anterior cerebral artery:
  - Leg > arm weakness.
  - Cognitive: muteness, perseveration, abulia, disinhibition.
- Middle cerebral artery:
  - Arm > leg weakness.
  - Left – aphasia.
  - Right – cognitive dysfunction and neglect, topographical difficulty, apraxia, constructional impairment.
- Posterior cerebral artery:
  - Hemianopia.
  - Cognitive: memory loss/confusion.

Investigation

- CT
  - Non- contrast CT brain remains the gold standard as it is superior for showing haemorrhage.
  - CT with contrast may help identify aneurysms, AVMs or tumors but is not required to determine whether or not the patient is a tPa lysis candidate.
  - Should occur emergently on patient's arrival to hospital.
- MRI
  - Superior for showing underlying structural lesions.
  - Contraindications.

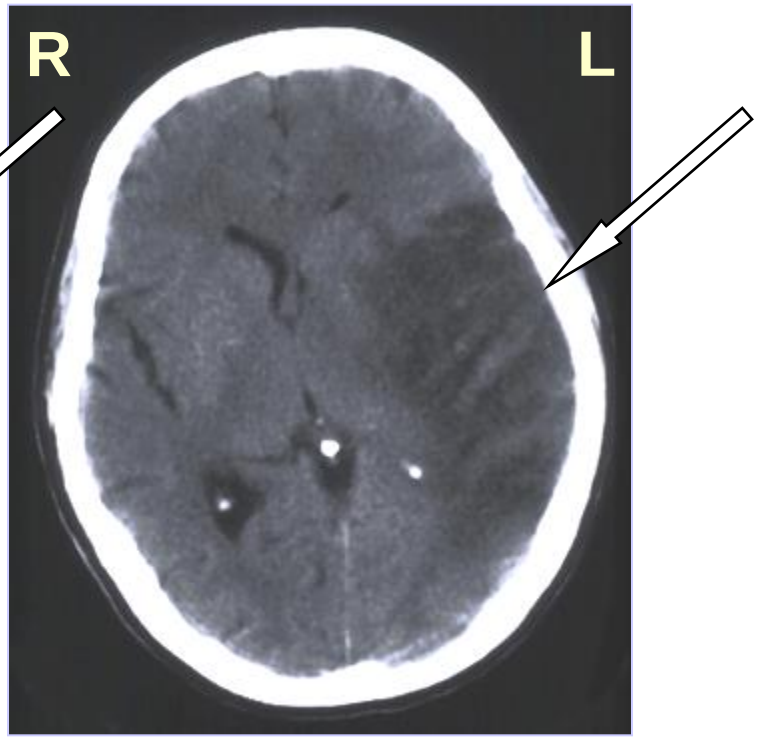
Investigation

Acute Infarction (4 hours)



Subtle blurring of gray-white junction & sulcal effacement

Subacute Infarction (4 days)



Obvious dark changes & "mass effect" (e.g. ventricle compression)

Therapeutic Strategy

- Best medical therapy;
  - Risk factor modification particularly blood pressure and smoking.
  - Antiplatelet therapy.
  - Lipid lowering therapy.

- Thrombolysis;
  - Rule out intracerebral haemorrhage.
  - Protocolised treatment pathway.
  - Check for contra-indications.
  - Administer within 3-hours of event.
  - 10% tPa stat over 1-2 minutes followed by remainder as infusion over 1-hour.

PHASE 1 – Immediate patient assessment indicates that this patient has the symptoms suggestive of a stroke & where the FAST test is positive for suspected stroke.

Times of **Symptom onset** and **Arrival**: date ____/____/____ time ____:____hrs; date ____/____/____ time ____:____hrs

Time difference ____:____ hrs

CONTRA INDICATIONS *Circle Yes, No or Not known as appropriate*

• History suggestive of subarachnoid haemorrhage	Yes	No	Not known
• Seizure at stroke onset	Yes	No	Not known
• BP > 185 mmHg systolic (or diastolic > 110 mmHg)	Yes	No	Not known
• BM < 2.8 or > 22 mmol/l	Yes	No	Not known
• Platelet count < 100,000	Yes	No	Not known
• If on Warfarin, INR >1.3	Yes	No	Not known
[contact Haematology bleep for urgent processing: **SJH** – ext 53353 / page 3729; **RIE** – bleep 6550; **WGH** – in hours ext 31482, out of hours page 8477**]**			
• Bacterial Endocarditis / Pericarditis	Yes	No	Not known
• Treated with LMW Heparin within last 48 hours & APTT is still raised	Yes	No	Not known
• NIH Stroke Scale <5 [*very minor neurological deficit*] or > 25	Yes	No	Not known
• Neurological symptoms very rapidly improving	Yes	No	Not known
or History of:			
⇒ Previous stroke **plus** Diabetes	Yes	No	Not known
⇒ Another stroke or head injury in last 3 months	Yes	No	Not known
⇒ GI, urinary or menstrual bleeding in last 21 days	Yes	No	Not known
⇒ Surgery or significant trauma in last 14 days	Yes	No	Not known
⇒ Arterial puncture at non-compressible site in last 10 days	Yes	No	Not known
⇒ Severe liver disease (hepatic failure, cirrhosis, varices etc)	Yes	No	Not known
⇒ Possibility of pregnancy	Yes	No	Not known

If there are any circles in the 'Yes' column, please discuss urgently with Stroke Consultant.

The time since onset was <3hr, and a possible contraindication was present, so discussed (telemedicine or face-to-face*) **with Stroke Consultant,** Dr. …… , who agreed the patient was eligible for Thrombolysis.

This ICP was initiated at …… : ….. Signed …… [* please delete as appropriate]

CONDITIONS *Circle Y or N as appropriate*

1. Intracerebral haemorrhage (ICA) or structural lesion must be excluded:
   Any evidence of structural lesion or ICH on CT scan? Y N initial
2. Patient must be in agreed venue for thrombolysis delivery Y N initial
3. Consent must be obtained (or assent from next of kin if unable to communicate) Y N initial
   [discussion of risk and benefit must have taken place, and be documented.]

CONCLUSION of CONTRAINDICATIONS &CONDITIONS: Is patient to receive Thrombolysis? Y N

Signed print designation

date time

How does this affect the Vascular Surgeon?

Therapeutic Strategy

- Best medical therapy.
- Thrombolysis.
- Carotid Endarterectomy.
- Carotid Stent.

Therapeutic Strategy

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Tips / Tricks for Carotid Disease

- Symptomatology.
- Disease Pathogenesis.
- Carotid Endarterectomy Consideration.

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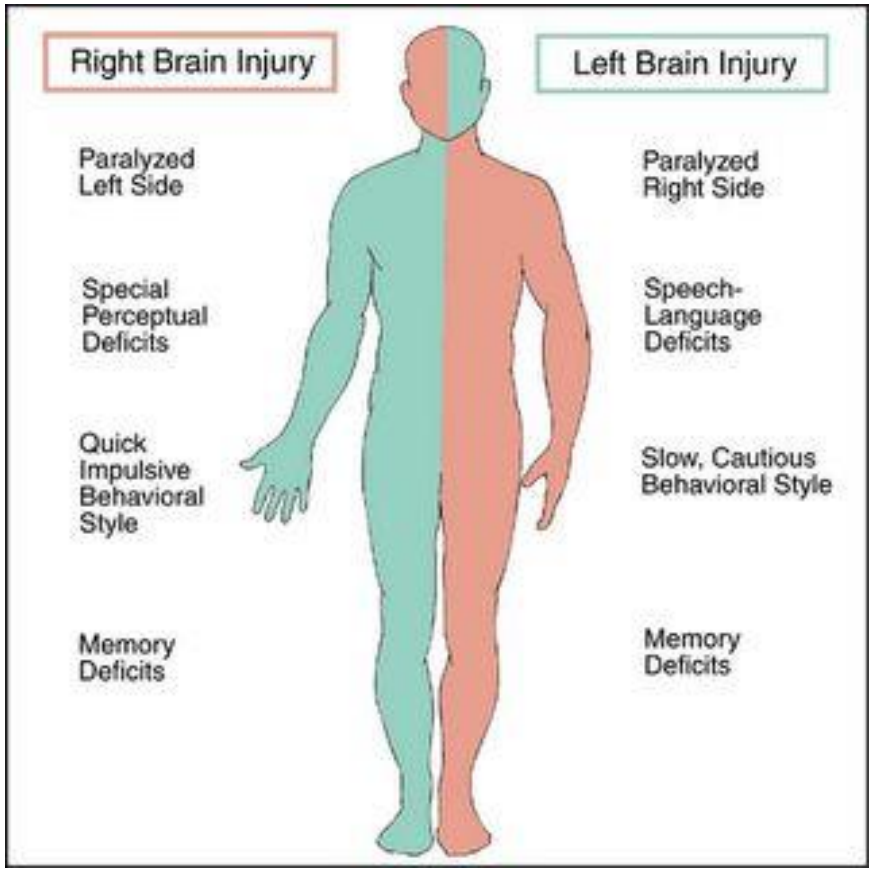
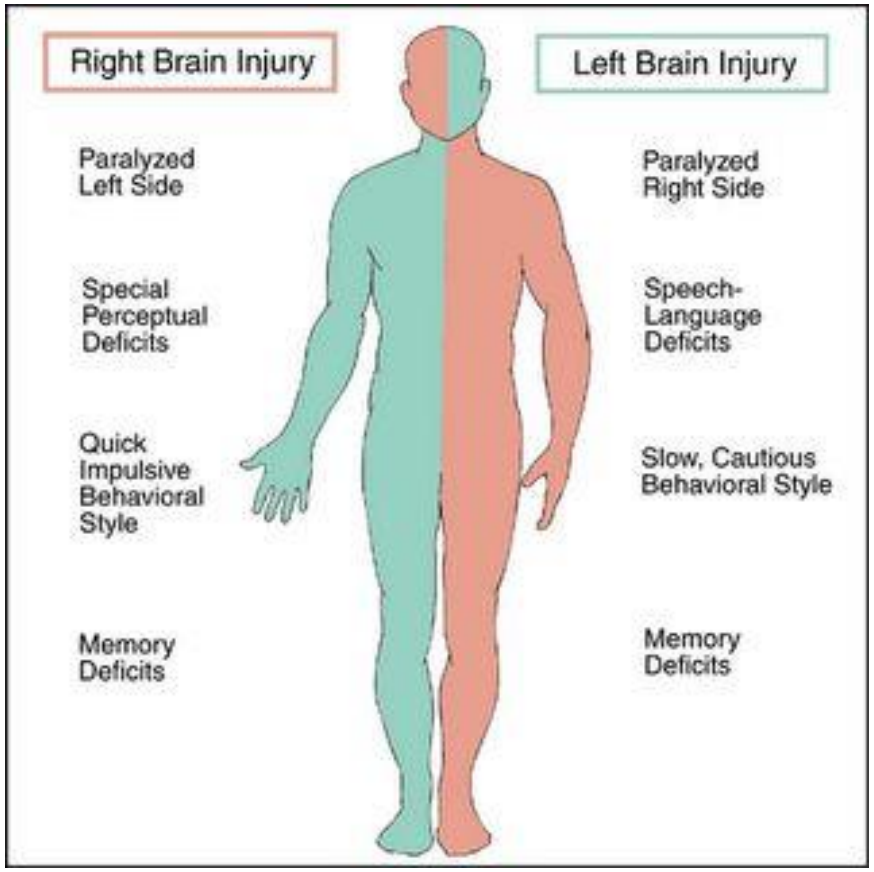
Symptomatology



Symptomatology

Left facial weakness

Right amaurosis fugax



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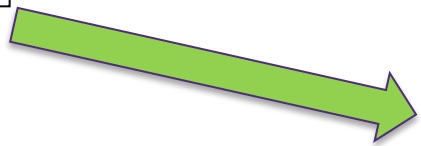
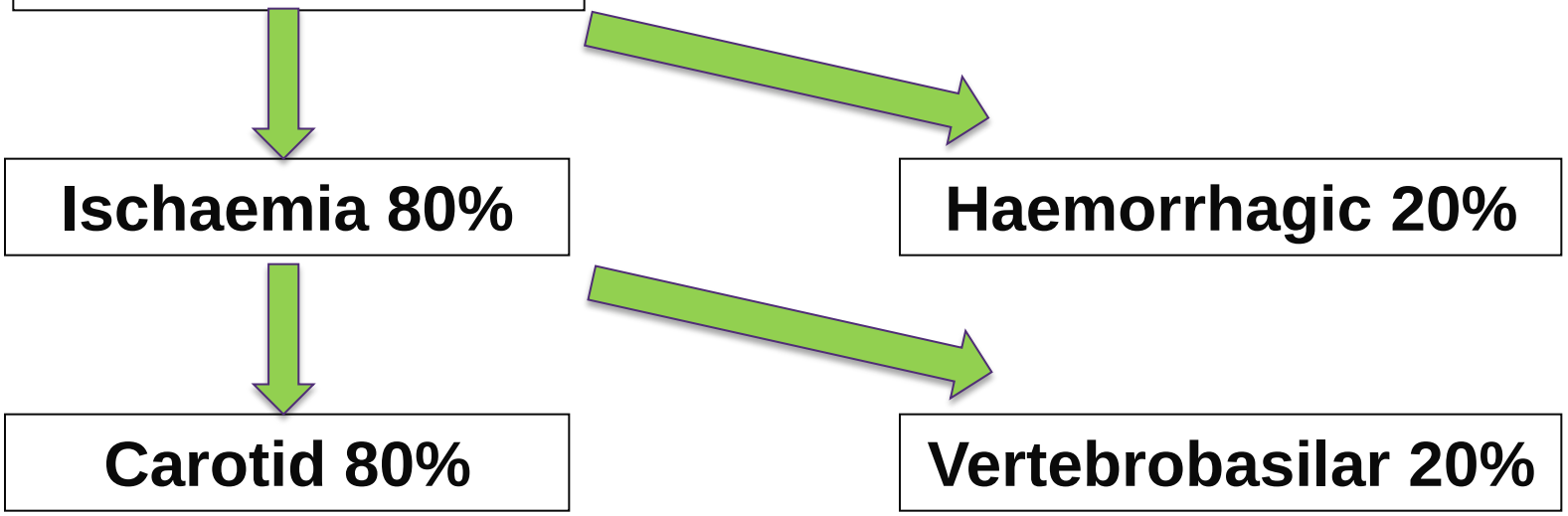
Stroke



Ischaemia 80%

Haemorrhagic 20%

Stroke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Thromboembolism of ICA / middle cerebral artery 50%

Small vessel occlusion of end-arteries 25%

Cardiogenic embolism 15%

Haematological disorders 5%

Miscellaneous – tumours, arteritis 5%

Stroke

- Ischaemia 80%
  - Carotid 80%
    - **Thromboembolism of ICA / middle cerebral artery 50%**
    - Small vessel occlusion of end-arteries 25%
    - Cardiogenic embolism 15%
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- Haemorrhagic 20%

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Miscellaneous – tumours, arteritis 5%

Tips / Tricks for Carotid Disease

- Symptomatology.
- Disease Pathogenesis.
- Carotid Endarterectomy Consideration.

Why Treat – Nice Guidelines

- Early treatment saves brain …..
- Evaluation by stroke physician – prompt referral as time to surgery should be less than 14 days.
- Aspirin 300mg for 14 days.
- Clopidogrel 75mg for life.

Table 10.6 • Carotid Endarterectomy Trialists Collaboration: 5-year risk of any stroke (including 30-day stroke/death) from the combined VA, ECST and NASCET trials

Trial	Stenosis	*n*	30-day CEA risk	5-year risk		ARR	RRR	NNT	Strokes prevented per 1000 CEAs
				Surgery	Medical				
CETC	<30%	1746	No data	18.36%	15.71%	– 2.6%	N/b	N/b	None at 5 years
CETC	30–49%	1429	6.7%	22.80%	25.45%	+ 2.6%	10%	38	26 at 5 years
CETC	50–69%	1549	8.4%	20.00%	27.77%	+ 7.8%	28%	13	78 at 5 years
CETC	70–99%	1095	6.2%	17.13%	32.71%	+ 15.6%	48%	6	156 at 5 years
CETC	String	262	5.4%	22.40%	22.30%	– 0.1%	N/b	N/b	None at 5 years

ARR, absolute risk reduction; N/b, no benefit conferred by CEA; NNT, number needed to treat; RRR, relative risk reduction; strokes prevented per 1000 CEAs, number of strokes prevented at 5 years by performing 1000 CEAs.
Data derived from the CETC[36–38] with all pre-randomisation angiograms remeasured using NASCET method.

