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 postoperative 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 endotra-
cheal 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 electroencephalo-
gram, the somatosensory-evoked potentials, a transcranial
Doppler imaging, and an internal carotid artery stump pres-
sure monitor.

On the other hand, regional anesthesia with deep and superfi-
cial cervical plexus blocks and local infiltration of an anes-
thetic 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 hos-
pital stays and may reduce morbidity. However, regional
anesthesia limits the use of pharmacological cerebroprotect-
tive agents and requires a cooperative patient. Should a trans-
ition 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 sten-
osis. 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 athero-
sclerotic 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 deter-
mined that the hematoma was likely the result of long-term
use of aspirin and Plavix. No other complications or postsur-
gical 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 des-
flurane 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 tech-
nique 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 condi-
tions. This approach avoids deep general anesthesia, elimi-
nates 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 draw-
back 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.
REFERENCES


COMPETING INTERESTS

The authors declare no competing interests.

PUBLISHING NOTES

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