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USE OF THE LARYNGEAL MASK AIRWAY IN A PATIENT UNDERGOING CAROTID ENDARTECTOMY

The following case report describes the management of a carotid endarterectomy, under general anesthesia, using a Laryngeal Mask Airway (LMA). The advantage of the LMA in these patients is then discussed.

INTRODUCTION

A 71-year-old female presented for elective left carotid endarterectomy. Two months prior the patient suffered a right-sided cerebrovascular accident with resultant left upper extremity hemiparesis. Digital subtraction angiography revealed a 30% stenosis of her right internal carotid, and a 95% stenosis of the asymptomatic left internal carotid. Past medical history revealed long-standing hypertension and type II diabetes mellitus. Past surgeries were unremarkable. There were no allergies and medications included losartan, diltiazem, clonidine, hydrochlorothiazide, glipizide, and aspirin. She denied symptoms of gastroesophageal reflux, as well as any history of myocardial infarction or angina, and had never smoked. Physical exam revealed an alert elderly female in no acute distress, with obvious weakness of her left arm. Height 5 feet, 2 inches, weight 130 pounds. Blood pressure 162/84.

SURGICAL PROCEDURE

After application of EEG electrodes, radial artery catheterization, and establishment of standard intraoperative cardiovascular monitoring, the patient was induced with 2 µg/kg of fentanyl, and 0.3 mg/kg of etomidate. Succinylcholine, 0.5 mg/kg, was administered to facilitate insertion of a size 4 LMA-Flexible™ using the method described by Brain¹. Anesthesia was maintained with intravenous fentanyl and isoflurane/oxygen. Ventilation was controlled or assisted to an ETCO₂ of 34-40 mmHg. Surgery and anesthesia were uneventful, with mean arterial blood pressures and heart rate maintained to within 10% of baseline, and no need of interventional drug therapy. EEG was stable throughout the sixty-five minute procedure and a bypass shunt was not used. Upon completion, the patient awoke comfortably with the LMA in place, responding to verbal commands and moving her extremities appropriately.

DISCUSSION

Carotid endarterectomy is a commonly performed, highly beneficial surgical procedure. However, it presents significant

challenges to the anesthetist. Chronic hypertension is present in 60-80% of patients undergoing the operation². Frequently, unstable intraoperative hemodynamics and exaggerated fluctuations in arterial blood pressure accompany the procedure^{2,3}. Because of the prevalence of coronary artery disease in these patients, episodes of intraoperative hypertension or hypotension and tachycardia may predispose to adverse postoperative cardiac outcomes, including an increased incidence of myocardial infarction³. Sustained blood pressure elevations above baseline levels are undesirable in patients undergoing carotid endarterectomy since cerebral edema can result from such hypertension, particularly in areas of diseased brain which have limited ability to autoregulate cerebral blood flow⁴. For these reasons, one of the principal goals of anesthetic management in the carotid endarterectomy patient is to maintain maximum hemodynamic stability. Achieving such a steady state during and after direct laryngoscopy and tracheal intubation is difficult. Tracheal intubation is associated with a 25-50% increase in pulse rate and blood pressure⁵. Increases in systemic blood pressure with direct laryngoscopy and intubation are more extreme in those patients with chronic hypertension⁶. Furthermore, coughing during emergence is common, precipitating acute changes in arterial and venous blood pressures and threatening the surgical site².

