

# Local versus general anaesthesia for carotid endarterectomy

## Abstract

Carotid endarterectomy (CEA) is the most frequently performed noncardiac vascular procedure. CEA reduces the rate of stroke in people with symptomatic stenosis however, benefit requires a low operative risk, which may depend on the type of anesthetic used.

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**Abbreviations:** CEA, carotid endarterectomy; GA, general anaesthesia; LA, local anaesthesia; TCD, transcranial doppler ultrasonography; NIRS, near-infrared spectroscopy EEG, electroencephalography; BIS, bispectral index

## Introduction

Carotid endarterectomy (CEA) is the most frequently performed noncardiac vascular procedure. CEA is preventative surgery aimed at reducing the rate of stroke in patients at high risk of such an event. Performing a CEA itself has considerable risk. The inherent risk of carotid surgery is perioperative stroke occurring at rates from 5 % to 7.5 %.<sup>1</sup> The causes of perioperative stroke are hypoperfusion, hyperperfusion or embolization during cross-clamping of the internal carotid artery. The co-morbidity associated with carotid disease is considerable. Many of these patients have existed ischaemic heart disease, chronic obstructive pulmonary disease or diabetes. In addition, they may be smokers and elderly. A significant number of patients undergoing coronary artery surgery have severe carotid artery disease. It is also true that up to half of the patients undergoing CEA have severe treatable coronary lesions. Stroke is the most serious postoperative risk. Other major complications that can occur are myocardial infarction, nerve injury which can cause problems with vocal cords, bleeding, restenosis. CEA may be performed under either general anaesthesia (GA) or local anaesthesia (LA). However, there are significant perioperative risks which may be lessened by performing the operation under LA rather than GA.<sup>2,3</sup> LA for CEA is very safe and allows continuous clinical assessment of cerebral function intraoperatively. The neurological evaluation is instant when the patient is awake, conversing, and following commands. The patient's toleration for cross-clamping provides information for the need for shunts.<sup>4</sup> The cross-clamp test with LA is a rather safe, efficient method with no costs at all. Benefits of avoidance from general anaesthesia and intubation seems to be additional gains especially in patients with comorbidities.<sup>3,4</sup> Although shunting prevents cerebral hypoperfusion, the routine use of an intraluminal shunt in all patients increases the rate of perioperative stroke resulting from embolic events. Thus, many authors advocate selective shunting guided by signs and measurements of cerebral hypoperfusion during cross-clamping. LA for CEA procedure is not preference in patients with severe cardiac and respiratory problems, or severe bilateral carotid stenosis.<sup>2</sup>

Sedation is commonly given to supplement the LA for CEA procedure, as inadequate analgesia or anxiety may increase the stress

response and could precipitate adverse cardiovascular effects. But sedation must be minimal during cross-clamping to allow frequent neurological assessment.<sup>5</sup> The value of CEA depends on the safety of the operation. Monitoring signs of neurologic complications in the awake patient during cross-clamping provides a maximum of specificity but the best cerebral monitoring to detect critical limits of cerebral perfusion during GA is an issue of controversy. Multiple methods including transcranial doppler ultrasonography (TCD), near-infrared spectroscopy (NIRS), electroencephalography (EEG) and somatosensory evoked potentials, bispectral index (BIS) have been recommended.<sup>6,7</sup>

## Local anaesthetic technique for carotid surgery

Regional block for CEA requires blockade of the cervical nerves C2–4 and may be performed by using a superficial cervical plexus block or a combination of superficial and deep cervical plexus blocks. The superficial cervical plexus block; the patient lies supine, with the head turned to the opposite side. Briefly, a 20-gauge needle is introduced into the skin (after raising a small bleb of 1% lidocaine) at the midpoint of the posterior border of the sternocleidomastoid muscle, and approximately 30mL 0.375 % bupivacaine is injected along the posterior border in both cranial and caudal directions subcutaneously and superficial and deep to the fascia of the muscle. The deep cervical plexus blocks are performed by using a single-injection at the C4 level<sup>8</sup> or three sites of injection (C2, C3, and C4 levels) technique<sup>9</sup> It is used much larger volumes of solution (up to 21 mL) for three sites of injection. The cervical transverse processes are palpated manually, approximately 1cm posterior to the posterior border of the sternocleidomastoid. The C3 transverse process may be located by counting up from the C6 transverse process (Chassaignac's tubercle) which is at the level of the cricoid cartilage. The total dose of 0.375 % bupivacaine is used to be 1.4mg/kg. However, deep cervical plexus block is associated with potentially serious complications, such as diaphragmatic dysfunction (in 61% of patients), which can lead to respiratory distress, and there is a risk of epidural, subarachnoid, or vertebral artery injection of local anesthetic.<sup>2,10</sup>

There is still need more evidence to determine the best type of anaesthesia for CEA. Cochrane Database as meta-analysis of the non-randomised studies showed that the use of LA was associated with significant reductions in the odds of death (35 studies), stroke (31 studies), stroke or death (26 studies), myocardial infarction (22 studies), and pulmonary complications (7 studies), within 30 days of

the operation. Meta-analysis of the randomised studies showed that the use of LA was associated with a significant reduction in local haemorrhage (OR = 0.31, 95% CI = 0.12 to 0.79) within 30 days of the operation, but there was no evidence of a reduction in the odds of operative stroke. Non-randomised studies suggest potential benefits with the use of LA but more randomised studies are needed.<sup>1</sup> The GALA Trial (general anaesthetic versus local anaesthetic for carotid surgery) which is randomised study have not shown a definite difference in perioperative stroke, myocardial infarction, or death between general and local anaesthesia for carotid surgery.<sup>3</sup>

## Conclusion

When it was compared surgery under general anaesthesia with that under local anaesthesia because prediction and avoidance of perioperative strokes might be easier under local anaesthesia than under general anaesthesia. The anaesthetist and surgeon, in consultation with the patient, should decide which anaesthetic technique to use on an individual basis and also, LA technique requires expertise and strong cooperation between the anaesthesiologist and surgical teams.<sup>3,7,11,12</sup>

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## Conflicts of interest

Authors declare that there is no conflict of interest.

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