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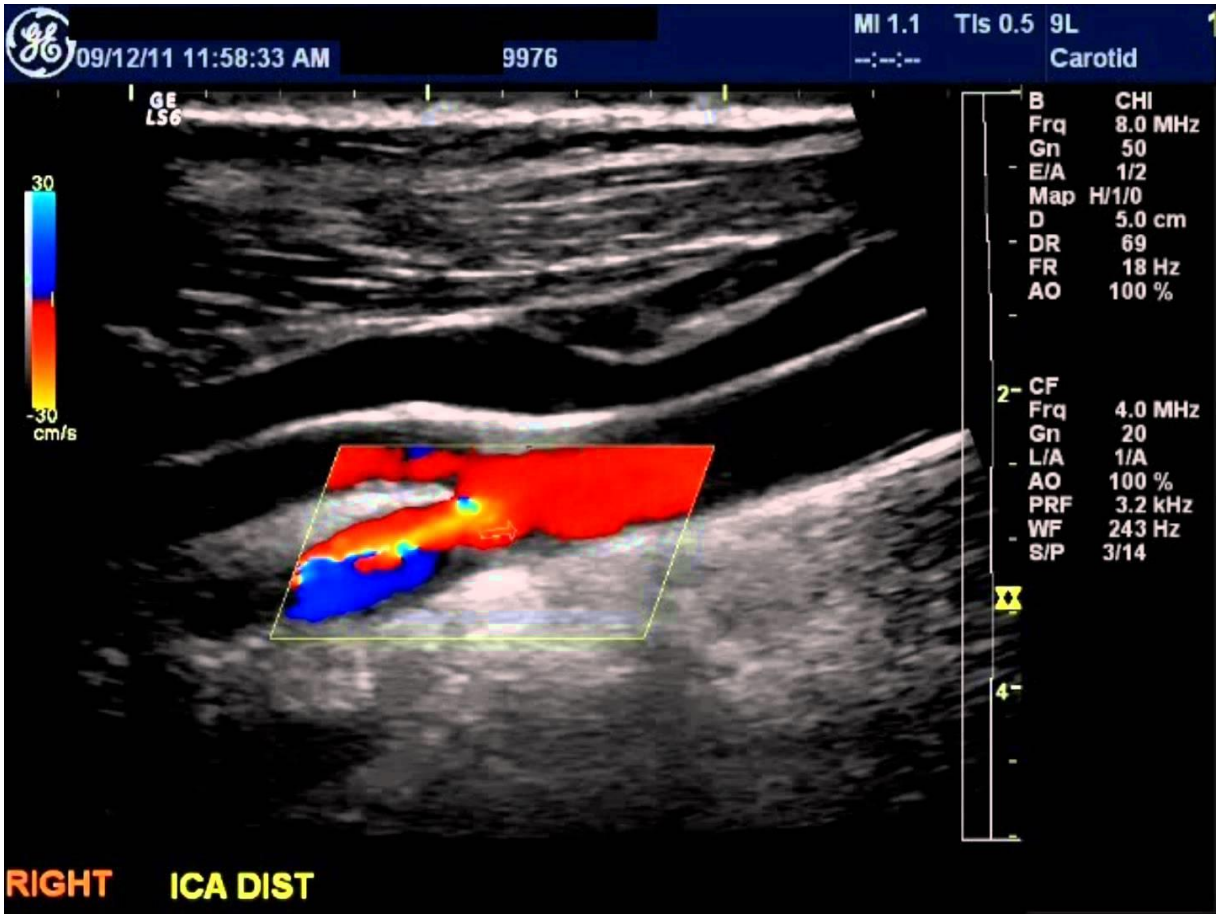
Investigation of potential surgical candidate

- Pre-morbid status – “End-of-Bedogram”.
- Risk factor evaluation and treatment.
- Baseline haematological analyses.
- Carotid duplex.
- Cross-sectional collaborative / operative planning image;
  - CT angiogram.
  - MR angiogram.
- Conventional angiograms no longer warranted (1-2% stroke risk).

Carotid Duplex



Eur J Vasc Endovasc Surg (2009) 37, 251–261

REVIEW

Joint Recommendations for Reporting Carotid Ultrasound Investigations in the United Kingdom

C.P. Oates [a,*], A.R. Naylor [b], T. Hartshorne [b], S.M. Charles [c], T. Fail [d], K. Humphries [e], M. Aslam [f], P. Khodabakhsh [g]

Carotid Duplex - Capabilities

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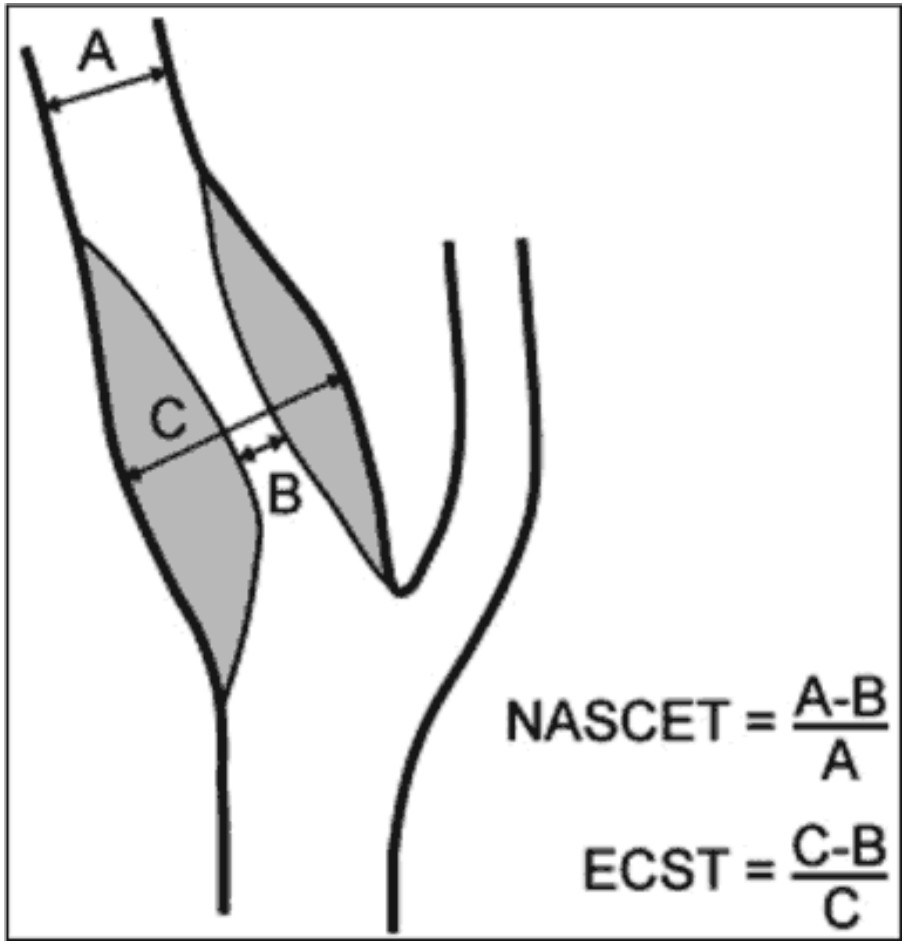
NASCET



Carotid Flow - Capabilities

- Can accurately identify and localise the presence of arterial disease in the extra-cranial carotid arteries.

- Can determine degree of stenosis:
  - NASCET.
  - Velocities.

Carotid Duplex Velocities

Degree of Stenosis (%)	Primary Parameters		Additional Parameters	
	ICA PSV (cm/sec)	Plaque Estimate (%)*	ICA/CCA PSV Ratio	ICA EDV (cm/sec)
Normal	<125	None	<2.0	<40
<50	<125	<50	<2.0	<40
50–69	125–230	≥50	2.0–4.0	40–100
≥70 but less than near occlusion	>230	≥50	>4.0	>100
Near occlusion	High, low, or undetectable	Visible	Variable	Variable
Total occlusion	Undetectable	Visible, no detectable lumen	Not applicable	Not applicable

Carotid Duplex Velocities

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- Provides information about surface or plaque morphology:
  - Smooth.
  - Irregular.
  - Mobile.

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  - Velocities.
- Provides information about surface or plaque morphology:
  - Smooth.
  - Irregular.
  - Mobile.
- Can document progression / recurrence of disease.

Carotid Duplex - Limitations

Carotid Duplex - Limitations

- Patient characteristics:
  - Size and contour of neck.
  - Depth and course of vessel.
- Patient co-operation;
  - Respiratory status.
  - Movement.
- Vessel characteristics:
  - Acoustic shadowing from calcification should not be an issue post-operatively.
- Post-operative dressings, sutures or staples.

Doppler Angle

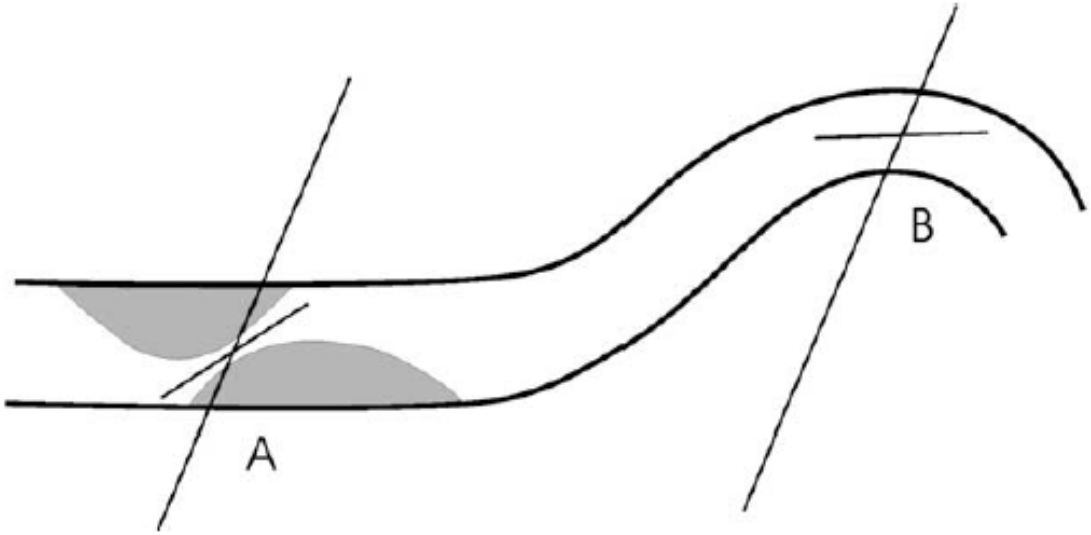
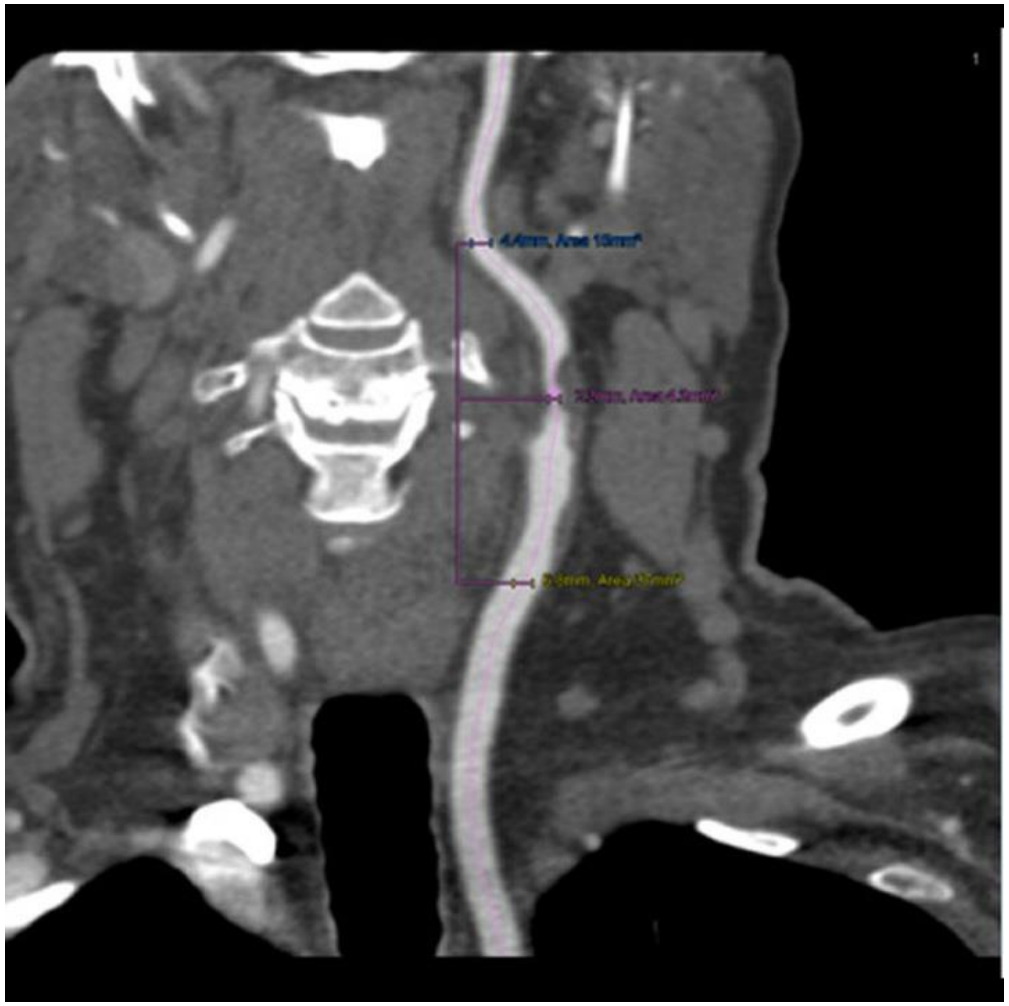


Figure 4 Showing correct alignment for the Doppler angle cursor in the case (A) of an eccentric stenotic jet, and (B) aligning along the tangent of a curved vessel.

Doppler Angle

If in doubt go and watch the scan being done and talk to your vascular laboratory sonographer

