

Carotid Endarterectomy - Full Clinical Guideline

Reference no.: CG-SURVAS/2023/001

1. Introduction

This guideline is for the post-operative care of carotid endarterectomy (CEA) patients. Evidence suggests that close monitoring and prompt management of these patients improves outcome by reducing neurological and potential airway complications.

2. Aim and Purpose

- to highlight common or serious post-operative complications of CEA and their management including:
 - blood pressure disturbance
 - arrhythmias
 - bleeding
- to provide guidance on commonly prescribed medications following CEA. These guidelines apply to patients from recovery, during their stay in the critical care areas and extend through to the vascular wards. It is important to remember that severe hypertension or cerebral hyperperfusion syndrome can present several days after CEA; re-escalation of care may be appropriate if this occurs.

3. Definitions, Keywords

Carotid endarterectomy; post-operative complications; hypertension

4. Guidelines

I. Blood Pressure Management

Blood pressure should be monitored invasively with in-situ arterial line in critical care areas.

a) Hypotension:

Hypotension is potentially more hazardous than hypertension.

Ensure adequate fluid loading.

Ensure heart rate > 60 beats per minute.

If mean arterial blood pressure (MAP) remains < 70mmHg call senior anaesthetic registrar who should consider instituting the following:

1st Line: Dobutamine infusion between 0 – 10 mcg/kg/min via peripheral cannula.

The patient may require transfer to the Step Down (SDU) or High Dependency Unit (HDU).

b) Hypertension:

In recovery area - see **plan 1**

On SDU/HDU/ward with *no* neurological deficit - see **plan 2**

On SDU/HDU/ward *with* neurological deficit or headache or seizures - see **plan 3**

Plan 1 – Theatre recovery area: systolic BP >180mmHg**General Points**

- Is the patient in urinary retention or in pain?
- Has the patient received their normal anti-hypertensive medication today?

First line**LABETALOL**

- (HR must be >60bpm. Stop further boluses if HR falls below 60bpm)
- 100mg labetalol in 20ml of 0.9% saline (*ie* 5mg per ml)
- Give 10mg (2ml) boluses slowly every 2 mins up to 100mg (*ie* 20ml 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 labetalol infusion at 50-100mg per hour, titrating dose to BP

Patient remains in recovery/SDU/HDU while labetalol infusion is running. Following cessation of the infusion, the patient should remain in recovery/SDU/HDU for 2 further hours to monitor for rebound hypertension.

Second Line**HYDRALAZINE**

- 10mg hydralazine in 10ml of 0.9% saline (*ie* 1mg per ml)
- Give 2mg (2ml) boluses slowly every 5 mins up to 10mg (*ie* 10ml 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 recovery/SDU/HDU while hydralazine therapy is underway. Following cessation of hydralazine therapy, the patient should remain in recovery/SDU/HDU for 2 further hours to monitor for rebound hypertension.

Third line**GTN**

- 50mg GTN in 50ml 0.9% saline (*ie* 1mg per ml)
- Start infusion at 2ml/hr (2mg/hr), increasing rate to 10ml/hr (10mg/hr), titrated to BP

Patient remains in recovery/SDU/HDU while GTN infusion is underway. Following cessation of GTN infusion, the patient should remain in recovery/SDU/HDU for 2 further hours to monitor for rebound hypertension.

Plan 2 - Patient is back on the ward: systolic BP>170mmHg, but NO headache/neurology

- There are three scenarios:
 - a) Patient is normally on antihypertensive therapy
 - b) Patient is not normally on antihypertensive therapy
 - c) Patient cannot swallow tablets

(2a) 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 = β -Blocker, C = Calcium Channel Blocker, D = Diuretic)

- If patient is on A, add in C (amlodipine 10mg)
- 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 (bendroflumethiazide 2.5mg)
- If patient is on A+D, add in C (amlodipine 10mg)
- If patient is on A+C+D, add in B (bisoprolol 5mg)

Stroke team can be contacted for advice via the stroke specialist nurse (07917650772), who can contact stroke SPR, stroke consultant

(2b) Patient is NOT normally on antihypertensive therapy***First line***

Amlodipine (10mg), 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

Ramipril 5mg, repeated at 3hrs if necessary

Third line

Bisoprolol 5mg unless contra-indicated or HR <60bpm

Stroke team can be contacted for advice via the stroke specialist nurse (07917650772), who can contact stroke SPR, stroke consultant

(2c) Patient cannot swallow tablets

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

Plan 3 – Patient is back on the ward: systolic BP>160mmHg & headache/seizure or neurological deficit

- Treatment should start **IMMEDIATELY** on the ward using non-invasive monitoring
- Anti-hypertensive protocol is the same as used in recovery area (see below)
- On call surgical SpR must be informed
 - a) Contact on call consultant vascular surgeon to inform them of increase in BP associated with seizure/headache or onset of neurological deficit. **Brain CT is likely to be indicated**
 - b) Contact on call ITU SpR to arrange urgent transfer to SDU/HDU/ITU for invasive arterial BP monitoring
 - c) Administer 8mg dexamethasone intravenously

First line

LABETALOL

- (HR must be >60bpm. Stop further boluses if HR falls below 60bpm)
- 100mg labetalol in 20ml of 0.9% saline (*ie* 5mg per ml)
- Give 10mg (2ml) boluses slowly every 2 mins up to 100mg (*ie* 20ml 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 labetalol infusion at 50-100mg per hour, titrating dose to BP

Second Line

HYDRALAZINE

- 10mg hydralazine in 10ml of 0.9% saline (*ie* 1mg per ml)
- Give 2mg (2ml) boluses slowly every 5 mins up to 10mg (*ie* 10ml 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 50ml 0.9% saline (*ie* 1mg per ml)
- Start infusion at 2ml/hr (2mg/hr), increasing rate to 10ml/hr (10mg/hr), titrated to BP

Following transfer, patient remains in SDU/HDU/ITU while anti-hypertensive treatment is ongoing and should remain for a minimum of 6 further post-treatment hours to closely monitor for rebound hypertension.

Stroke team can be contacted for advice via the stroke specialist nurse (07917650772), who can contact stroke SPR, stroke consultant

II. Arrhythmias

All patients should have ECG monitoring during their critical care stay. During the first 12 hours post-operatively patients can occasionally become bradycardic; providing the MAP stays > 70mmHg this may not require treatment. If there are any concerns, consider administration of atropine or glycopyrrolate as required.

III. Bleeding

Bleeding from the carotid artery after endarterectomy is a potentially life-threatening complication. Bleeding occurs into a closed space, which can result in airway obstruction. Therefore, close monitoring is essential. Early signs are difficulty swallowing, inability to cough and mild neck swelling. Late signs are stridor and desaturation, especially as most patients will be on supplemental oxygen therapy. Be aware that surgical drains may become blocked and are not a reliable sign of active bleeding. An expanding neck haematoma is a clinical emergency and both surgical and anaesthetic senior help should be called immediately.

IV. Medications

Patients should receive their usual cardiac medications in the peri-operative period. Patients would usually receive a dose of Teicoplanin 400mg IV in theatre and a further 2 post-operative doses of 400mg 12-hourly unless no patch is used, in which case a single intra-operative dose will suffice. Consult with the surgical notes for specific post-operative instructions on anticoagulation and antibiotics.

In the event of confusion and/or neurological deficits in the post-operative period, the surgeon should be contacted as early as possible. These patients may require further investigation or treatment.

5. References (including any links to NICE Guidance etc.)

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