Carotid endarterectomy with local anesthesia and laryngeal mask airway/general anesthesia

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ABSTRACT

There is no clear consensus as to the appropriate anesthetic technique for patients undergoing a carotid endarterectomy. Such patients may have comorbid conditions, such as coronary artery disease, hyperlipidemia, and others. The two main anesthetic approaches are general anesthesia, including an endotracheal tube, with neurological monitoring, and regional anesthesia that allows for an awake patient to be assessed neurologically. The objective of our report was to evaluate a novel anesthetic technique that combined general anesthesia with a laryngeal mask airway (LMA) plus regional anesthesia in the form of bupivacaine injected into the surgical site. Anesthesia was maintained with desflurane 4%, so the patient emerged rapidly for neurological assessment at the conclusion of surgery. We report on a case of a 55-year-old patient who underwent a successful carotid endarterectomy using this hybrid technique of general anesthesia with LMA plus regional anesthesia. This technique was safe and effective, and the patient experienced no complications other than a hematoma on the left neck that was likely the result of long-term use of aspirin and Plavix. While further study is warranted, this hybrid technique of general anesthesia with LMA plus regional anesthesia holds promise for carotid endarterectomy patients.

INTRODUCTION

Atherosclerotic buildup in the carotid arteries can be asymptomatic but places patients at elevated risk for cerebral infarction. Occlusions typically occur at the carotid bifurcation and may involve the proximal internal carotid vessel as well.

Carotid stenosis typically occurs as part of generalized vascular disease in patients with coronary artery disease (CAD) and other comorbid conditions.

Surgical treatment of carotid endarterectomy for carotid stenosis >70% appears to offer advantages over medical therapy [1]. Carotid endarterectomy is associated with a 30-day perioperative risk of stroke or death of 3.3% (95% confidence interval: 1.8–5.9%) for asymptomatic and 6.3% (95% confidence interval: 3.5–11.1%) for symptomatic stenosis [2]. The mean mortality rates have been reported to be about 1% for elective and 3% for emergency carotid endarterectomy [3]. Early stroke may occur in 0.9–7% of carotid endarterectomy patients attributed to embolization [4].

There is no clear consensus on the most appropriate anesthetic technique for carotid endarterectomy. In a British survey, the majority of surgeons (69%) used general anesthesia, but regional anesthesia, often combining deep and superficial cervical plexus blocks, is increasingly used [5]. The goals of anesthesia for carotid endarterectomy are primarily to prevent the brain and heart from ischemic injury, maintain good hemodynamic stability, and allow for neurological assessment of the patient.

If general anesthesia is used, care must be taken to maintain adequate cerebral perfusion, and the patient must emerge rapidly and clearly enough to allow for an immediate post-operative neurological evaluation [6]. General anesthesia offers some advantages: the patient can be immobilized, ventilatory control is relatively easy to maintain, and the brain can be protected in the case of ischemic assault. Maintenance anesthesia may use a volatile agent, such as sevoflurane,

desflurane, or isoflurane. Ventilation may involve an endotracheal tube (ETT) or a laryngeal mask airway (LMA). Awake neurological evaluation is considered the gold standard, necessitating a smooth, immediate emergence. Monitoring the patient during anesthesia may rely on an electroencephalogram, the somatosensory-evoked potentials, a transcranial Doppler imaging, and an internal carotid artery stump pressure monitor.

On the other hand, regional anesthesia with deep and superficial cervical plexus blocks and local infiltration of an anesthetic may offer other advantages, including the ability to assess the awake patient perioperatively and equivalent or even superior hemodynamic stability [6]. It has been argued that regional anesthesia holds the potential to shorten hospital stays and may reduce morbidity. However, regional anesthesia limits the use of pharmacological cerebroprotective agents and requires a cooperative patient. Should a transition to general anesthesia from regional anesthesia be required, there is suboptimal access to the patient's airway. Hybrid techniques may combine general anesthesia with regional anesthesia to truncate operating times [7]. We report a case of a unique surgical anesthesia technique used to treat a patient with carotid stenosis.

