Use of Near Infrared Spectroscopy Cerebral Oximetry Monitoring for Patient with Congenital Absence of Internal Carotid Artery During Ipsilateral Trapezius Muscle Tumor Excision in the Lateral Position

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INTRODUCTION

Operative procedures which may disrupt blood flow to the vital organs pose unique intraoperative challenges to anesthesiologists. The issue of how to monitor whether the end organ is being perfused is one that has vexed the specialty of anesthesiology for as long as the field has existed. The brain is arguably the most sensitive organ to the effects of compromised perfusion, and, in turn, low perfusion states often lead to the most catastrophic sequelae. A noninvasive modality for ascertaining the perfusion of the brain has eluded practitioners of anesthesiology until recently.

Cerebral oximetry monitoring is a technology that allows for the direct, noninvasive measurement of cerebral oxygen saturation. At present, it is primarily employed for cardiac surgery; however, data from cerebral oximeters in other arenas has been helpful for mortality prediction and in heart failure patients,. It has even been shown to be more sensitive and specific than pulmonary artery catheterization in determining left ventricular function. Interestingly, maintenance of cerebral oximetry values at greater than 75% of baseline, in non-vascular abdominal surgery, where the duration of general anesthesia was greater than 2 hours, showed a shorter PACU discharge time as well as shorter hospital length of stay. Cerebral oximetry is also well-suited to gauge depth of anesthesia and hypotension, with directed interventions improving morbidity and mortality. Needless to say, this technology is underutilized, as it is currently primarily confined to cardiac surgical cases.

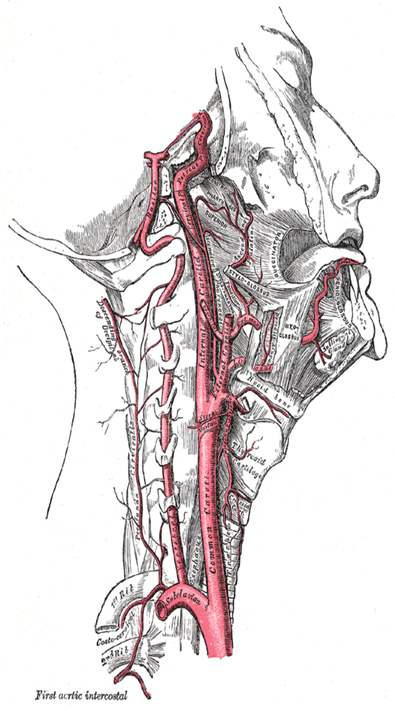
This is the case of a 76 year old male with a congenitally absent right internal carotid artery, which, according to the patient was diagnosed incidentally decades prior on a routine medical visit and worked up at that time. This is a condition with catastrophic potential during compromising surgery. The patient was scheduled for lipoma removal from the right trapezius muscle and a preoperative carotid doppler confirmed no flow in the right internal carotid artery. The patient's past medical history was significant for hypertension, hyperlipidemia, and NIDDM. Given the anatomic proximity of the mass to the patient's only functioning right carotid artery, a unique monitoring challenge had presented itself to the anesthesia team.

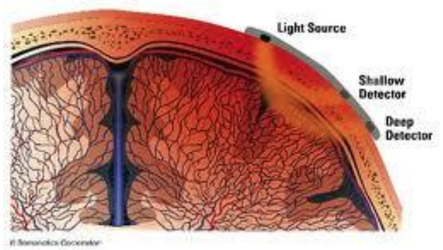
Impression: The **left** common, internal and external carotids are patent with good ICA flow. The internaland the external carotid arteries have mild stenosis with mild bifurcation plaque

The **right** ***ICA has an occlusion (old).*** The CCA and ECA are patent with good flow.

CASE

The patient was brought to the operating room, peripheral intravenous access was secured, standard ASA monitors were placed and right external carotid artery flow was confirmed with Doppler. The cerebral perfusion monitor was placed, showing initial saturations of left 74% and right 70%, which were considered to be baseline. His intial blood pressure in the OR was 171/81 and peripheral oxygen sturation of 99%. After adequate pre-oxygenation, the patient was induced with midazolam, propofol and fentanyl, paralyzed with succinylcholine and an easy endotracheal intubation was accomplished after grade II view with a Mac 2 laryngoscope. He was maintained with sevoflurane and nitrous oxide for the duration of the case. Peripheral oxygen saturation was maintained at 100% throughout the case. Blood pressure reached a trough of 90/39 intraoperatively, where he was supported with phenylephrine and ephedrine with adequate response. Concurrently, the cerebral oximeter showed a bilateral saturation of 63%, which also responded to vasopressor support. After closure of the surgical site and adequate bandaging, all anesthetic agents were discontinued, full train-of-four sequences were accomplished, the patient was noticed to be breathing spontaneously and following commands and was extubated. He was transferred to the PACU in stable condition and had no sequelae of inadequate cerebral





Two depths of light penetration are used to subtract out surface data, resulting in a regional oxygenation value for deeper tissues.

DISCUSSION

As anesthesiologists, our goal is to protect the patient from undue harm during the course of an operation. The pharmacologic methods we use to induce unconsciousness and render the patient insensate universally depress cardiac and respiratory function. Traditionally, the utilization of blood pressure monitoring and pulse oximetry are considered adequate measures of tissue perfusion and extrapolations must be made that adequate peripheral saturation denotes adequate cerebral circulation. This technology removes extrapolation from peripheral perfusion to cerebral perfusion, allowing the direct and non-invasive measurement of the most exquisite goal of tissue perfusion.

CONCLUSION

Near-infrared spectroscopy allows for an external monitoring of cerebral blood flow. Although primarily utilized for carotid endartectomy and cardiac surgery, employing the Somanetics INVOS cerebral perfusion monitoring system enabled us to noninvasively monitor our patient's already-compromised cerebral perfusion. This ability to keep abreast of the cerebral perfusion state has been demonstrated previously and gave us the ability to intervene when appropriate to increase cerebral perfusion. This gave us a decisive advantage in that we were able to assess, in real-time, the pulsatile arterial and venous mixed capillary perfusion status numerically and graphically. Needless to say, the case proceeded uneventfully and our patient was able to go home the same day complication-free. As this case has clearly demonstrated to us, emerging non-invasive monitoring technologies may be utilized when situations present the anesthesia team with unique challenges..

The Diasonics Duplex Scanner was used to evaluate the common,internal and external carotid arteries, bilaterally. The vessels were evaluated by direct B-mode imaging, Spectrum analysis and Colorflow doppler.

The degree of existing stenosis was calculated on the basis of visual plaque evaluation as well as flow velocity changes.

	Right systolic	Right diastolic	Left systolic	Left diastolic
Common Carotid	64 cm/sec	0 cm/sec	72 cm/sec	12 cm/sec
Internal Carotid	0 cm/sec	0 cm/sec	108 cm/sec	22 cm/sec
External Carotid	133 cm/sec	0 cm/sec	112 cm/sec	0 cm/sec
Ica/Cca velocity Ratio	0.00		1.50	1.83

REFERENCES