The Effects of Laryngeal Mask Insertion on Intracranial Pressure in a Patient with Posterior Fossa Tumor: A Case Report

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Citation

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Abstract

INTRODUCTION

An increase in intracranial pressure (ICP) during induction of general anesthesia is potentially hazardous in patients with cerebral pathology. When the intracranial compliance curve is at the inflection point, a small increase in intracranial volume will cause a disproportionate rise in ICP, thus reducing cerebral perfusion [1]. Elevation of systemic blood pressure and subsequent increase in ICP during rigid laryngoscopy for tracheal intubation may occur in patients with intracranial pathology [2]. We describe a patient undergoing craniotomy for resection of a posterior fossa tumor, in whom the laryngeal mask airway (LMA) was used. The ICP changes were monitored continuously during LMA insertion and tracheal intubation.

CASE REPORT

A 19 year old, previously healthy, woman was admitted to the hospital with complaints of increasing headache, double vision, and nausea of two weeks duration. On admission, vital signs were: blood pressure (BP) 140/100 mmHg, mean arterial pressure (MAP) 80 mmHg, heart rate (HR) 52 beats/min, respiratory rate (RR) 14 breaths/min, and temperature 36.3 degrees Celsius. Patient’s weight and height were 68 kg and 172 cm, respectively. Physical examination revealed nuchal rigidity and bilateral papilledema. Following admission, a contrast enhanced CT scan of the head showed a partially cystic left cerebellar tumor. Midline shift and severe hydrocephalus were noted secondary to compression of the fourth ventricle by the mass. Ventriculostomy, performed emergently at the bedside, produced clear cerebrospinal fluid (CSF) under high pressure. CSF drainage temporarily improved the symptoms. The following day, at surgery, before induction of anesthesia, ICP was measured at 33 mm Hg. Vital signs in the OR were: BP 112/76 mmHg, MAP 88 mmHg, HR 84 beats/min, RR 13 breaths/min. With continuous ICP monitoring, general anesthesia was induced with intravenous midazolam (1 mg), fentanyl (1.5 mcg/kg), and propofol (2.3 mg/kg). Subsequently, the ICP decreased from 33 to 26 mmHg. Blood pressure and mean arterial pressure decreased from 112/76 to 98/71 mmHg, and from 88 to 80 mmHg, respectively. The heart rate decreased from 84 to 76 beats/min. After adequate face mask ventilation was established, vecuronium (0.1 mg/kg) was administered. At this point, a size 3 LMA was inserted. Continuous ICP monitoring showed no change. The blood pressure after LMA insertion was 102/70 mmHg, MAP 80 mmHg, and HR 79 beats/min. The patient was hyperventilated with 100% oxygen via the LMA until the end-tidal CO2 tension was 26 mmHg. In response, there was a further decrease in ICP from 26 to 16 mmHg. A size 6.0 mm endotracheal tube was then inserted coaxially through the LMA and guided into the trachea with the aid of a flexible fiberoptic scope. Transient upsurge of ICP from 16 to 18 mmHg was noted as the endotracheal tube entered the trachea. This was accompanied by a rise in the BP to 121/82 mmHg, MAP to 95 mmHg, and the HR to 91 beats/min. Additional dose of propofol (1.2 mg/kg) was administered. In response, the BP decreased to 105/77 mmHg, MAP to 86 mmHg, and the HR to 82 beats/min. The ICP did not change. After the airway was secured with the ETT, LMA was deflated, but left in place. Surgery was successful with removal of the tumor in toto. At the end of the procedure, while the patient remained anesthetized, the LMA was re-inflated and the ETT was withdrawn. When the patient regained consciousness, the LMA was removed without coughing or bucking.

DISCUSSION

The LMA was introduced by Dr. Archie Brain as a new concept in airway management in 1983 [3], and has since been used for a variety of procedures under controlled and spontaneous ventilation. The device was best regarded as an alternative to the face mask. Today, almost 10 years since the introduction of LMA as a commercial product, its role as a routine airway device for surgical procedures has expanded to include the management of patients with a difficult airway [4,5]. The major advantages of LMA as compared to the tracheal intubation are: ease of use, patient comfort, avoidance of rigid laryngoscopy and muscle relaxants, attenuated stress response, and minimal interference with respiratory physiology [6]. Intubation with a cuffed tracheal tube is necessary for intracranial surgery, because of the limited access to the airway during the procedure. Fiberoptic studies have shown that LMA's distal aperture normally lies in close proximity to the vocal cords. Cuffed 6.0 mm ETT, as used in our patient, will easily pass through an adult size laryngeal mask (sizes 3 and 4), while size 5 LMA will allow for the insertion of a 6.5 mm ETT [7]. During LMA insertion, in our patient, we observed minimal hemodynamic stimulation, and consequently no change in the ICP. While inserting the ETT coaxially through the LMA into the trachea, there was a small increase in the patient's blood pressure and heart rate, with commensurate increase in the ICP. This was most likely related to airway stimulation by the tracheal tube. These changes were transient and responded well to deepening the anesthesia with intravenous propofol. Removing the ETT at the conclusion of the surgery, and maintaining the airway with the LMA, allowed our patient to emerge from anesthesia without straining and coughing. LMA use in neurosurgical procedures has been reported previously. This is the first case report describing the effects of LMA insertion on the ICP in a patient undergoing craniotomy for a posterior fossa tumor [8]. The insertion of LMA, as documented by continuous ICP monitoring, was not associated with ICP changes. In addition, the hemodynamic response to LMA placement was minimal. The LMA, therefore, is an ideal additional adjunct airway device in a select group of neurosurgical patients.

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