TITLE PAGE

Unilateral hypoglossal nerve palsy after the use of laryngeal mask airway (LMA) Protector

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Running title: Hypoglossal nerve palsy and LMA Protector

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Unilateral hypoglossal nerve palsy after the use of laryngeal mask airway (LMA) Protector

Running title: Hypoglossal nerve palsy and LMA Protector
Abstract

The LMA® Protector™ Airway is the latest innovation of the second generation LMA devices. One distinguishing feature of this device is its integrated, colour-coded cuff pressure indicator (Cuff Pilot™ technology) which enables continuous cuff pressure monitoring and allows adjustments when necessary, thus confers better monitoring in patient safety. We report a case of postoperative unilateral hypoglossal nerve palsy after the uncomplicated use of LMA Protector. This case showed that anesthetists need to routinely measure the cuff pressure and Cuff Pilot™ technology is not a panacea for potential cranial nerve injury after airway manipulation.

Keywords: airway, laryngeal mask, hypoglossal nerve palsy, complication, postoperative
The laryngeal mask airway (LMA) Protector™ (Teleflex Medical Co, Ireland) is the latest innovation of the single use second generation LMA devices. Similar to previous LMA devices, the LMA Protector™ has common features such as a preformed curvature to allow easy insertion [1, 2] with bite block, gastric access and high oropharyngeal leak pressure. The airway and cuff are entirely made of silicone, which makes it more flexible and potentially a less traumatic device. It is the only laryngeal mask which combines a pharyngeal chamber and dual gastric drainage channels, designed specifically to channel gastric content away from the airway [2, 3]. An important distinguishing feature of the LMA Protector™ Airway is its integrated, color-coded (green, yellow, red zones corresponding to increasing intracuff pressures) cuff pressure indicator (Cuff Pilot™ technology) which enables continuous cuff pressure monitoring, and allows adjustments when necessary [2,3], thus confers better monitoring in patient safety [4]. We report a case of postoperative unilateral hypoglossal nerve palsy after the uncomplicated use of LMA Protector™. Written informed consent for the use of images, video and details of the case for publication of this report had been obtained.
Case Report

A 70-year-old, 70kg man with body mass index (BMI) 25.7 kg/m², underlying hypertension and dyslipidemia. He underwent an elective open hernioplasty for right inguinal hernia under ambulatory surgery. He had normal airway features – good mouth opening, Mallampati score 1, thyromental distance >6 cm and normal tongue protrusion. General anesthesia was induced with intravenous propofol 200 mg plus fentanyl 100 µg and a size 4 LMA Protector™ Airway was placed smoothly with single attempt by a senior resident. The cuff was inflated with 25 ml of air and the black line indicator on the cuff pilot valve remained within the green zone throughout the surgery. However, we did not check the intra-cuff pressure with manometry. The oropharyngeal leak pressure was 25 cmH₂O. The sternal notch test and bubble test to confirm the placement of the LMA protector was done after insertion [5]. Anesthesia was maintained with sevoflurane and oxygen/air mixture. Patient’s breathing was supported with pressure support of 8 cmH₂O, which generated a tidal volume of 400-450 ml and the maximum minute ventilation attained was 12 L/min with peak pressures 8-10 cmH₂O. He was positioned supine with standard American Society of Anesthesiologists (ASA) monitoring for the surgery which lasted for 180 minutes. The surgery was uneventful and patient’s vital signs was stable throughout. Postoperatively, the LMA was removed smoothly when he was awake. There were no blood stains and minimal secretions on the device.

At the post anesthesia care unit (PACU), patient complained of difficulty in chewing his food and weird tongue movement. He had no voice changes or altered taste sensation. On examination, the patient’s tongue was deviated to the left side during active protrusion (Fig. 1). The sensation of the tongue was intact. There were no tongue fasciculations or wasting. Neurological examination revealed no lateralizing signs or limb weakness. The gag and cough reflexes as well as other cranial nerves
examination were normal. Patient was referred to the ear, nose and throat (ENT) surgeon on the same
day. Nasoendoscopy examination was unremarkable. The working diagnosis was that of an isolated left
hypoglossal nerve palsy or neuropraxia. He was allowed home on the same day with reassurance, oral
prednisolone for one-week duration and follow up review at the outpatient ENT clinic. No
neuroimaging was required. He achieved complete recovery three months after the injury (Fig. 1,
Supplemental Video 1) and subsequently discharged from the clinic follow-up.
Discussion

Hypoglossal nerve injury is a rare but distressing complication after airway management during general anesthesia [6]. Although there have been case reports of its occurrence after the use of other types of LMA [7-11], our case involves the use of the new LMA® Protector™ Airway. To our knowledge, this could be the second reported case. The first case was reported by Leong et al in the poster presented at the European Anesthesiology Conference 2018 in Copenhagen (poster title: unilateral hypoglossal nerve palsy after the use of a novel supraglottic airway device; 01AP03-8).