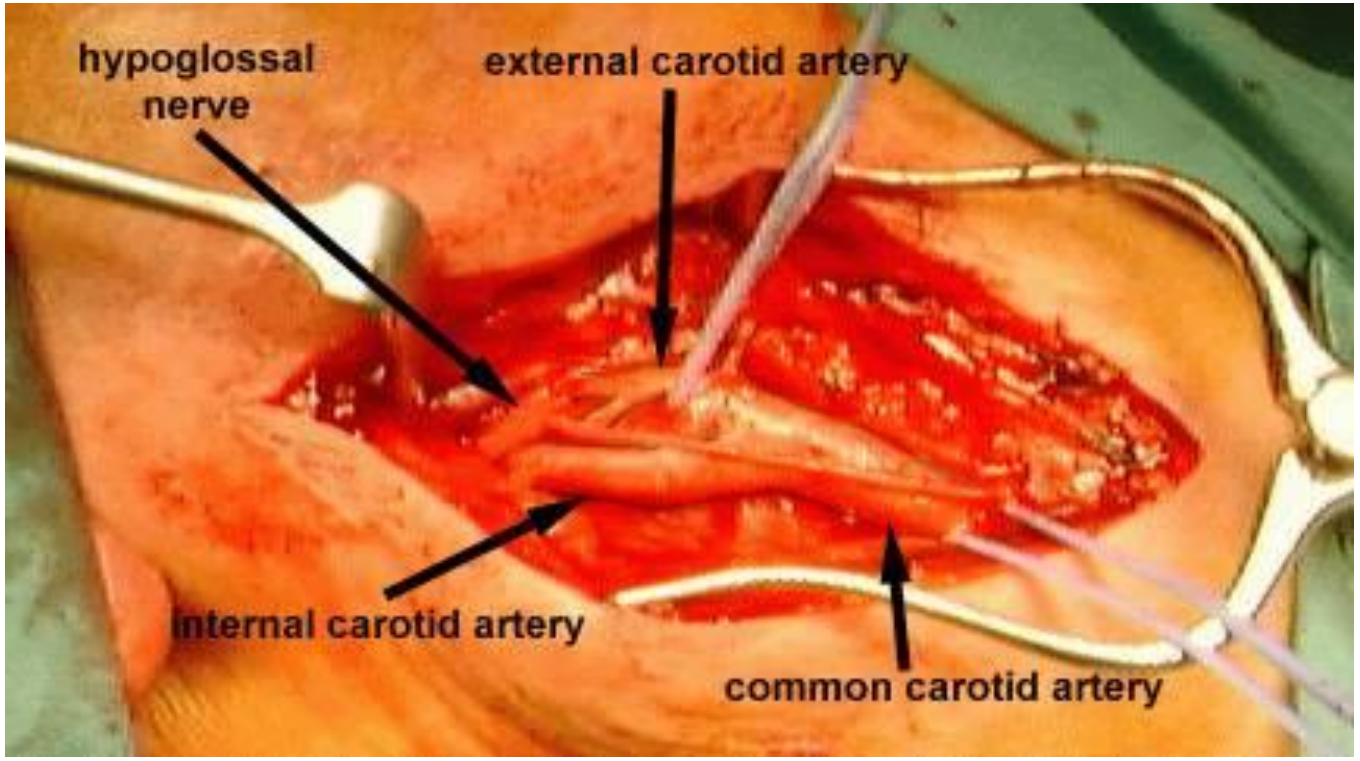
CT Angiogram



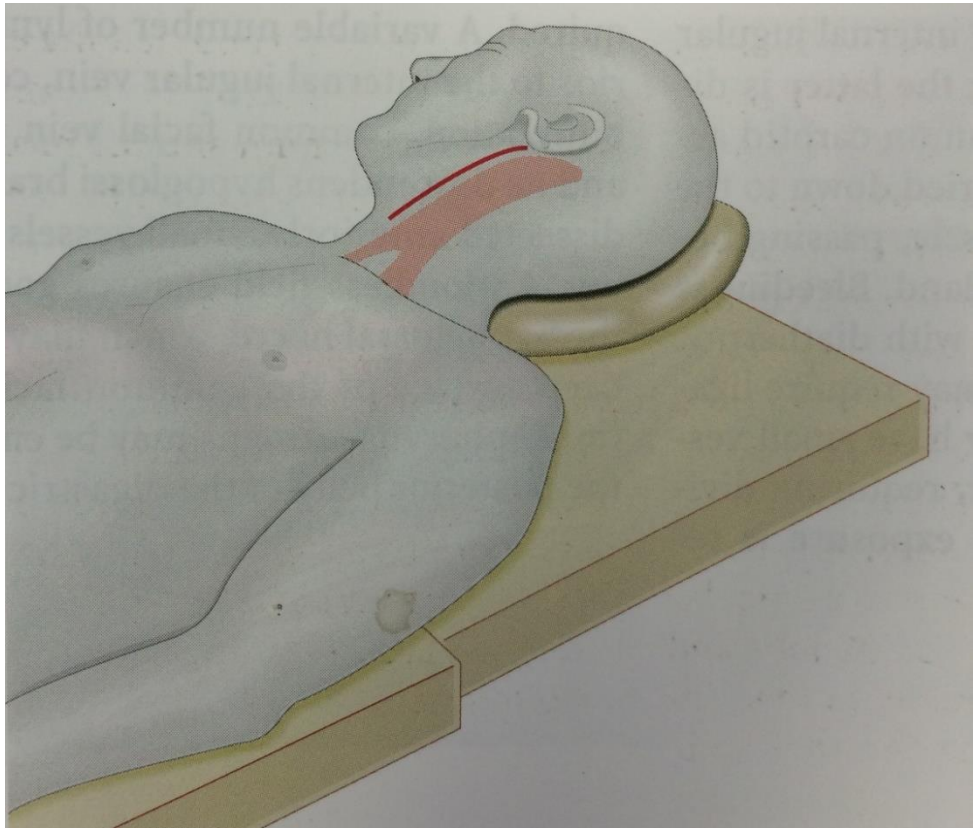
Consent

- General Local Complications;
  - Pain, Bruising, Bleeding, Wound infection.
- Systemic Complications;
  - Cardiovascular, Respiratory, Thromboembolic.
- Procedural Specific Complications;
  - Stroke.
  - Nerve injury.
  - Scar.
  - Numbness.
  - Patch infection.

Carotid Endarterectomy



1 – Patient Positioning



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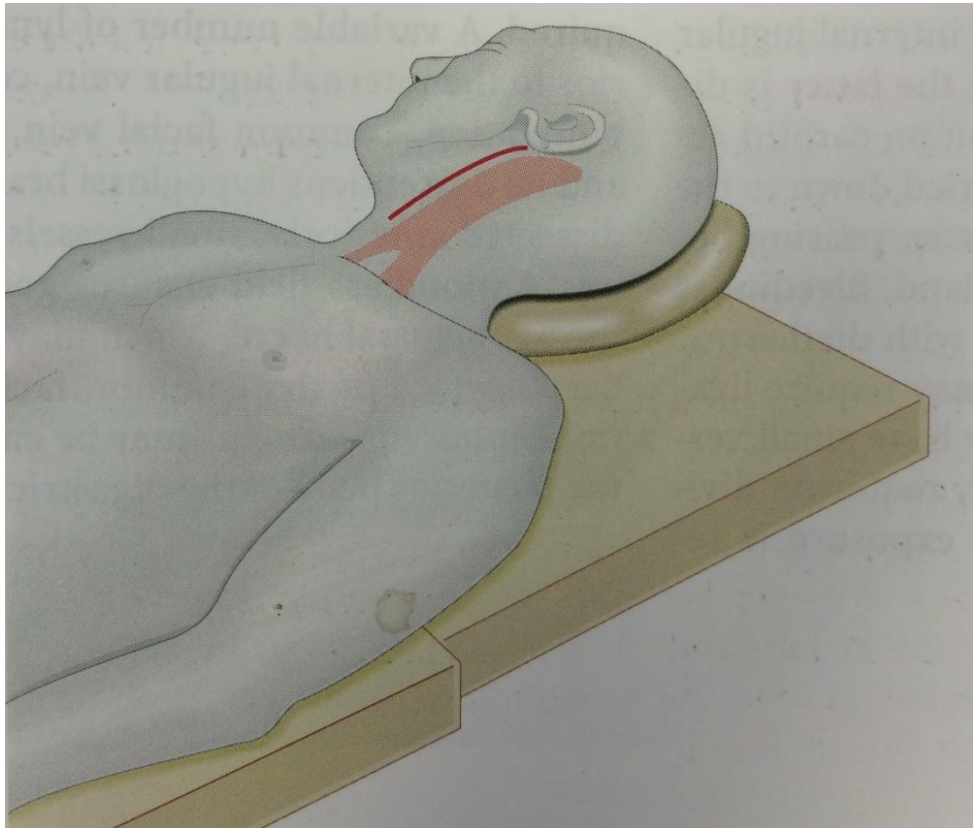


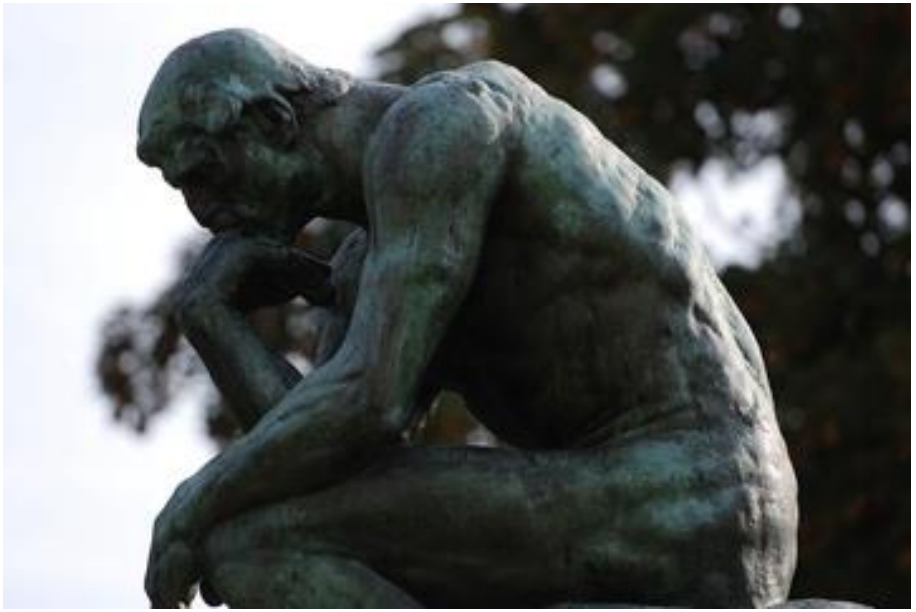
- Head ring – neck extended and moved to face contralateral side +/- shoulder support.
- Operating table in “Beach” position with head at 45^0 and pillow under bent knees.
- Betadine preparation to avoid pressure on neck.
- Drapes then Ioban®.

2 – Skin Incision

2 – Skin Incision

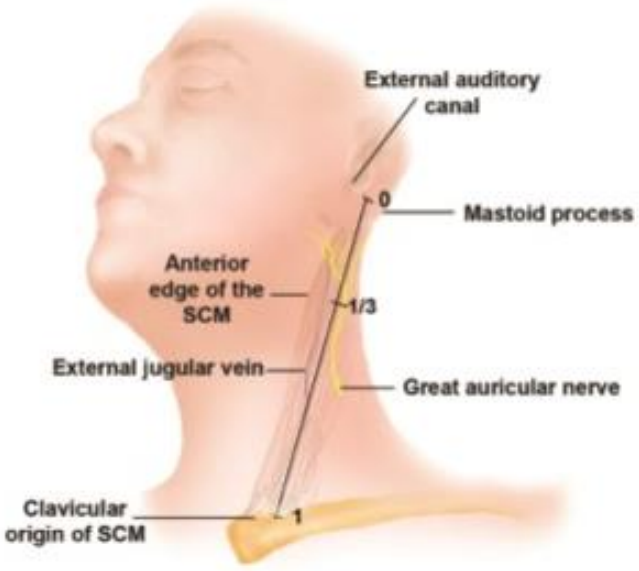
- Place fingers of one hand at suprastenal notch and other fingers at mastoid process.
- Push fingers away from each other to create a straight line in front of SCM for incision.
- Ensure skin incision curves under ear lobe.
- Ensure skin incision 2 FB below mandible.

You should immediately be thinking about Nerves..

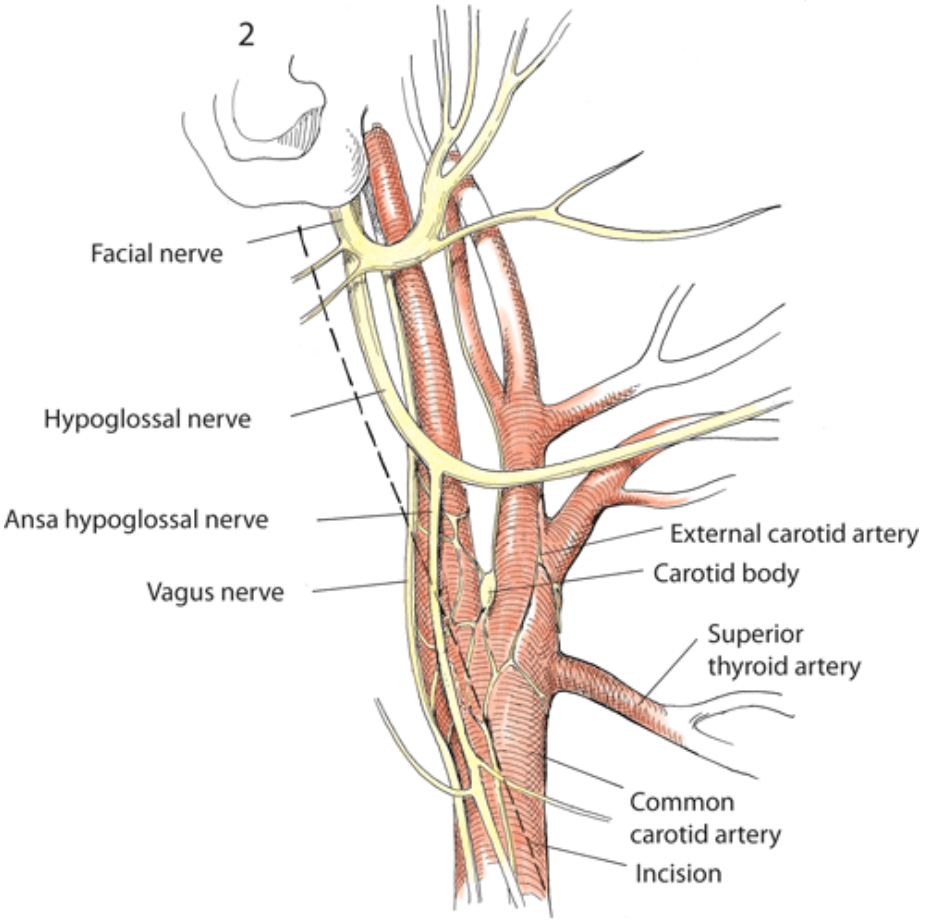


What nerves are encountered during CEA?