CASE REPORT

The patient was a 55-year-old Caucasian male with a history of significant CAD, dyspnea, hyperlipidemia, and carotid stenosis. The patient also had a history of coronary artery bypass graft procedure involving five vessels and about eight months earlier had undergone re-stenting of one vessel using five drug-eluting stents. The patient was taking low-dose aspirin 81 mg, Livalo 2 mg, Nitrostat sublingual 0.4 mg as needed, Plavix 75 mg, Toprol extended release 25 mg, and Tylenol extra strength 500 mg as needed. The patient was allergic to Crestor and has a family history of CAD and type II diabetes. A carotid Doppler examination prior to surgery revealed no stenosis on the right carotid artery and 80–99% stenosis on the left. A computer-tomography angiogram showed about 80% stenosis at the origin of the internal carotid artery. The distal vessel diameter was 1 mm vs. 4.5 mm.

The patient was induced using intravenous (IV) midazolam 2 mg, fentanyl 100 mcg, and propofol 140 mg. Maintenance anesthesia was administered through an LMA with desflurane 4% and fentanyl 150 mcg. Other medications used during the surgery included NTG paste 1" on chest, IV heparin 5000 units through IV, and IV protamine 50 mg.

The initial surgical incision was made and 0.25% bupivacaine (total 20 mL) was injected into the surgical site. A cross-clamp was used to place and shortly thereafter to remove a shunt to redirect blood flow during the removal of the atherosclerotic plaque. A drain removed excess fluid. The surgery concluded, the incision sutured closed, and the patient emerged quickly. A neurological assessment with the awake patient could find no neurological deficits.

The patient recovered quickly and was discharged but returned the second day after surgery when a hematoma on the left side of the neck was observed. The patient remained in the hospital for 24-hour observation, and it was determined that the hematoma was likely the result of long-term use of aspirin and Plavix. No other complications or postsurgical issues were reported.

DISCUSSION

General anesthesia requires an ETT with an arterial line and often necessitates neurological monitoring. Local anesthesia allows for neurological assessment of an awake patient, which may or may not require an arterial line, but generally requires a compliant, cooperative patient. Our surgical team developed a unique hybrid procedure that allows for general anesthesia with an LMA (dispensing with the ETT) and desflurane for smooth, rapid emergence supplemented by a local anesthetic at the surgical site. What we have found is that often no or minimal hemodynamic changes occur with LMA due to the light plane of anesthesia required to tolerate it, thus not requiring use of an arterial line. In addition, there is little or no bucking during emergence with LMA anesthesia which, along with rapid emergence, makes this hybrid technique valuable. Overall, this hybrid technique provides the patient minimal anesthesia, does not require an arterial line or a Foley catheter, and promotes hemodynamic stability as well as rapid emergence.

Our general technique is to use a number 3 or 4 LMA for women and men, respectively, and to allow the patient's spontaneous respiration to continue with assistance from pressure-supported ventilation and 3–4% desflurane. All patients are shunted and patched, and a cross-clamp is applied when the shunt is placed or removed. About 1" of NTG paste is placed at the onset of the procedure along with 5000 units of IV heparin, which is reversed at the conclusion of the procedure with 50 mg of protamine.

While this novel technique offers advantages even in a patient with comorbidities and a history of coronary bypass as described in this case, the success of the procedure depends in great measure on the speed at which the surgical team can work and the requisite skill of the surgeon.

CONCLUSION

Carotid endarterectomy using general anesthesia with an LMA plus regional anesthesia is feasible in a patient with high-grade carotid occlusion and significant comorbid conditions. This approach avoids deep general anesthesia, eliminates the need for an ETT and arterial line, dispenses with a Foley catheter, promotes good hemodynamic stability, and allows for rapid emergence. Further study of this technique may find that it saves clinical time as well. The main drawback to the procedure is that it requires specific surgical skills and the ability of a surgical team to perform the surgery very quickly. These barriers may be overcome with training.

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COMPETING INTERESTS

The authors declare no competing interests.

PUBLISHING NOTES

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