The hypoglossal nerve innervates all the extrinsic muscles and intrinsic muscles of the tongue, except for the palatoglossus muscles which is innervated by the vagus nerve. An injury to the hypoglossal nerve causes ipsilateral tongue deviation (pathognomonic), with dysarthria and dysphagia in severe cases. The tongue deviates towards the side that is affected due to the unopposed action of the contralateral genioglossus [12]. We postulate that our patient’s left hypoglossal nerve was compressed by the distended LMA cuff against surrounding structures such as the hyoid bone. The hypoglossal nerve exits the cranium via the hypoglossal canal, and travels alongside the internal and external carotid arteries, before passing just above the hyoid bone to innervate the tongue muscles. The nerve becomes superficial at the level of the angle of mandible, passing just above the greater horn of the hyoid bone to enter the mouth. This is a potential site for compression injury [6,12] and male patients may be more susceptible due to their larger hyoid bone dimensions. Some authors suggest that LMA cuff insufflation may be associated with hypoglossal nerve injury. In those reported cases, the cuff insufflation volumes were in the range between 15 to 40 ml but no mentioning of intraoperative cuff pressure monitoring or titration [7,8,10]. Although the recommended cuff insufflation volume varies according to LMA size and type, excessive pressure in the volume cuff especially during longer cases
and exacerbated by the use of nitrous oxide (N₂O) may produce injurious malposition of the airway devices [7,8,10,11]. Indeed some authors postulate that intermittent routine cuff pressure monitoring could decrease the incidence of hypoglossal nerve palsy [6,13]. Routine position changes after airway securement such as during turning from supine position, surgical preparation and draping can cause cuff malposition and predispose to hypoglossal nerve trauma. Therefore it is recommended that we routinely perform intermittent cuff pressure monitoring especially during longer surgeries and when nitrous oxide (N₂O) is administered. We should also check patient positioning intermittently with special attention to the patient’s head and airway securement [6].

Hypoglossal nerve injury is typically diagnosed in a delayed fashion postoperatively after a thorough workup to exclude a stroke, endotracheal trauma, airway hematoma or impending airway obstruction [6]. The symptoms and signs of hypoglossal neurapraxia are often self-limiting, with 43% achieved resolution within 6 weeks after surgery and additional 40% were symptom free within 6 months after surgery [6]. Thus treatment is usually supportive and follow up until resolution of symptoms and signs. A short course of steroid therapy had been used to decrease swelling especially for cases with suspected airway edema after manipulation however there are no controlled studies of the benefits of this treatment on hypoglossal nerve neuropraxia perse.

Our patient had hypoglossal nerve injury despite using the LMA® Protector™ Airway with Cuff Pilot™ technology. Possible contributing factors include cuff over-inflation with failure of the cuff pressure indicator and inappropriate placement of the device. In this case, the placement of the LMA protector was inserted smoothly at the first attempt and correct placement was tested with confirmation of oropharyngeal leak pressure at 25 cmH₂O therefore inappropriate placement of the device is unlikely. We had some experience in using this device in the airway management of obese patients which we recently presented as poster in KoreAnesthesia 2018 in Seoul (poster title: evaluation
of the clinical performance of LMA Protector in the moderately obese patients; ABST-000411). None of the obese patients in the study suffered from hypoglossal nerve palsy. Primary research assessing the LMA-Protector™ is sparse [2]. There were two studies which evaluated the use of LMA Protector in normal population and they did not report any serious complication [1,14].

Although the Cuff Pilot™ technology is purported to allow continuous cuff pressure monitoring at a glance, anesthetists should remain vigilant with intermittent monitoring of the cuff pressures using manometry. This isolated rare case of hypoglossal nerve injury associated with the use of the new LMA® Protector™ Airway suggests that its unique in-built Cuff Pilot™ technology is not a panacea for potential cranial nerve injury after airway manipulation. Anesthetists should practice routine cuff pressure monitoring with manometry and careful selection of supraglottic airway devices for short procedures. One may consider down-sizing the device in a spontaneously breathing patient because this may limit the occurrence of pharyngolaryngeal morbidity such as sore throat and hoarseness of voice [15]. The manufacturer of the LMA-Protector™ recommended insertion of size 3 LMA-Protector™ for patient weight 30-50kg, size 4 for patient weight 50-70 kg and size 5 for patient weight 70-100 kg. All the three airway sizes have similar maximum intra-cuff pressure of 60cmH₂O [3].
References


Figure legends

Fig. 1. Patient with left hypoglossal nerve palsy after the use of laryngeal mask airway protector. Left section – Left tongue deviation after the surgery. Right section – he achieved complete recovery 3 months after the injury.

Supplemental video legends

Supplemental video 1. Patient with left hypoglossal nerve palsy after the use of laryngeal mask airway protector. He achieved complete recovery 3 months after the injury