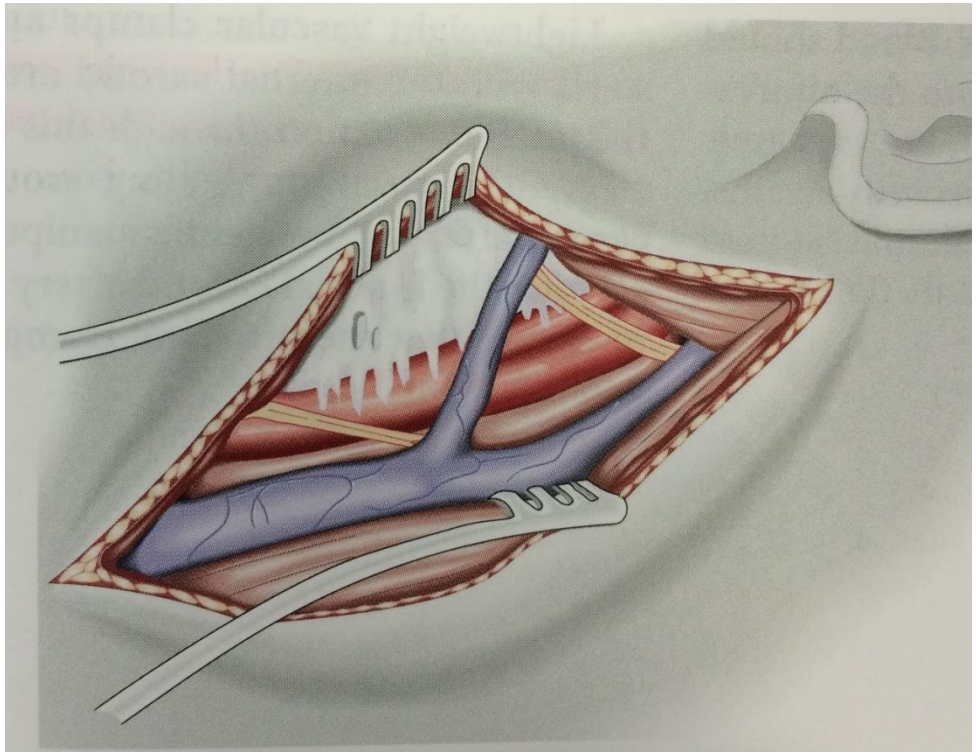
Greater Auricular Nerve



Ansa – Hypoglossal - Vagus



3 – Dissection down onto anterior facial vein



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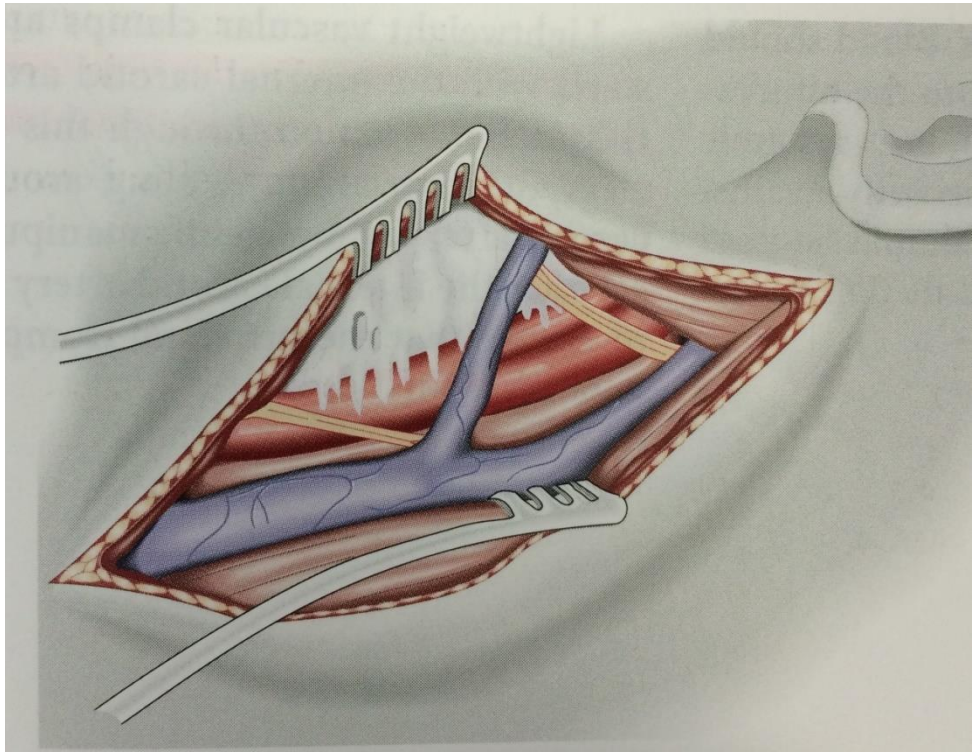
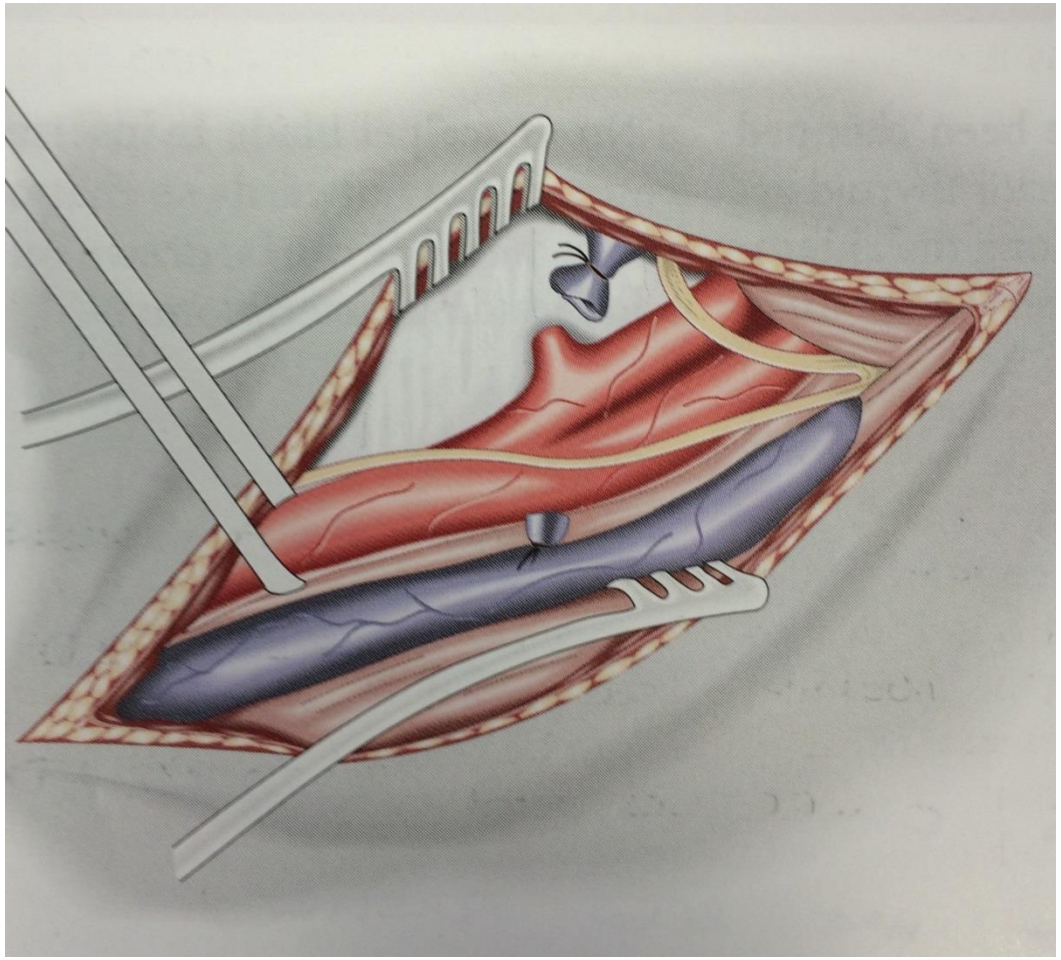


- Skin incision – careful haemostasis.
- Subcutaneous tissue.
- Division of platysma leads to SCM.
- Stay tight on SCM to identify IJV.
- Ligate small vessels on way to anterior facial vein which suggests level of carotid bifurcation.

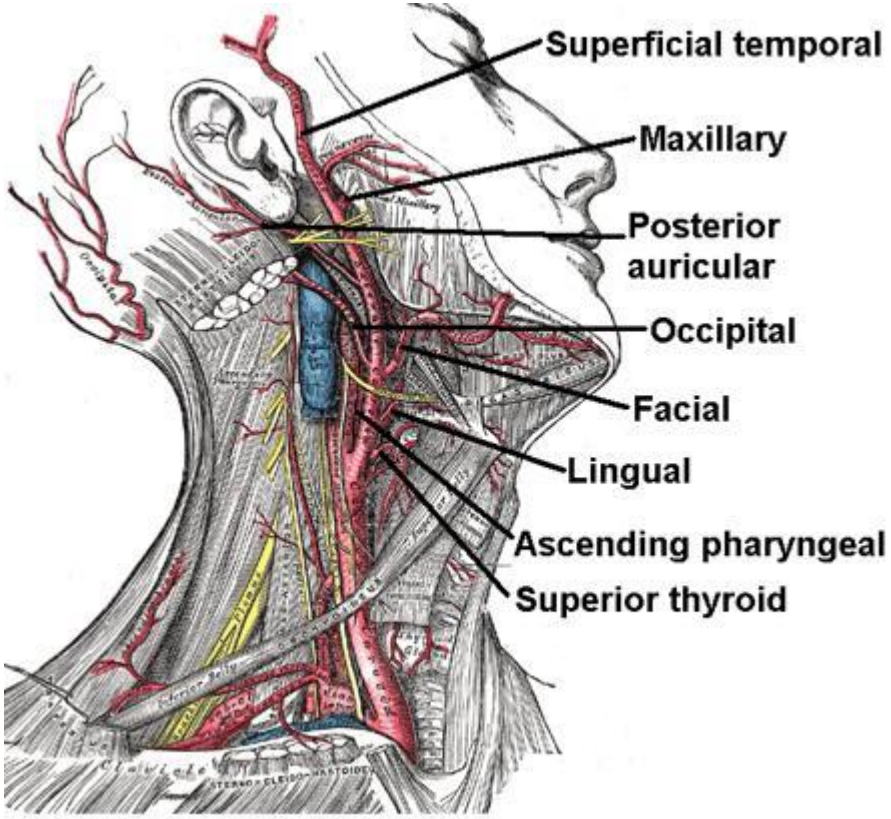
4 – Control of Carotid Vessels



Anatomy of the External Carotid Artery

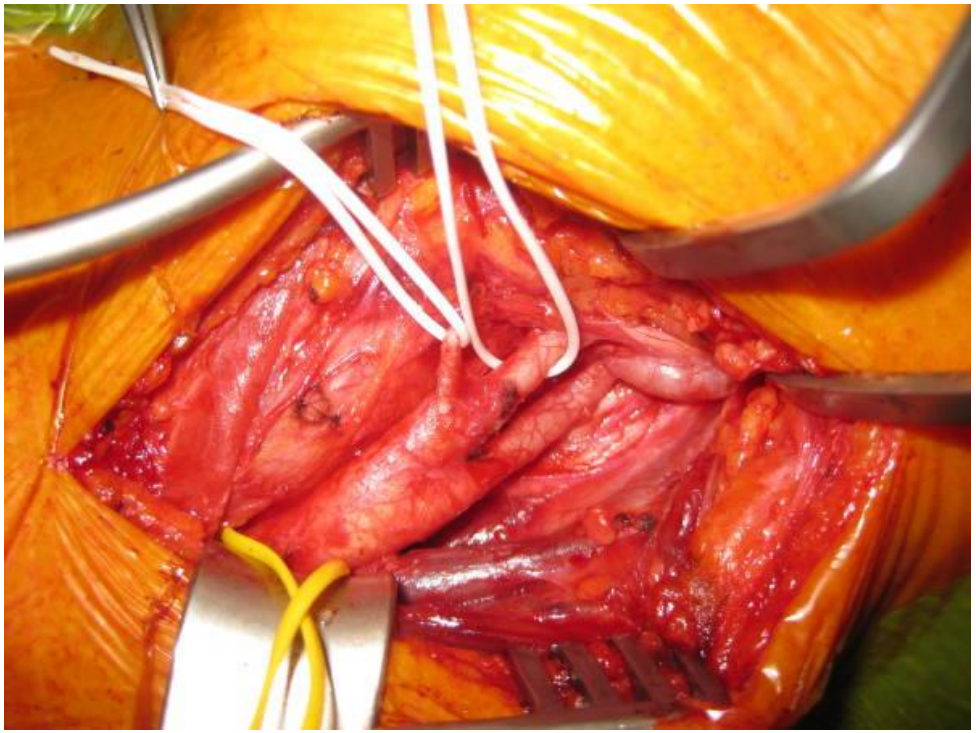
Anatomy of the External Carotid Artery

- S: superior thyroid artery.
- A: ascending pharyngeal artery.
- L: lingual artery.
- F: facial artery.
- O: occipital artery.
- P: posterior auricular artery.
- M: maxillary artery.
- S: superficial temporal artery.

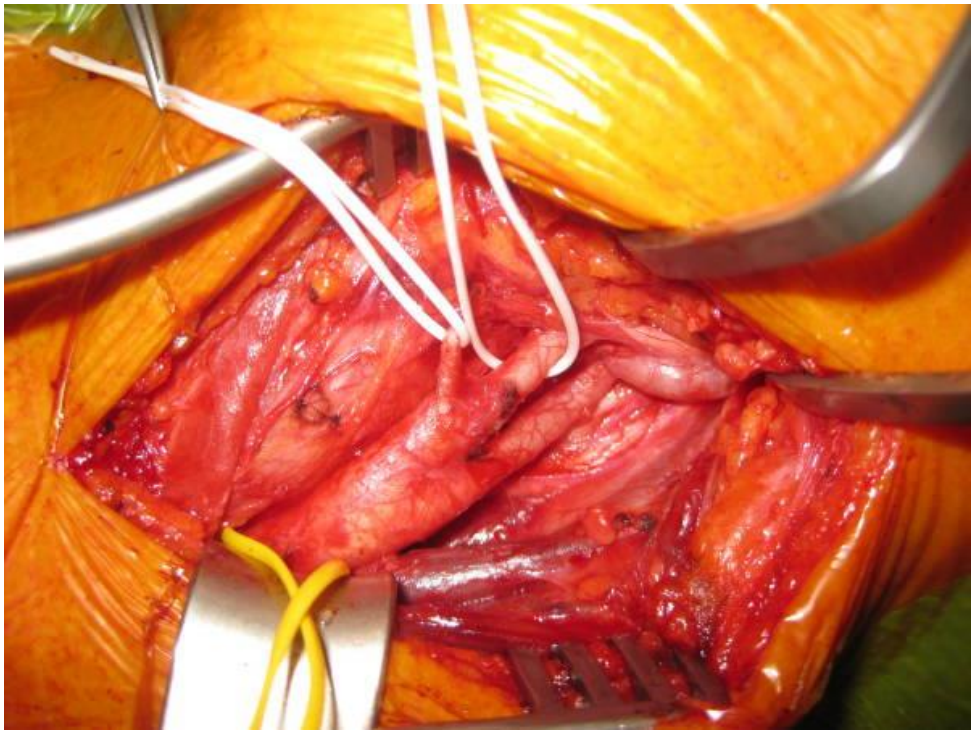


Some Anatomists Like Freaking Out Poor Medical Students

4 – Control of Carotid Vessels

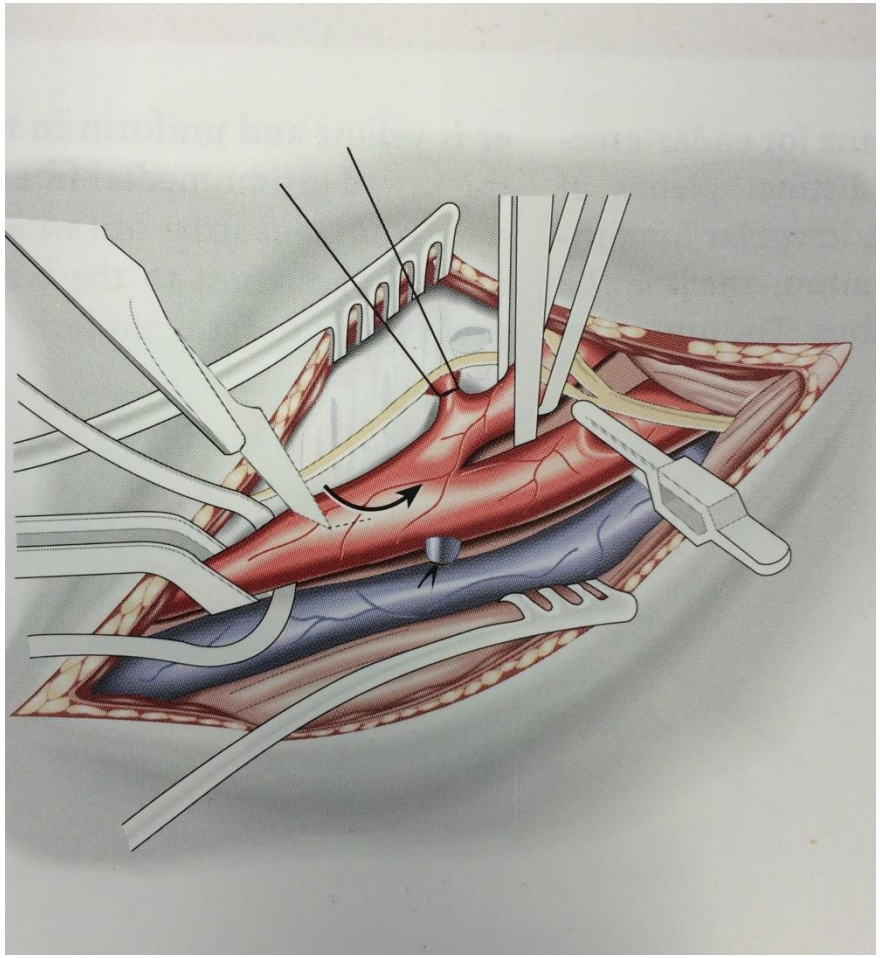


4 – Control of Carotid Vessels



- Once vessels identified early heparinisation.
- Careful sharp dissection of ICA, ECA, STA and CCA.
- Beware the posteriorly orientated ICA.
- Vessel sloops.

5 – Vessel Clamping



5 – Vessel Clamping

5 – Vessel Clamping

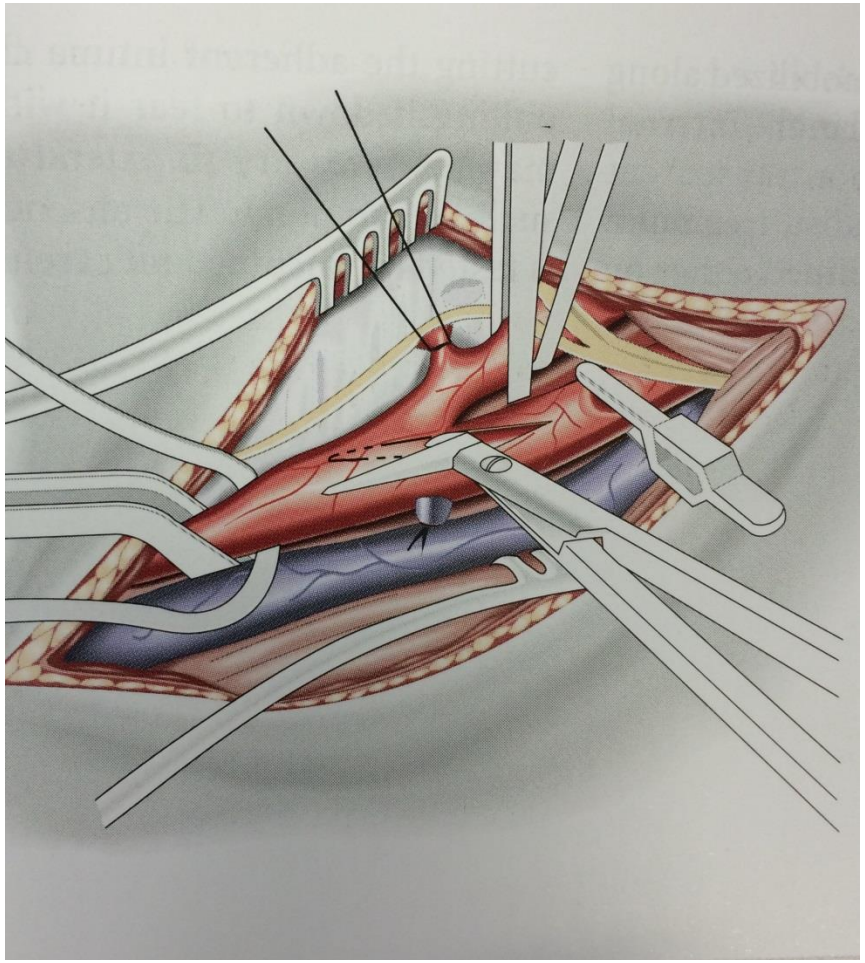
- Clamp on ICA first – do not crush vessel with Kitzmiller or Gregory clamp.
- Clamp CCA as assistant tightens sloops of ECA and STA.