The Laryngeal Mask Airway (LMA) was initially introduced in the United States as a substitute for the face mask. Correspondingly, the types of cases initially deemed appropriate for LMA use were those applicable to face mask anesthesia. This changed as the device's utilitarian value was proven throughout a wide variety of surgical procedures, and the LMA was seen to be capable in situations whereby endotracheal intubation had become the standard mode of ventilatory management⁷. Because hemodynamic stability is a much-desired anesthetic goal in carotid endarterectomies, LMA has particular appeal. Use of the LMA results in an attenuated cardiovascular response compared with that found with direct laryngoscopy and endotracheal intubation³. Costa e Silva and Brimacombe⁸ initially reported use of the LMA on four patients undergoing carotid endarterectomy. No patient coughed or gagged during emergence, blood pressure/pulse remained within 15% of baseline values during placement and emergence, and antihypertensives were unnecessary. Marietta and Lunn³ examined cardiovascular stability during carotid endarterectomy in a blinded study of 61 patients comparing endotracheal intubation and the LMA. Their data revealed

that the LMA managed patients had fewer episodes of intraoperative hypertension and tachycardia requiring therapeutic intervention than a comparable group managed with endotracheal intubation.

In our patient, we elected to use a LMA-Flexible because its wire-reinforced flexible tubing aids in head positioning and in staying unobtrusive to the surgical field. The LMA-Classic™ has been successfully employed in other reports^{3,8}. In our experience, etomidate, because of its cardiovascular stability, is the preferred induction agent for the carotid patient. However, because of its inability to provide acceptable conditions for LMA insertion, muscle relaxation is necessary, and in this case a small amount of succinylcholine was employed. While we were able to maintain desired ETCO₂ levels using assisted ventilation, positive pressure ventilation via the LMA is an established technique⁹, and has been successfully employed in the carotid patient, along with muscle relaxation and non-depolarizing relaxants³.

Our surgeons found the operating field to be undisturbed by the LMA, and this has been the experience with other reports^{3,8}.

Caution must be employed with regard to the standard LMA contraindications: morbid obesity, history of hiatal hernia or esophageal reflux, as well as patients with reduced pulmonary compliance. Finally, use of LMA in carotid endarterectomies should only be recommended to the clinician who has become experienced with basic LMA techniques, and is familiar with the advantages and limitations of the device.

SUMMARY

Our case demonstrates the advantages of using the LMA in carotid endarterectomy—its ability to maintain an increased margin of cardiovascular stability. In appropriately selected patients, LMA airway management may have advantages over endotracheal intubation, and can be a valuable resource in the management of these often-difficult patients. It is an option that should be considered by those anesthetists who are experienced with the LMA and have mastered the basic techniques.

REFERENCES

- 1) Brain A.I.J., Denman W.T., Goudsouzian N.G. *LMA-Classic and LMA-Flexible Instruction manual*. 1999 February
- 2) Brimacombe J.R., Brain A.I.J., Berry A.M. *The Laryngeal Mask Airway - A Review and Practical Guide (Chapter 13-Advanced Uses: Surgery)*. 1997; 160
- 3) Marietta D.R., Lunn J.K., Ruby E.I., Hill G.E. Cardiovascular stability during carotid endarterectomy:

endotracheal intubation versus laryngeal mask airway. *J Clin Anesth* 1998;10: 54-57

- 4) Stoelting R.K., Miller R.D. Central nervous system disease. In: *Basics of anesthesia*. New York: Churchill Livingstone, 1994; 331-341
- 5) Ng W.S. Pathophysiological effects of tracheal intubation. In: Latta I.P., Rosen M., eds. *Difficulties in tracheal intubation*. London: Bailliere Tindall, 1984; 12-35.
- 6) Prys-Roberts C., Meloche R., Foex P.: Studies of anaesthesia in relation to hypertension I. Cardiovascular responses of treated and untreated patients. *Br J Anaesth* 1971; 43: 122-37.
- 7) Rosenblatt W.H., Ovassapian A., Eige S. Use of the laryngeal mask airway in the United States: A Randomized Survey of ASA Members. *Anesthesiology* 1998;89 (Supplement 3A); A575.
- 8) Costa e Silva L., Brimacombe J. The laryngeal mask for carotid endarterectomy. *J Cardiothoracic and Vascular Anesth* 1996; 10: 972-973.
- 9) Brimacombe J., Berry A., IPPV and the laryngeal mask airway - what are the risks? *Today's Anaesthetist* 1995 10:5.