



## Unilateral hypoglossal nerve palsy after the use of laryngeal mask airway (LMA) Protector -a case report-

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**Background:** The laryngeal mask airway (LMA<sup>®</sup>) Protector<sup>™</sup> (Teleflex Medical Co., Ireland) is the latest innovation in the second generation of LMA devices. One distinguishing feature of this device is its integrated, color-coded cuff pressure indicator (Cuff Pilot<sup>™</sup> technology) which enables continuous cuff pressure monitoring and allows adjustments when necessary; this ensures patient safety due to better monitoring.

**Case:** We report a case of postoperative unilateral hypoglossal nerve palsy after uncomplicated use of the LMA Protector. To the best of our knowledge, this could be the second reported case.

**Conclusions:** This case demonstrates that anesthetists need to routinely measure cuff pressure and that the Cuff Pilot<sup>™</sup> technology is not a panacea for potential cranial nerve injury after airway manipulation.

**Keywords:** Airway; Complication; Hypoglossal nerve palsy; Laryngeal mask; Postoperative.

The laryngeal mask airway (LMA) Protector<sup>™</sup> (Teleflex Medical Co, Ireland) is the latest innovation in single-use, second generation LMA devices. Similar to previous LMA devices, the LMA Protector<sup>™</sup> 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<sup>™</sup> Airway is its integrated, color-coded (green, yellow, and red zones corresponding to increasing intracuff pressures) cuff pressure indicator (Cuff Pilot<sup>™</sup> technology) which enables continuous cuff pressure monitoring and allows adjustments when necessary [2,3], thus ensuring patient safety due to better monitoring [4]. We report a case of postoperative unilateral hypoglossal nerve palsy after the uncomplicated use of the LMA Protector<sup>™</sup>. Written informed consent for the use of images, video and details of the case for publication of this report has been obtained.

### Case Report

A 70-year-old man (weight 70 kg, body mass index 25.7 kg/m<sup>2</sup>) with underlying hypertension and dyslipidemia underwent an elective open hernioplasty for right inguinal hernia under ambulatory surgery. He had normal airway features: good mouth

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opening, Mallampati score of 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 in a 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 using manometry. The oropharyngeal leak pressure was 25 cmH<sub>2</sub>O. The sternal notch test and bubble test were performed after insertion to confirm the placement of the LMA protector [5]. Anesthesia was maintained with a mixture of sevoflurane and oxygen/air. The patient's breathing was supported with a pressure support of 8 cmH<sub>2</sub>O, which generated a tidal volume of 400–450 ml and the maximum minute ventilation attained was 12 L/min with peak pressures of 8–10 cmH<sub>2</sub>O. He was placed in a supine position with standard American Society of Anesthesiologists monitoring for the surgery which lasted for 180 minutes. The surgery was uneventful, and the patient's vital signs were stable throughout. Postoperatively, the LMA was removed smoothly when he was awake. Moreover, blood stains or minimal secretions were not observed on the device.

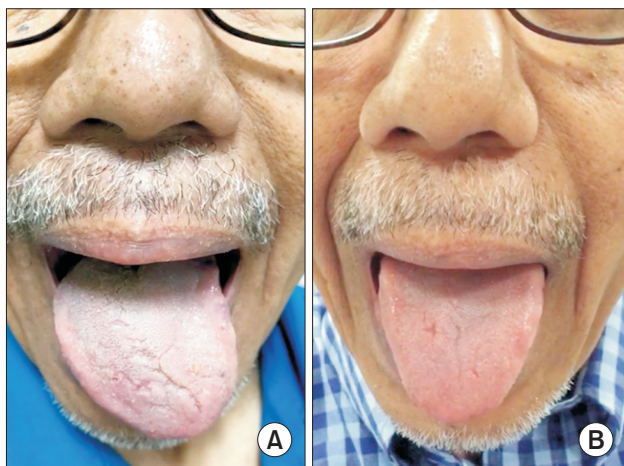
At the post anesthesia care unit, the patient complained of difficulty in chewing food and a weird tongue movement. He had no voice changes or altered taste sensation. On examination, the patient's tongue was seen to be deviated to the left during active protrusion (Fig. 1). All sensations of the tongue were intact and there were no tongue fasciculations or wasting. The neurological examination revealed no lateralizing signs or limb weakness. The gag and cough reflexes as well as other cranial nerves were normal. The patient was referred to the ENT surgeon the same day. The nasoendoscopy examination was

unremarkable. The working diagnosis was that of an isolated left hypoglossal nerve palsy or neuropraxia. He was allowed to go home the same day with reassurance, oral prednisolone for one week, and instructed for follow up at the ENT outpatient clinic. Neuroimaging was not required. He achieved complete recovery 3 months after the injury (Fig. 1, Supplementary Video 1) and was subsequently discharged from the follow-up clinic.