5 – Vessel Clamping

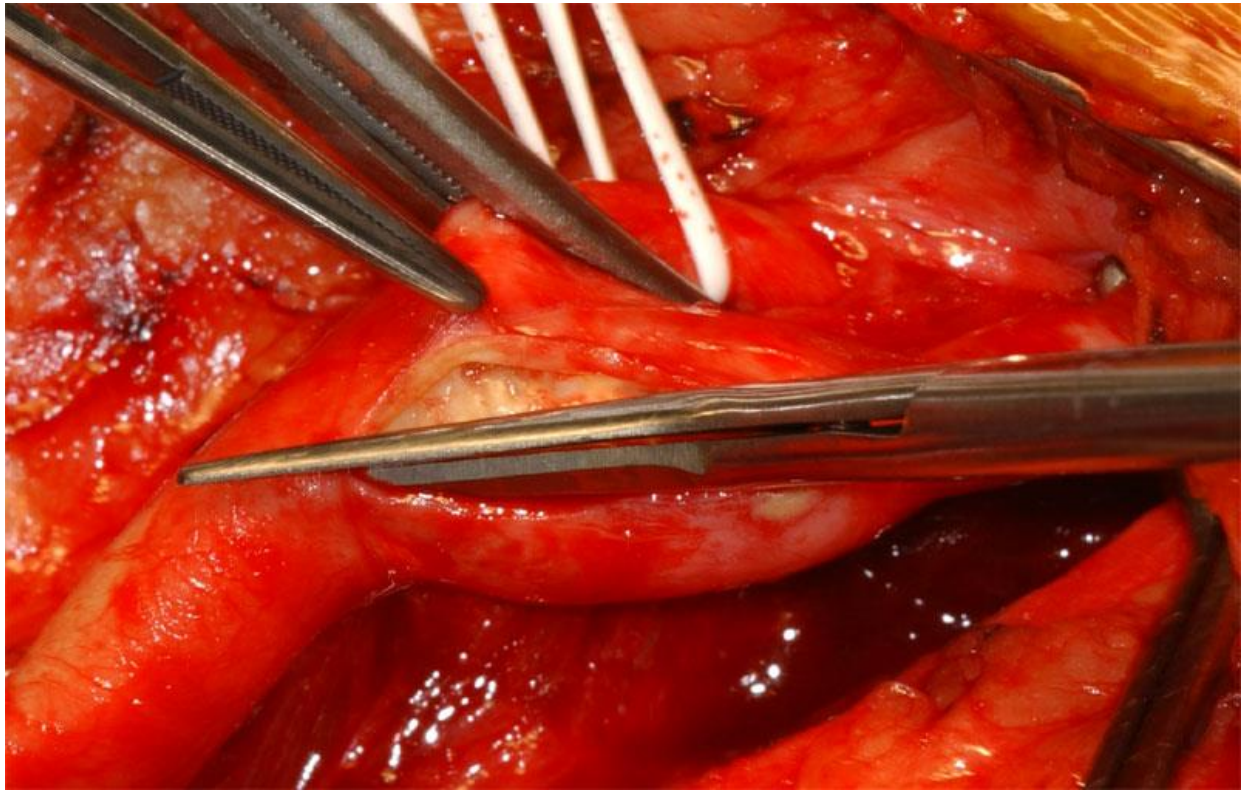
- Clamp on ICA first – do not crush vessel with Kitzmiller or Gregory clamp.
- Clamp CCA as assistant tightens sloops of ECA and STA.

Need to work fast
But you have some time !!

6 – Arteriotomy



6 – Arteriotomy



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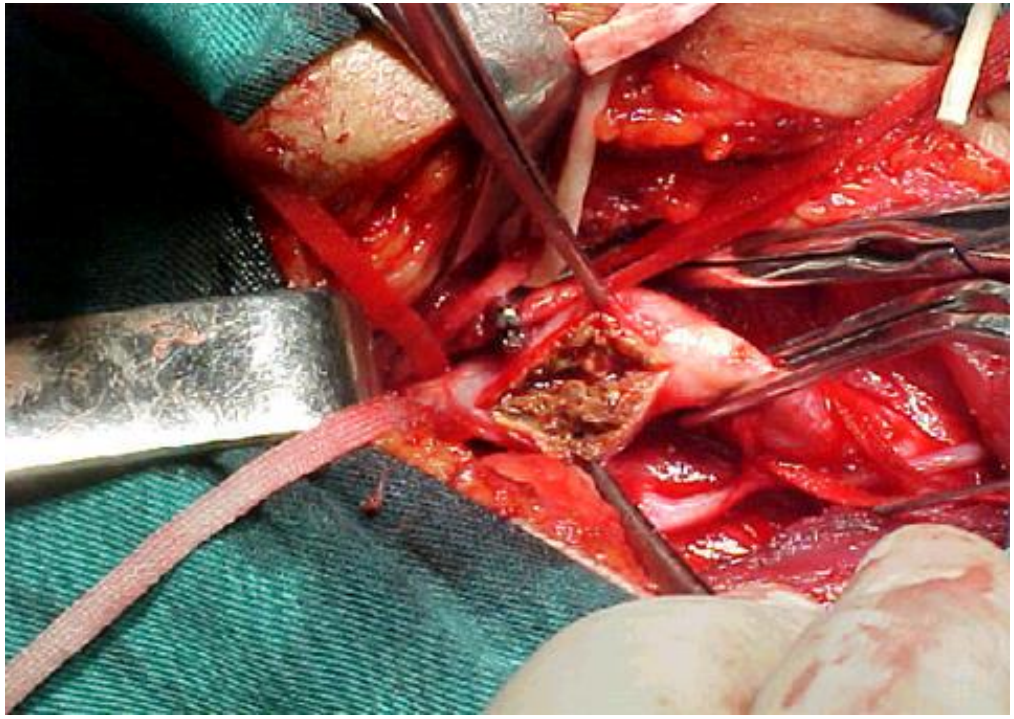

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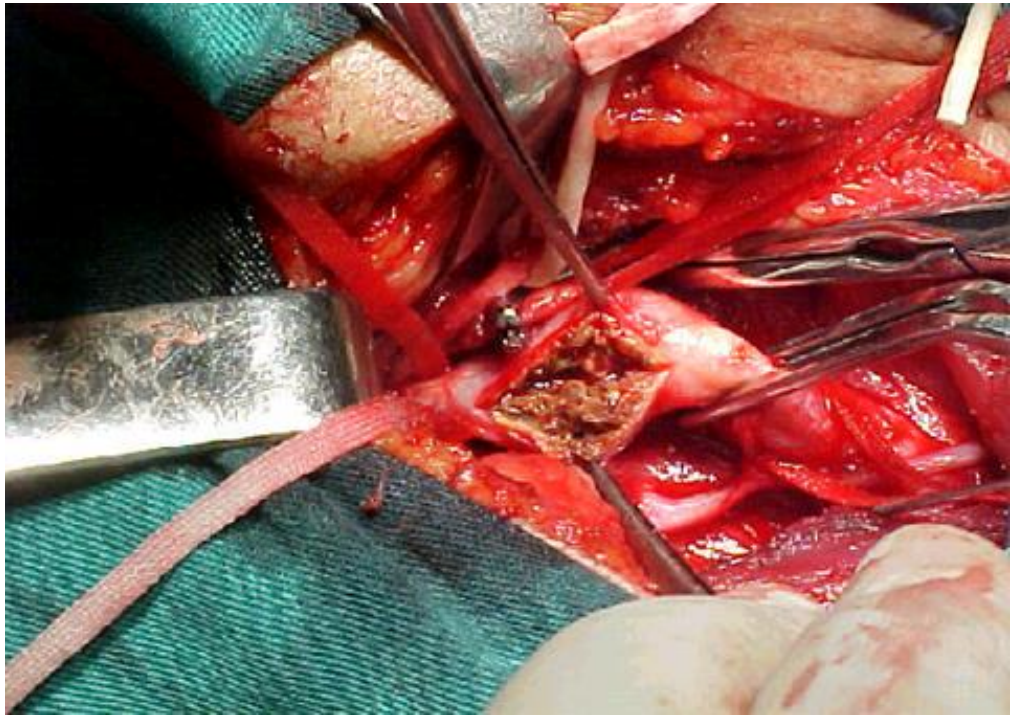
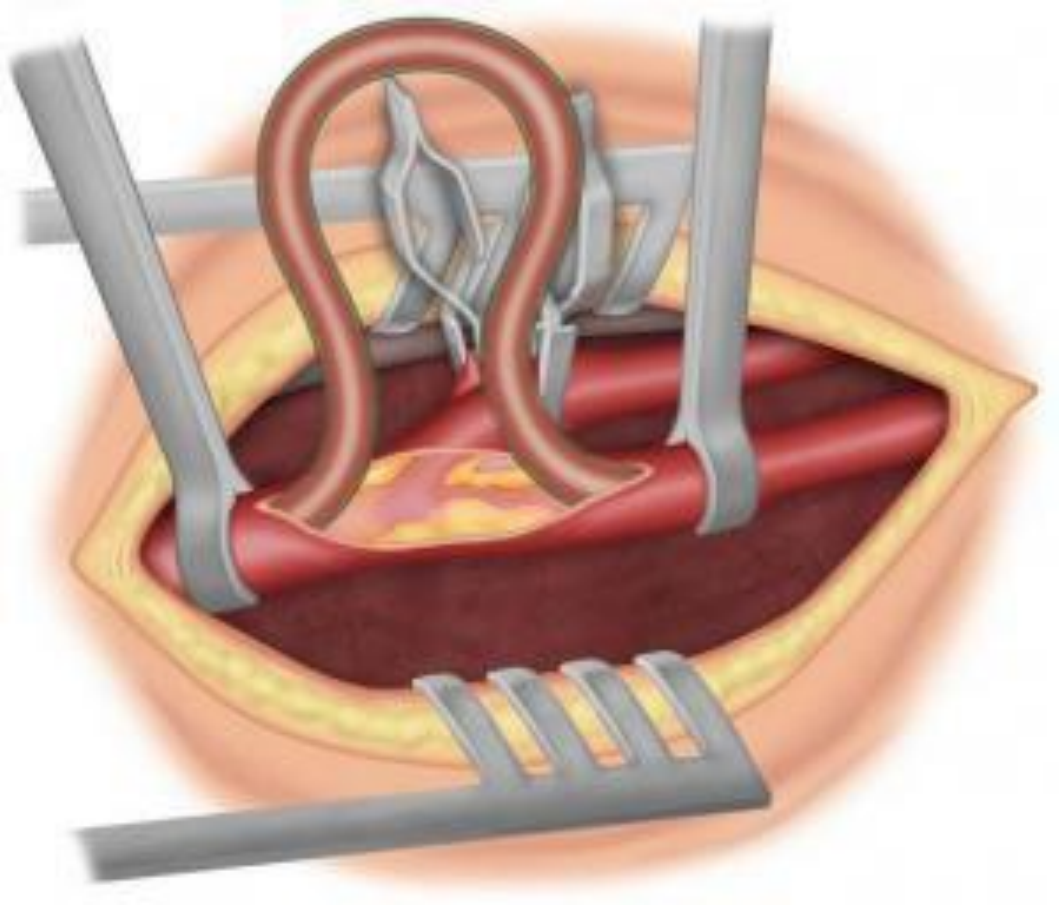


- 11 Blade in a softish segment of CCA.
- Ensure bottom blade of Pott's scissors in lumen.
- Do not take Pott's scissors out.
- Try to stay on anterior of vessel.
- Extend proximally and distally to normal lumen.

7 – Shunt Insertion



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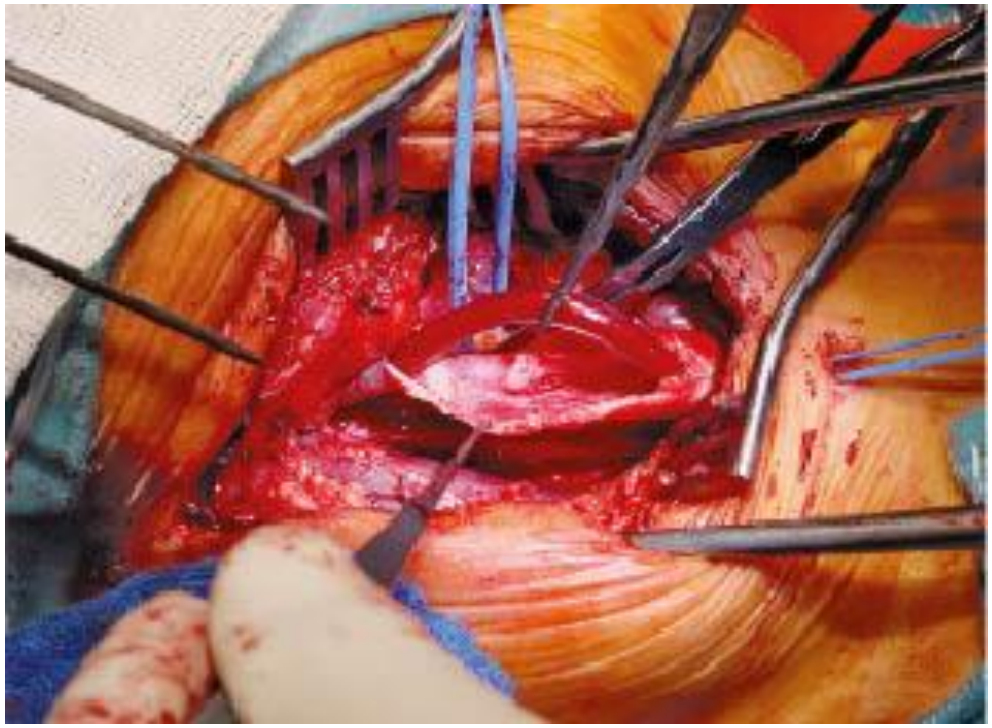

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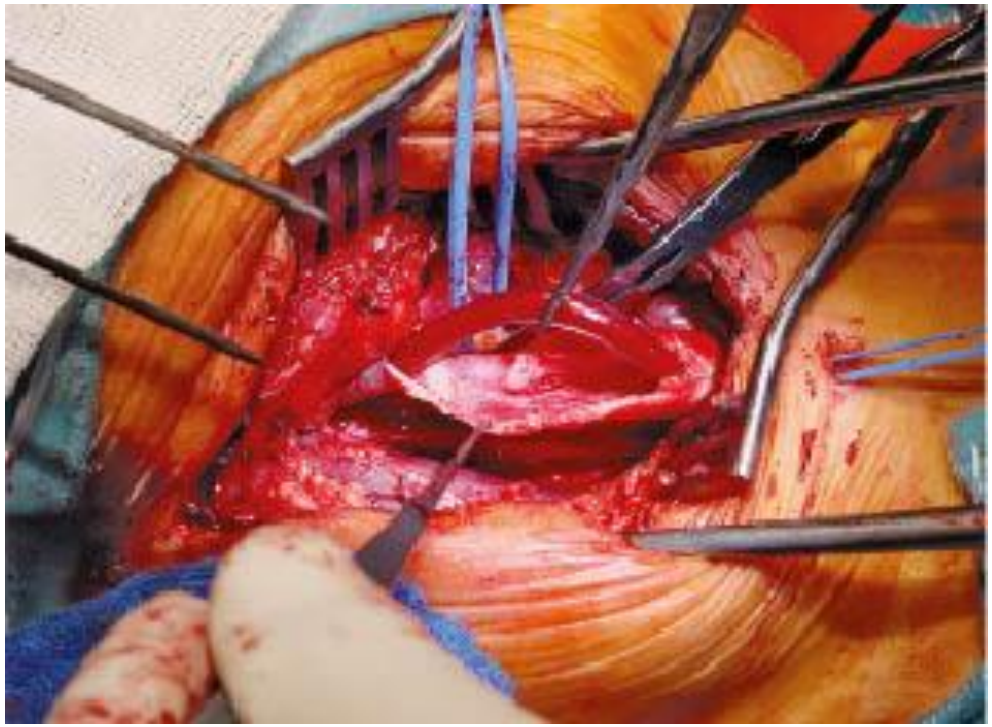
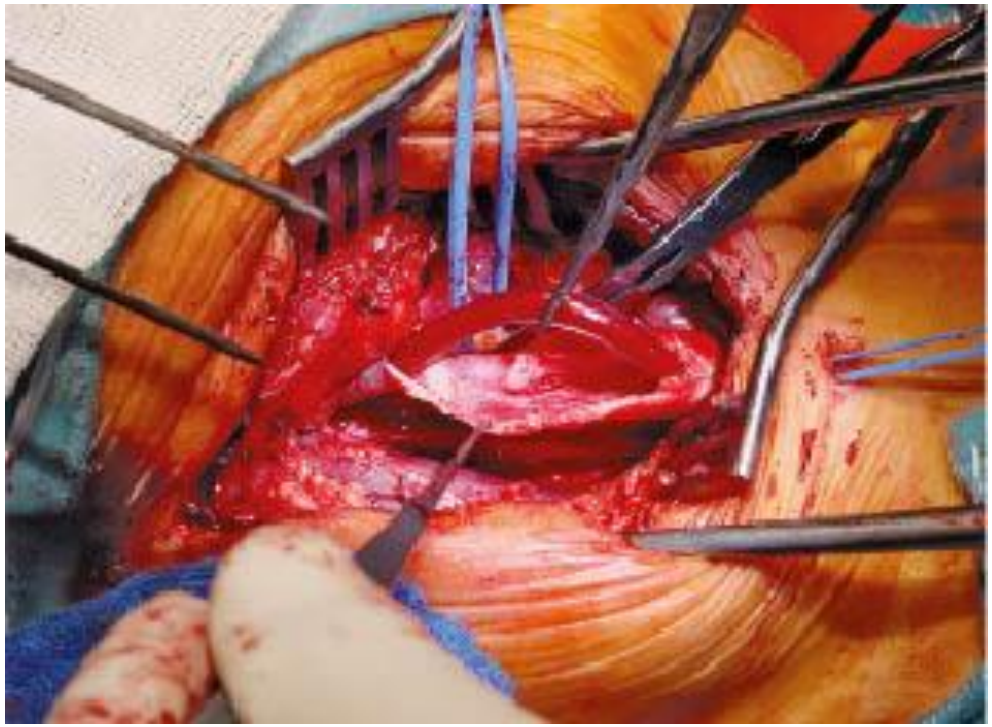


- Choices of Shunts:
  - Brenner.
  - Pruit-Inihara.
  - Javid.
  - Sundt.

7 – Shunt Insertion



- Take ICA clamp off.
- Gently insert shunt under direct vision.
- Allow shunt to back bleed.
- Take clamp off CCA and tighten sloop until ready to pass shunt in vessel lumen.
- Loosen sloop and allow shunt gently pass into CCA.

Brenner Shunt Insertion

- Check shunt.
- Flush shunt.

Brenner Shunt Insertion

- Apply haemostat to larger calibre shunt lumen.

Brenner Shunt Insertion

- Take clamp off ICA.
- Gently insert smaller calibre lumen of shunt into ICA.
- Allow the shunt to bleed out via side-arm.
- Look at ICA back-bleeding pressure or attach to a pressure monitor.

7 – Brenner Shunt Insertion

- Exchange the haemostat to the smaller calibre lumen which has been previously placed into ICA.

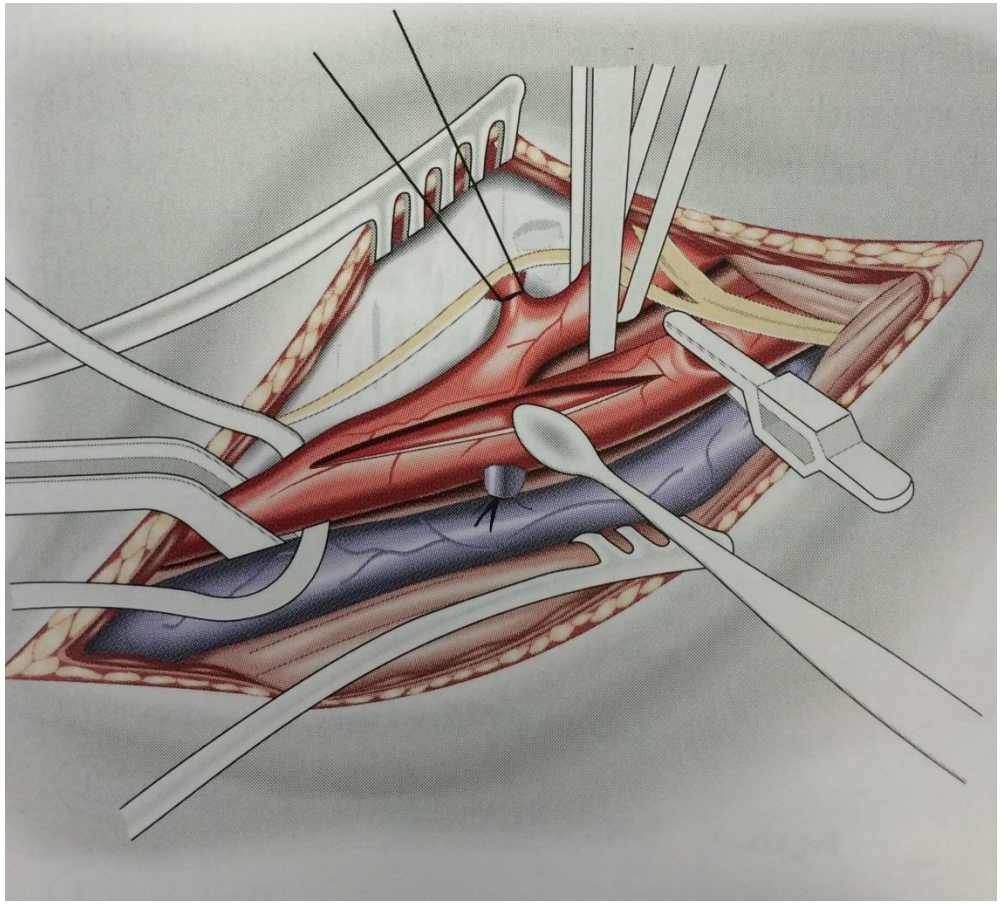
7 – Brenner Shunt Insertion

- Take clamp of CCA and gently hold sloop to control CCA flow.
- Ease pressure on the CCA sloop and carefully insert larger calibre lumen of shunt into the CCA.
- Allow the shunt to bleed out via side-arm.
- Allow 5 – 10 heart beats to flush the shunt.

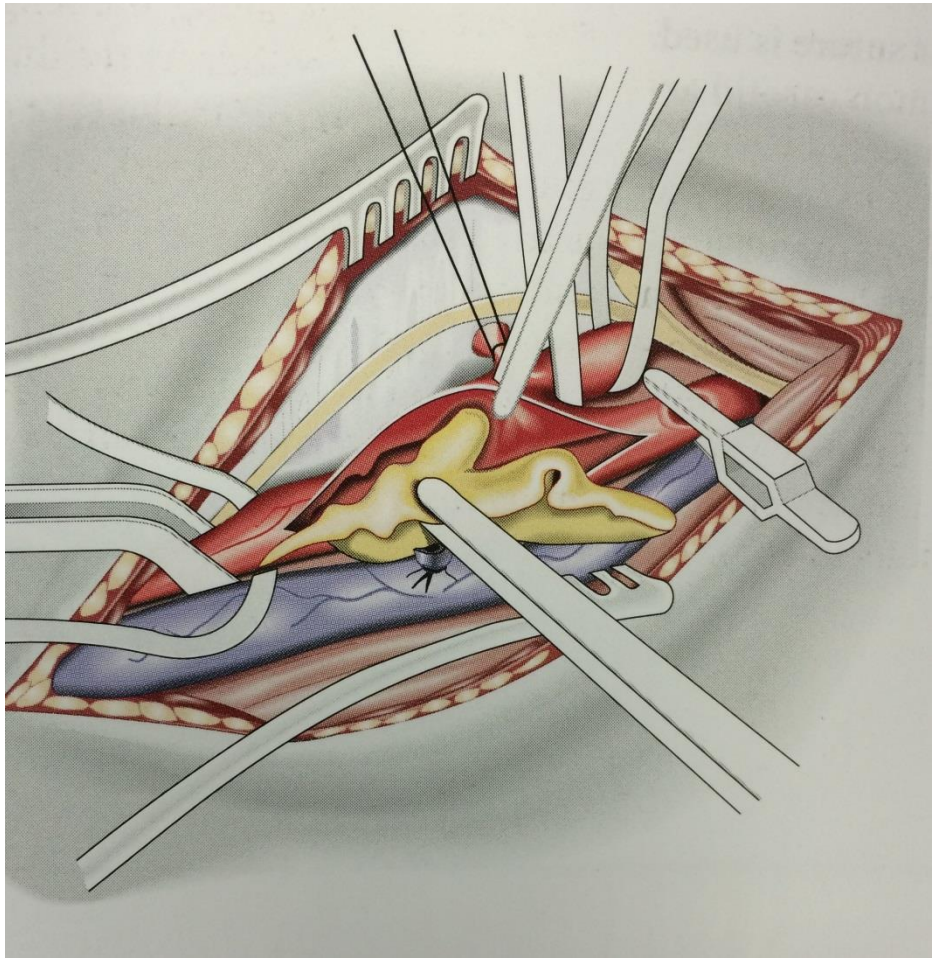
7 – Brenner Shunt Insertion

- Move haemostat from ICA lumen to the side-arm.
- Shunt flow should now be functional.

8 – Endarterectomy



8 – Endarterectomy



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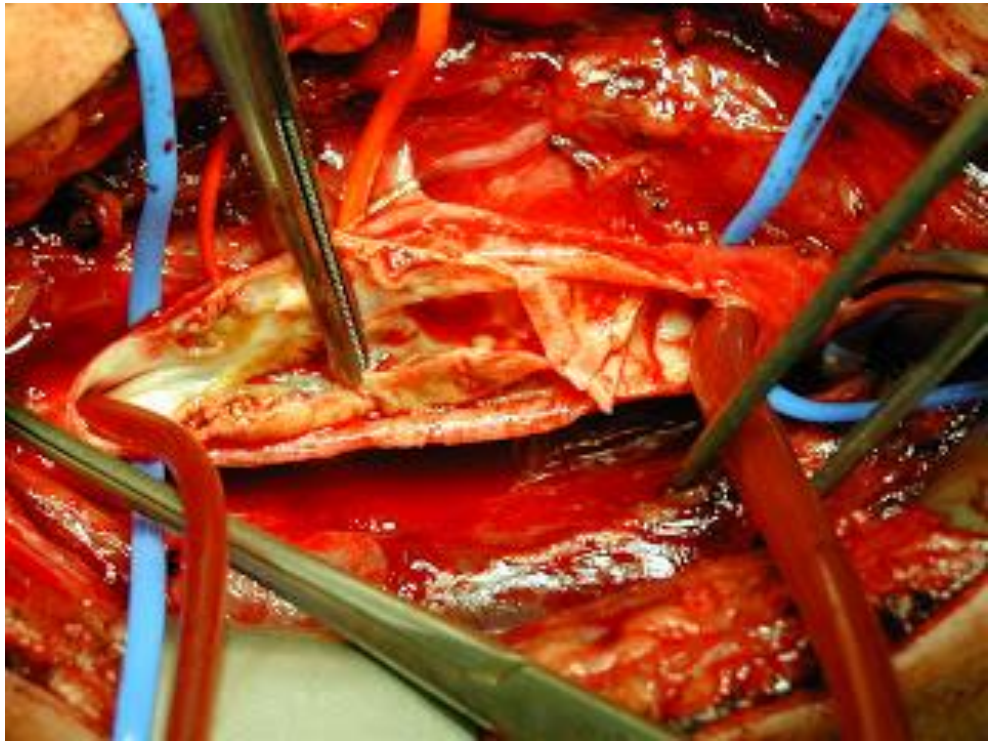

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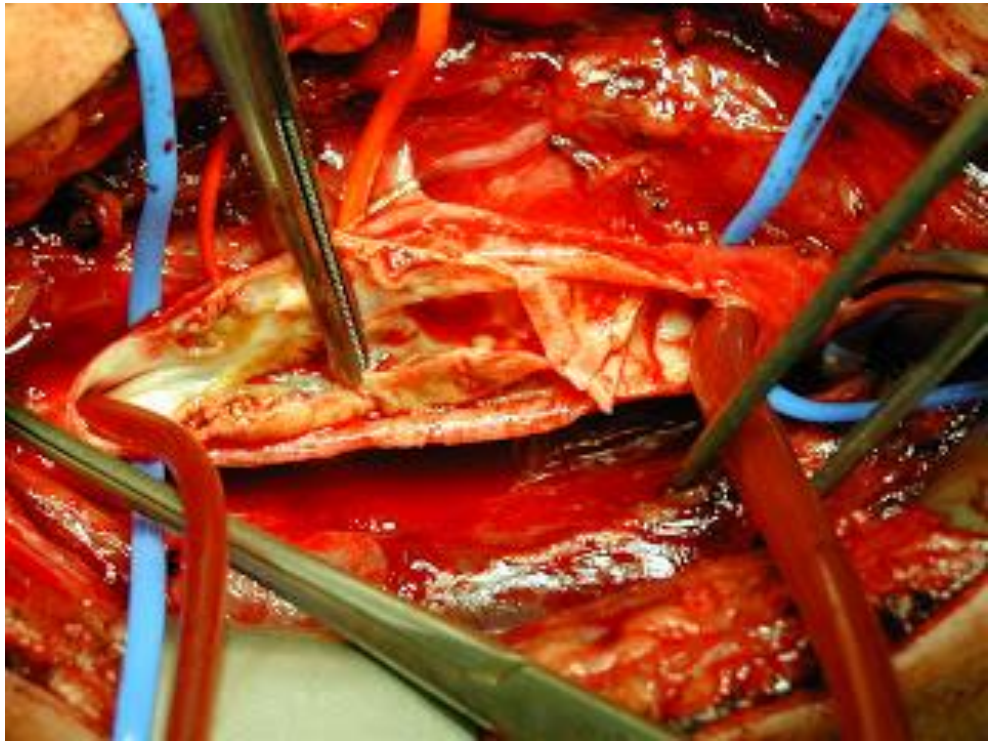
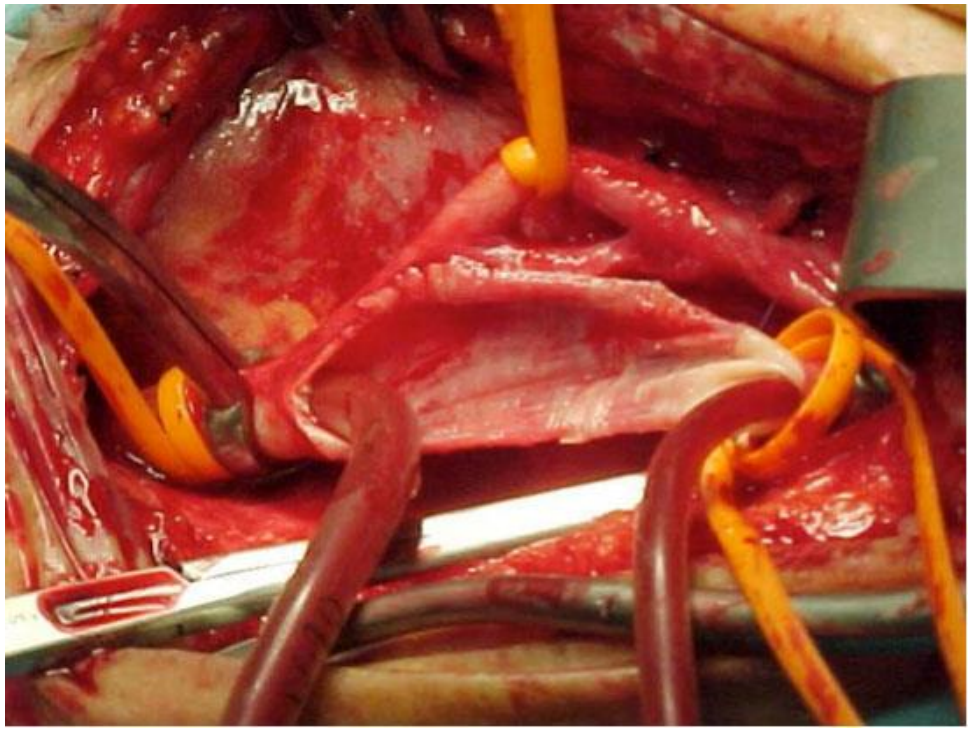


- Start at most diseased portion of vessel as plane of endarterectomy often easiest to identify.
- Divide proximal CCA portion.
- Eversion endarterectomy of ECA.
- Careful technique for distal ICA end-point.
- Remember to avoid directly handling remaining intima.