## Discussion

Hypoglossal nerve injury is a rare but distressing complication of airway management that arises during general anesthesia [6]. Although there have been reports of its occurrence after the use of other types of LMA [7–11], our case involves the use of the novel LMA® Protector™ Airway. To the best of our knowledge, this could be the second reported case. The first was reported by Leong et al. in a 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 and intrinsic muscles of the tongue, except the palatoglossus 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 above the hyoid bone to innervate the tongue muscles. The nerve becomes superficial at the level of the angle of the mandible, passing just above the greater horn of the hyoid to enter the mouth. This is a potential site for compression injury [6,12] and male patients may be more susceptible due to the presence of larger hyoid bones. Some authors have suggested that the LMA cuff insufflation may be associated with hypoglossal nerve injury. In these reported cases, the cuff insufflation volumes were 15 to 40 ml but intraoperative cuff pressure monitoring or titration has not been mentioned in these reports [7,8,10]. Although the recommended cuff insufflation volume varies according to the size and type of LMA used, excessive pressure in the volume cuff, especially during longer cases, exacerbated by the use of nitrous oxide (N<sub>2</sub>O) may cause injury due to the malposition of the airway devices [7,8,10,11]. Some authors have theorized that intermittent routine cuff pressure monitoring could decrease the incidence of hypoglossal nerve palsy [6,13]. The position of a patient changes after securing the airway while turning from a supine position during surgical



**Fig. 1.** Patient with left hypoglossal nerve palsy after the use of laryngeal mask airway protector. (A) Left tongue deviation after the surgery. (B) Complete recovery 3 months after the injury.

preparation and draping, and this can cause cuff malposition and predispose the patient to hypoglossal nerve trauma. Therefore, it is recommended to routinely perform intermittent cuff pressure monitoring especially during long surgeries and when N<sub>2</sub>O is administered. We should also check the patient's position intermittently with special focus on the head and airway securement [6].

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

Our patient had hypoglossal nerve injury in spite of using the LMA<sup>®</sup> Protector<sup>™</sup> Airway with Cuff Pilot<sup>™</sup> technology. The possible contributing factors include cuff over-inflation with failure of the cuff pressure indicator and inappropriate placement of the device. In this case, the LMA protector was inserted smoothly in the first attempt and correct placement was confirmed by with an oropharyngeal leak pressure at 25 cmH<sub>2</sub>O; therefore, inappropriate placement of the device was unlikely to be the cause. We have some experience with the use of this device for airway management in obese patients and recently presented a poster on this topic at the 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 effects of LMA-Protector<sup>™</sup> use is sparse [2]. There have been 2 studies which evaluated the use of the LMA Protector in normal population which did not report any serious complication [1,14].

Although the Cuff Pilot<sup>™</sup> technology is purported to allow continuous cuff pressure monitoring at a glance, anesthetists should remain vigilant with intermittent monitoring of cuff pressures using manometry. This rare isolated case of hypo-

glossal nerve injury associated with the use of the novel LMA<sup>®</sup> Protector<sup>™</sup> Airway suggests that its unique in-built Cuff Pilot<sup>™</sup> 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. The size of the device may be decreased in spontaneously breathing patients because this may limit pharyngolaryngeal morbidities such as sore throat and hoarseness of voice [15]. The manufacturer of the LMA-Protector<sup>™</sup> recommended sizes 3, 4, and 5 for patients weighting 30–50 kg, 50–70 kg, and 70–100 kg respectively. All 3 airway sizes have a similar maximum intra-cuff pressure of 60 cmH<sub>2</sub>O [3].

## Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

## Author Contributions

Li Yeon Tham (Data curation; Investigation; Writing—original draft; Writing—review & editing)

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## Supplementary Materials

Further details are presented in the online version of this article (Available from <https://doi.org/10.4097/kja.d.18.00354>).

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