9 - Completed Endarterectomy



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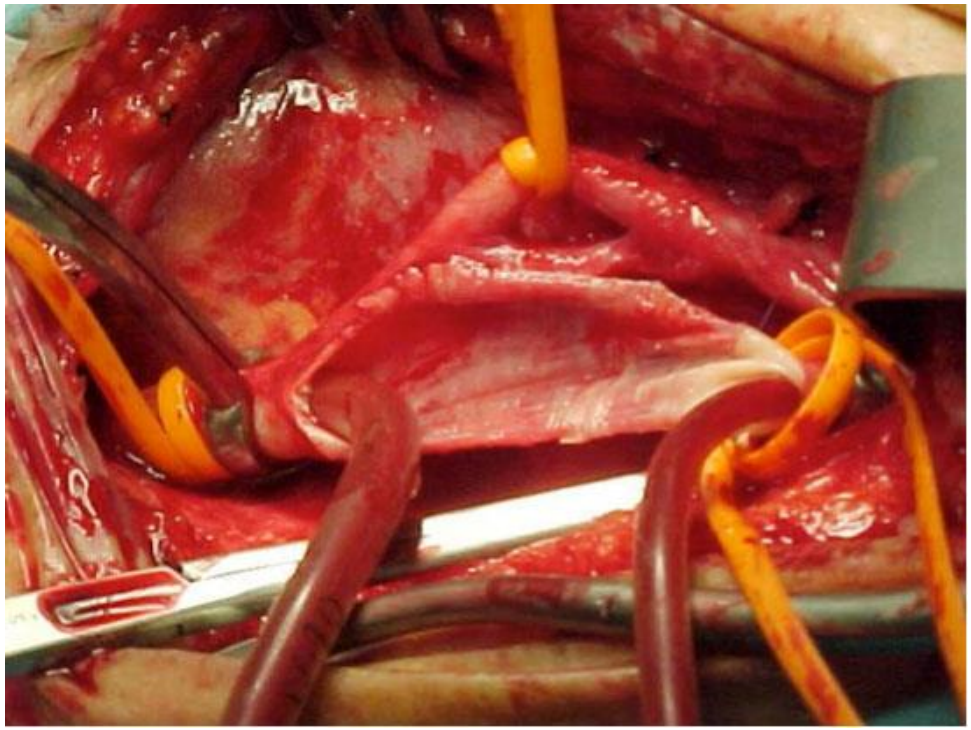
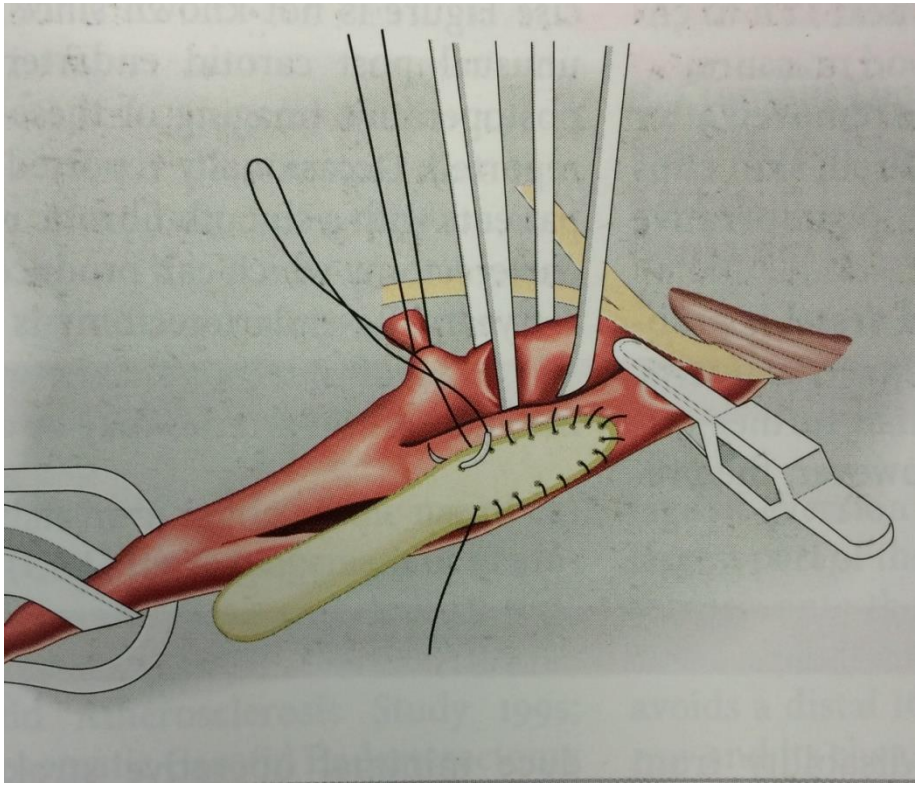


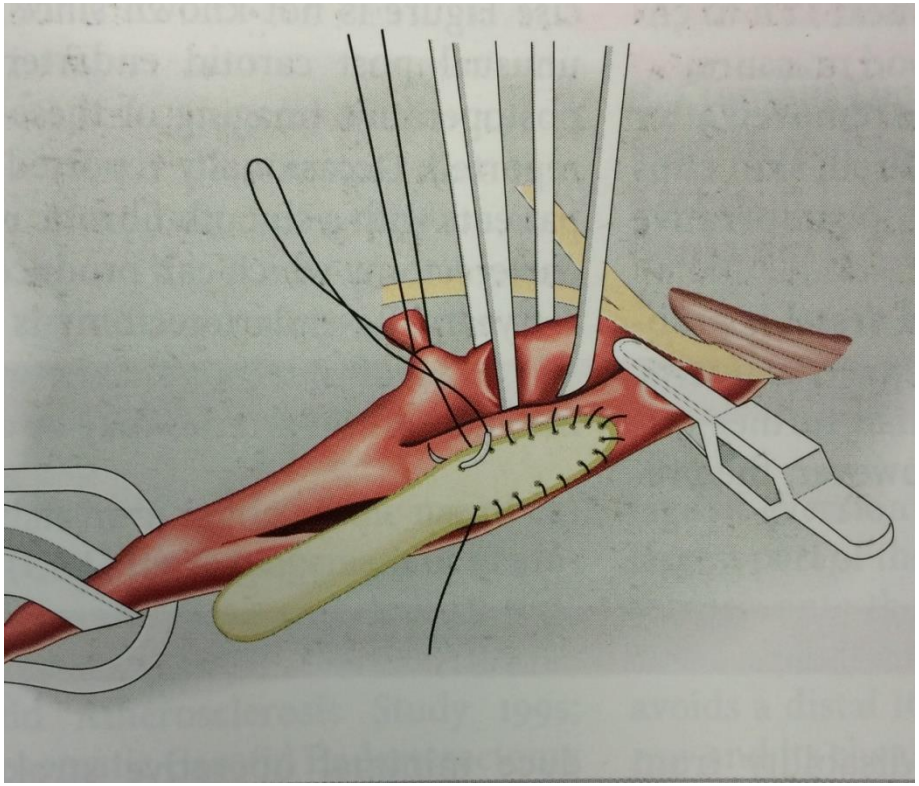
- Copious hepsal flushing.
- Double check for any mobile fragments.
- Consider Kunlun Tacking sutures to distal end-point using 7/0 prolene.

Carotid Plaque

10 – Patch Angioplasty

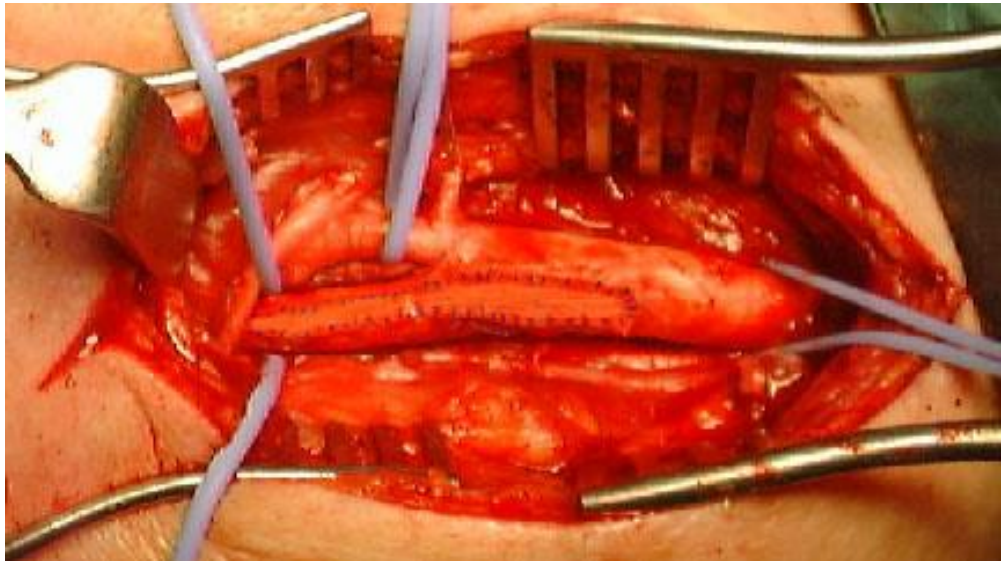


10 – Patch Angioplasty



- Bovine pericardial patch.
- 6/0 prolene.
- Preferred personal technique.
- Careful suturing distal end-point.

11 – Removal of shunts and completion of patch



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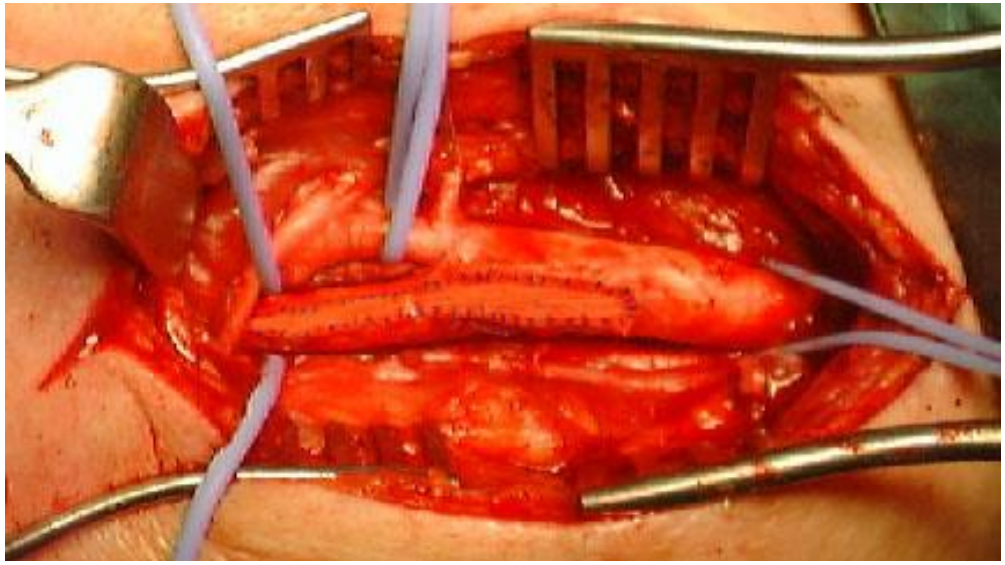
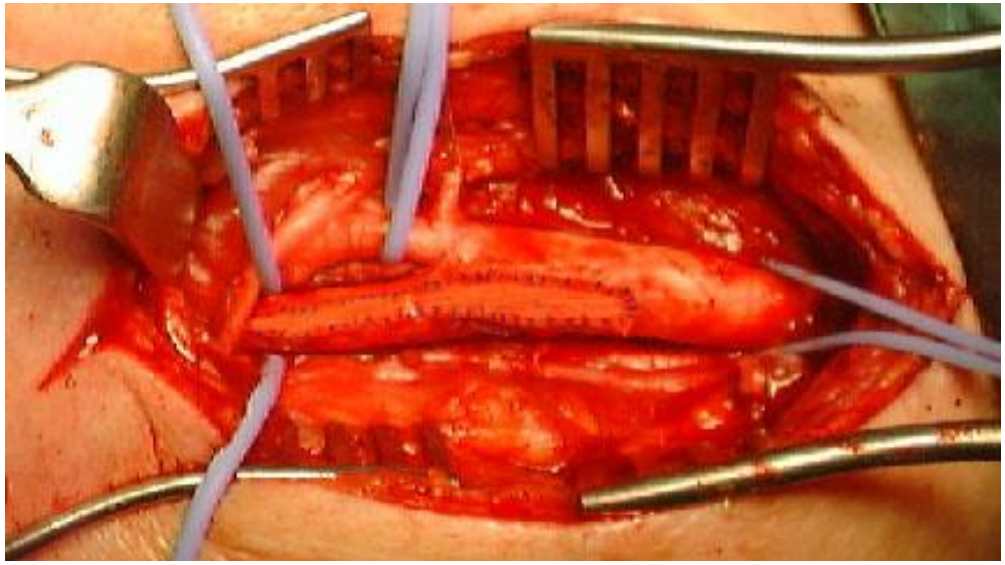


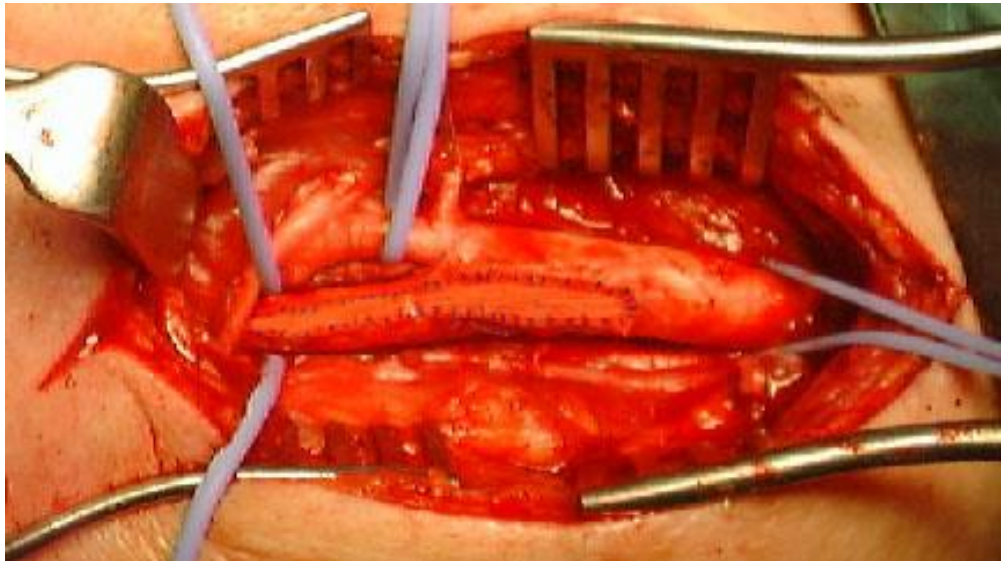
- Backbleed ECA and STA prior to completion of patch.
- Apply 2 haemostats to proximal limb of Brenner shunt.
- Divide shunt with sharp scissors.
- Take care not to divide patch or posterior wall.

11 – Removal of shunts and completion of patch



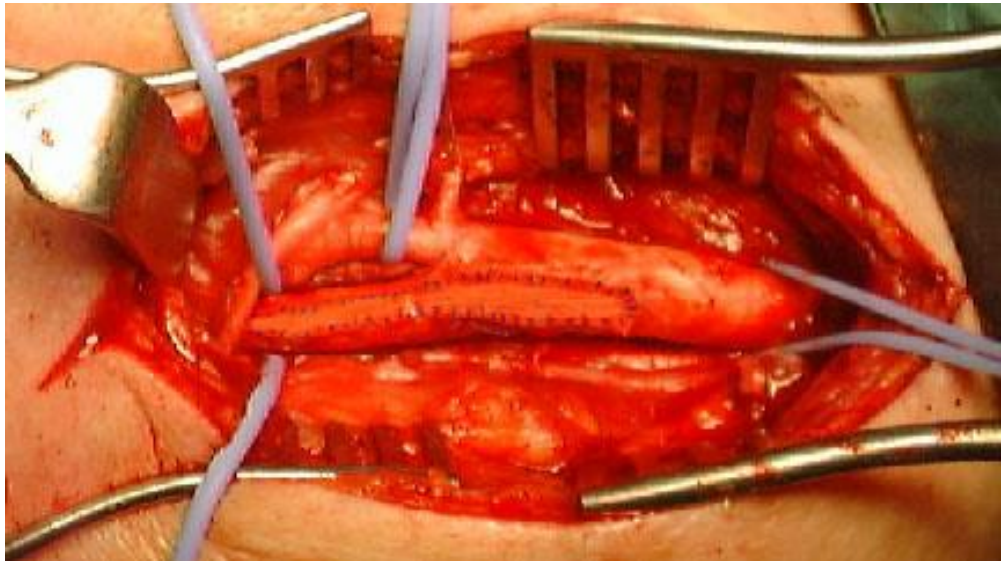
- Take out ICA shunt limb first and allow ICA backbleeding.
- Apply ICA clamp carefully above suture line.
- Take out CCA shunt limb and allow some forward bleeding before applying tension on sloop prior to clamping CCA again.

11 – Removal of shunts and completion of patch



- Assistant performs copious hepsal flushing of lumen.
- Surgeon completes anastomosis.

12 – Removal of clamps



- ICA clamp removed first to allow backbleeding into patch.
- Place finger pressure over ICA again to occlude it.
- Loosen ECA and STA sloops and let CCA clamp off to flush flow into ECA.
- After 10 heart beats release pressure off ICA to restore cerebral perfusion.

Post-Procedural Care?

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What I do ……

- Four-hours recovery and review prior to ward transfer.
- Strict blood pressure monitoring.
- Neurovascular assessment.
- Restoration of best medical therapy.
- If well - all lines and drain out next morning.
- If well and mobilising, discharge day-1 afternoon on best medical therapy.
- Review 3-months in out-patient clinic +/- carotid duplex.

Belfast Trust Carotid Blood Pressure Protocol

- Depends on current patient location: Recovery vs. Ward.
  - Haemodynamic assessment.
  - Basic Factors - Is the patient in urinary retention or in pain?
  - Evaluate for headache or presence of seizures.

- Review operative notes for defined acceptable blood pressure parameters.
  - Contact anaesthetist and surgeon.

- Has the patient received their normal anti-hypertensive medication today?
  - If not and the patient is able to swallow administer this.

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GUIDANCE FOR THE MANAGEMENT OF POST-CAROTID ENDARTERECTOMY HYPERTENSION

THEATRE RECOVERY: target systolic BP < _____ mmHg

General Points

Is the patient in urinary retention or in pain?
Contact anaesthetist and surgeon.
Has the patient received their normal anti-hypertensive medication today?
If not and the patient is able to swallow administer this.

First line

LABETALOL

100mg Labetalol in 20 mls of 0.9% Saline. (*ie* 5mg per ml)
Give 10mg (2 ml) boluses slowly every two mins up to 100mg (ie 20mls given over 20mins)
If BP remains elevated after 20 mins, move to second line agent.
If BP reduces and does not rebound, continue regular BP observations.
If BP reduces but increases again, start infusion at 50-100mg per hour, titrating dose to BP.

Patient remains in the recovery ward while Labetalol infusion is running. Consider early referral for admission to HDU. If Labetalol infusion can be discontinued the patient should remain in the recovery ward for observation of any rebound hypertension and should be reviewed by anaesthetist or surgeon prior to discharge to ward 6A.

Second line

HYDRALAZINE

10mg Hydralazine in 10mls of 0.9% Sodium Chloride (*ie* 1mg per ml)
Give 2mg (2ml) boluses slowly every 5 mins up to 10mg (ie 10mls given over 25 mins)
If BP remains elevated after 25 mins, move to third line agent.
If BP reduces and does not rebound, continue regular BP observations.
If BP reduces but increases again, move to third line agent

Patient remains in the recovery ward. Consider early referral for admission to HDU. Following Hydralazine therapy the patient should remain in the recovery ward for observation of any rebound hypertension and should be reviewed by anaesthetist or surgeon prior to discharge to ward 6A.

Third Line

GTN

50mg GTN in 50mls 0.9% Sodium Chloride (*ie* 1mg per ml)
Start infusion at 5mls/hr (5mg/hr), increasing rate to 12mls/hr (12mg/hr), titrated to BP.

Patient remains in the recovery ward and refer for admission to HDU. If GTN infusion can be discontinued the patient should remain in the recovery ward for observation of any rebound hypertension and should be reviewed by anaesthetist or surgeon prior to discharge to ward 6A.

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GUIDANCE FOR THE MANAGEMENT OF POST-CAROTID ENDARTERECTOMY HYPERTENSION

PATIENT IS BACK ON THE WARD:

Systolic BP >170mmHg, but NO headache or neurology

THIS IS A POST-OP SURGICAL EMERGENCY AND SHOULD BE TREATED IMMEDIATELY

Is the patient in urinary retention or in pain?
Contact ward doctor and vascular STR.
Has the patient received their normal anti-hypertensive medication today?

Patient IS normally on antihypertensive therapy

First line

Check the patient has received normal anti-hypertensive medication. If not, administer this.

Second line

A = ACE inhibitor, B = B-Blocker, C = Calcium Channel Blocker, D = Diuretic

- If patient is on A, add in C (Amlodpine 5mg)
- If patient is on C, add in A (Ramipril 5mg)
- If patient is on D, add in A (Ramipril 5mg)
- If patient is on A+C, add in D (Indapamide 2.5 mg)
- If patient is on A+D, add in C (Amlodipine 5mg)
- If patient is on A+C+D, add in B (Bisoprolol 5mg)
- If patient is on B, add in A if history of heart failure (Ramipril 5mg) or if no history of heart failure add in C (Amlodipine 5mg)

If patient cannot swallow tablets

Pass nasogastric tube and administer appropriate medicines in liquid form as prescribed above.

Consider contacting Hypertension Specialist for clinical review

Patient is NOT normally on antihypertensive therapy

First line

Amlodipine 5mg, repeated after 1 hour if no change in BP.
DO NOT use crushed Nifedipine capsules
If no reduction in BP, move to second line agent

Second line

Bisoprolol 5mg.
If contra-indicated, move to third line agent.

Third line

Ramipril 5mg, repeated at 3hrs if necessary

Consider contacting Hypertension Specialist for clinical review

GUIDANCE FOR THE MANAGEMENT OF POST-CAROTID ENDARTERECTOMY HYPERTENSION

PATIENT IS BACK ON THE WARD:

Systolic BP >160mmHg + headache/seizure or deficit

THIS IS A POST-OP SURGICAL EMERGENCY AND SHOULD BE TREATED IMMEDIATELY

Treatment must begin immediately and vascular surgeon should be contacted
Use non-invasive monitoring if arterial line has been removed

First line
LABETALOL
100mg Labetalol in 20 mls of 0.9% Saline. (*ie.* 5mg per ml)
Give 10mg (2 ml) boluses slowly every two mins up to 100mg (ie 20mls given over 20mins)
If BP remains elevated after 20 mins, move to second line agent.
If BP reduces and does not rebound, continue regular BP observations.
If BP reduces but increases again, start infusion at 50-100mg per hour, titrating dose to BP.

Second line
HYDRALAZINE
10mg Hydralazine in 10mls of 0.9% Sodium Chloride (*ie.* 1mg per ml)
Give 2mg (2ml) boluses slowly every 5 mins up to 10mg (ie 10mls given over 25 mins)
If BP remains elevated after 25 mins, move to third line agent.
If BP reduces and does not rebound, continue regular BP observations.
If BP reduces but increases again, move to third line agent

Third Line
GTN
50mg GTN in 50mls 0.9% Sodium Chloride (*ie* 1mg per ml)
Start infusion at 5mls/hr (5mg/hr), increasing rate to 12mls/hr (12mg/hr), titrated to BP.

Vascular ward doctor or hospital at night team should begin treatment and must also:

- ✓ *Contact on call vascular STR to inform him/her of increase in BP associated with seizure/ headache or onset of neurological deficit*
- ✓ *Contact on call anaesthetic team if any airway compromise*
- ✓ *Contact critical care team to arrange transfer to HDU for ongoing invasive monitoring and treatment if infusion of anti-hypertensives is required or BP is difficult to control*
- ✓ *Administer 6.6mg Dexamethasone intravenously*

Following transfer, patient remains in HDU while anti-hypertensive treatment ongoing. Following cessation of treatment, the patient should remain in HDU for observation of any rebound hypertension prior to transfer back to ward 6A.

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What I do ……

My follow-up practice governed by patient symptomatology

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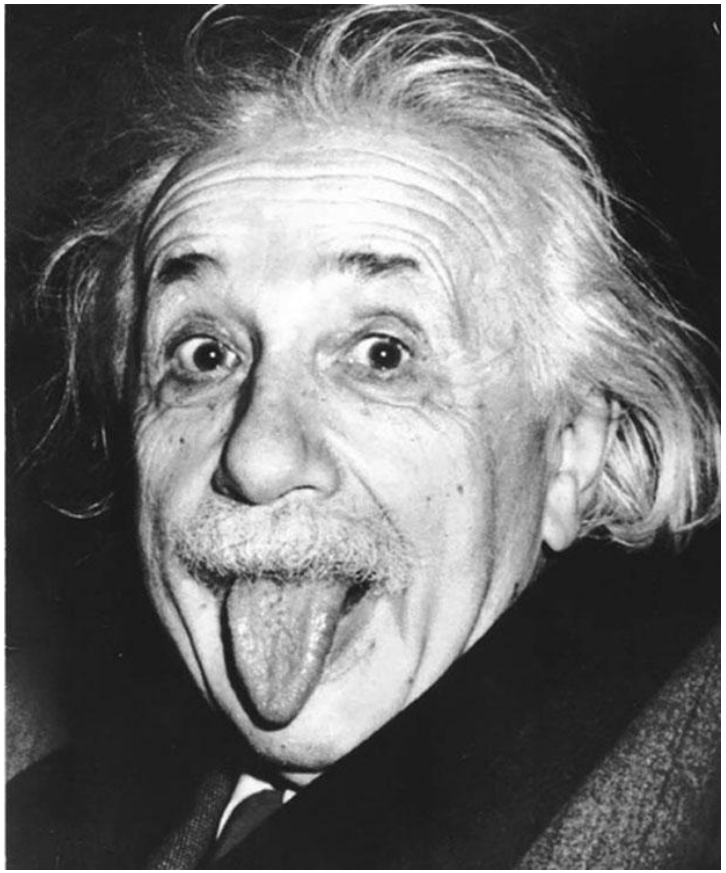
What I do ……

My follow-up practice governed by patient symptomatology

What if ….. area of stenosis identified on follow-up carotid duplex ??? in an asymptomatic patient

Important Literature



J Vasc Surg. 2000 Dec;32(6):1043-51.

Frequency of postoperative carotid duplex surveillance and type of closure: results from a randomized trial.

AbuRahma AF[1], Robinson PA, Mullins DA, Holt SM, Herzog TA, Mowery NT.

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Frequency of postoperative carotid duplex surveillance and type of closure: results from a randomized trial.

AbuRahma AF[1], Robinson PA, Mullins DA, Holt SM, Herzog TA, Mowery NT.

Objective: To analyse the frequency and timing of postoperative carotid duplex ultrasound scanning (PCDS) according to the type of closure from a randomized carotid endarterectomy (CEA) trial comparing primary closure (PC) versus patching.

Patient Population: 399 CEAs were randomised into 135 PCs, 134 polytetrafluoroethylene (PTFE) patch closures, and 130 vein patch closures (VPCs) with a mean follow-up of 47 months.

Methods: PCDS was performed at 1, 6, and 12 months and every year thereafter (a mean of 4.0 studies per artery). Kaplan-Meier analysis was used to estimate the rate of > or = 80% restenosis over time and the time frame of progression from less than 50%, from 50%-79% and equal / greater than 80% stenosis.

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Frequency of postoperative carotid duplex surveillance and type of closure: results from a randomized trial.

AbuRahma AF[1], Robinson PA, Mullins DA, Holt SM, Herzog TA, Mowery NT.

Results: Restenoses of 80% or more developed in 24 (21%) arteries with PC and nine (4%) with patching.

Kaplan-Meier estimate of freedom of 80% or more restenosis at 1, 2, 3, 4, and 5 years was 92%, 83%, 80%, 76%, and 68% for PC, respectively, and 100%, 99%, 98%, 98%, and 91% for patching, respectively, (P <.01).

Of the 24 PC patients with >80% restenosis, 10 were symptomatic. Therefore, therefore 14 asymptomatic arteries (12%) detected only with PCDS cost $139, 200.),

Of the 9 arteries closed with patches (3 PTFE closures and 6 VPCs) with greater than 80% restenosis 3 patients were symptomatic.

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Frequency of postoperative carotid duplex surveillance and type of closure: results from a randomized trial.

AbuRahma AF[1], Robinson PA, Mullins DA, Holt SM, Herzog TA, Mowery NT.

Results: In patients with normal duplex scan findings at the first 6 months, only four (2%) of 222 patched arteries (two asymptomatic) developed greater than 80% restenosis versus five (38%) of 13 in patients with abnormal duplex scan examination findings identified at the 6 month scan (P<.001).

Conclusions: PCDS is beneficial in patients with PC, but is less beneficial in patients with patch closure.

PCDS examinations at 6 months and at 1- to 2-year intervals for several years after PC are adequate.

For patients with patching, a 6-month postoperative duplex scan examination with normal results is adequate.

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Effects of best medical therapy

Cost implications

Surgery only in symptomatic patients

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Duplex ultrasound surveillance after carotid artery endarterectomy.

Al Shakarchi J[1], Lowry D[2], Nath J[3], Khawaja AZ[3], Inston N[3], Tiwari A[2].

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Al Shakarchi J[1], Lowry D[2], Nath J[3], Khawaja AZ[3], Inston N[3], Tiwari A[2].

Objective: This study assessed and systematically reviewed the evidence base for long-term surveillance after CEA and a normal early scan.

Methods: Electronic databases were searched for studies assessing duplex surveillance after CEA in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines.

Outcomes: The primary outcome for this study was the incidence of restenosis after a normal early scan. The secondary outcome was the number of re-interventions after a normal early scan.

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Results: The review included seven studies that reported 2317 procedures.

Of those patients with a normal early scan, 2.8% (95% confidence interval, 0.7%-6%) developed a restenosis, and 0.4% (95% confidence interval, 0%-0.9%) underwent a re-intervention for their restenosis during the follow-up period.

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GALA Trial

- General Anaesthesia versus Local Anaesthesia for carotid surgery Trial.
- 3526 patients with symptomatic or asymptomatic carotid stenosis randomised to GA or LA.
- No difference between anaesthetic groups.
- Outcome – clinical judgement call by vascular team members.

Lancet 2008; 9656: 2132-42.

CREST Trial

- Carotid Revascularisation Endarterectomy versus Stenting Trial.
- 2502 symptomatic and asymptomatic patients randomised to CEA or CAS.
- Age: CAS better < 70 years, CEA better > 70 years.
- Higher risk of stroke with CAS compared to subgroup analysis of higher MI risk with CEA.

Stroke 2011

Cases

Case 1

- 72 year old male patient presents following a fall with associated left arm weakness;
  - Lives alone.
  - Two recent episodes of eye blurring.
  - Past medical history of angina, COPD and smoking.

Case 2

- 89 year old female patient presents from ED after being found non-communicative with a dense weakness of right arm and leg;
  - Lives in a nursing home.
  - Doesn't mobilise.
  - Past medical history of right above knee amputation.

Case 3

- 64 year old female presents with fainting episodes and unsteady gait;
  - Occasional forget-fullness.
  - Retro-orbital pain.
  - Lives in a residential home.
  - Past medical history of rheumatoid arthritis.

Questions ??