Laryngospasm as a Cause of Unsuccessful Placement of Laryngeal Mask Airway ProSeal: A Case Report

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Laryngospasm is a potential complication encountered during anesthesia using a laryngeal mask airway (LMA). We report a case in which laryngospasm resulted in unsuccessful placement of an LMA ProSeal Airway (Teleflex Inc), and we discuss the various causes of unsuccessful placement of this type of airway device. Laryngospasm causes increased resistance to gas flow by inducing closure of vocal cords, aryepiglottic fold, and periglottic tissue. In this case report, the laryngospasm-induced increased resistance to gas flow was manifested by exaggerated outward movement of the LMA ProSeal following its connection to gas flows and thus resulted in failed airway placement. The possibility of laryngospasm as a cause of failed placement of an LMA ProSeal must be considered in clinical practice.

Keywords: Laryngeal mask airway, laryngospasm, LMA ProSeal, unsuccessful placement of LMA ProSeal.

Laryngospasm is a complication that can be encountered following placement of a laryngeal mask airway (LMA). We report a case in which laryngospasm resulted in exaggerated outward movement and unsuccessful placement of a reusable double-cuff LMA (LMA ProSeal Airway, Teleflex Inc) and discuss the various causes of unsuccessful placement of an LMA ProSeal.

Case Summary
A 35-year-old, 56-kg, ASA grade 1, male smoker was scheduled for fistulectomy to treat an anal fistula. Results of the preanesthetic evaluation, including the airway assessment, were within normal limits.

General anesthesia was administered at the patient’s choice. Anesthesia was induced with fentanyl, 100 µg, and propofol, 100 mg, followed by brief ventilation with sevoflurane and nitrous oxide in oxygen. A completely deflated and lubricated size 4 LMA ProSeal was introduced by the anesthesia resident using standard technique, and the cuff was inflated with 30 mL of air. No resistance was encountered during insertion, and there was a slight outward movement of the LMA following cuff inflation.

Soon after connecting it to the anesthesia breathing circuit and delivery of anesthetic gases, there was a sudden exaggerated outward movement of the LMA ProSeal. The airway was removed, and a repeated bolus dose of propofol was administered, considering inadequate plane of anesthesia as a cause. The first attempt at insertion of the LMA ProSeal was undertaken by the anesthesia resident, and a second attempt was then undertaken by the senior faculty member using a jaw-thrust maneuver. This time, the LMA ProSeal again slowly moved outward following its connection to the anesthesia circuit and furthermore following positive pressure ventilation. The LMA was removed immediately, and mask ventilation was started. This time, there was no movement of the reservoir bag, and we found it difficult to ventilate the patient’s lungs. The mask was reapplied, ruling out upper airway obstruction.

At this time, the diagnosis of laryngospasm was made, and continuous positive pressure with closed expiratory valve was applied. Laryngospasm was relieved within a few seconds, and we were able to ventilate the lungs easily. Following this, neuromuscular blockade was achieved using 4 mg of vecuronium bromide, and the trachea was intubated with a cuffed orotracheal tube. Throughout this period, there was no drop in oxygen saturation below 95%. The surgery lasted 30 minutes and was uneventful.

At the end of the surgery, neuromuscular blockade was reversed with neostigmine, 3 mg, and glycopyrrolate, 0.4 mg. The patient again experienced laryngospasm following extubation, which was again successfully managed by continuous positive airway pressure with 100% oxygen. The postoperative period remained uneventful.

Discussion
On analyzing the whole episode retrospectively, we speculate that the unsuccessful placement of LMA was a consequence of laryngospasm following insertion of the LMA ProSeal. The mechanism of laryngospasm following
LMA insertion is the activation of airway protective reflexes triggered by chemo- and mechanoreceptors in the oropharynx and laryngotracheobronchial tree. Various factors influencing the airway protective reflexes include cuff volume, type and size of LMA, insertion technique, timing of removal, surgical stimulation, depth of anesthesia, the level of the clinician’s experience, and patient factors, such as upper respiratory tract infection and smoking. In the present case, the patient was a smoker, which must have predisposed him to laryngospasm. The incidence of laryngospasm with LMA ProSeal has been estimated to be 1.5% but varies from 0% to 41%. The incidence of severe laryngospasm is probably low; a large-scale survey had reported it to be only 0.07%. A recent meta-analysis has shown a very low and rare incidence of laryngospasm and other airway reaction with general anesthesia using an LMA with various inhalational anesthetic agents and propofol.

The LMA ProSeal is the most ingenious of the specialized LMA devices because of the improved ventilatory characteristics and protection against regurgitation and gastric insufflation. After publication of the first article on the LMA ProSeal, in the May 2000 issue of *British Journal of Anaesthesia*, the subsequent crossover study in 2002 hinted that airway protective reflex activation may be more common with LMA ProSeal than the classic LMA. Laryngospasm occurs when there is excessively prolonged adductor response to intense stimulation of the superior laryngeal nerve. It involves closure of not only vocal cords but also false vocal cords, aryepiglottic fold, and periglottic tissue. A delay in the diagnosis and treatment of laryngospasm can lead to hypoxemia and acute pulmonary edema, and thus can be life-threatening.

Problems encountered during the placement phase of LMA can be subdivided into failure to insert the device into the pharynx (insertion failure) and failure of the device to function once in the pharynx(vitalitory failure). Various pathophysiologic problems such as coughing, gagging, laryngospasm, bronchospasm, and regurgitation/aspiration contribute toward both failed insertion and failed ventilation. On an extensive review of the literature in PubMed and the MEDLINE database, laryngospasm as a cause of failed or unsuccessful placement of LMA ProSeal has never been reported, to our knowledge. The various causes of failed LMA placement have been classified as difficulty in insertion, inappropriate hypopharyngeal seal, and increased resistance to gas flow. Difficulty in insertion and inappropriate hypopharyngeal seal are mainly due to anatomic factors. These anatomic factors include tongue size, mouth opening, size and shape of the hypopharynx, and head and neck position. All these factors were ruled out in our patient because findings of the preoperative airway assessment were within normal limits and no resistance was encountered during LMA ProSeal insertion. Because the insertion was smooth and the laryngospasm was detected clinically, the most probable cause of failed use of LMA ProSeal in our patient was concluded to be increased resistance to gas flow. The factors determining the resistance to gas flow include vocal cord opening, aryepiglottic infolding, and epiglottic position. The slight outward movement of the LMA at the time of cuff inflation is a sign of correct LMA placement; however, an exaggerated outward movement, especially following its connection to fresh gas flow or breathing circuit, may suggest failed LMA placement because of various aforesaid factors causing increased airway resistance.

The LMA is positioned so as to form 2 end-to-end seals with the pharynx. One seal is with the periglottic tissue connecting the LMA to the respiratory tract and thus allowing the exchange of respiratory gases. The other seal is with the hypopharyngeal tissues connecting it to the gastrointestinal tract and thus preventing the movement of gas and fluid between the pharynx and esophagus. We hypothesize that laryngospasm may cause increased resistance to gas flow, especially following its connection to the anesthesia breathing circuit, as a continuous flow of gases and subsequent positive pressure ventilation displaces the LMA ProSeal from its position. This displacement may manifest as its exaggerated outward movement and, hence, failed placement of the LMA ProSeal.

Laryngospasm as a cause of failed or unsuccessful placement of LMA ProSeal has not been reported previously, to our knowledge. We emphasize that the possibility of laryngospasm as a cause of failed LMA ProSeal placement must be considered in similar episodes of placement failure in clinical practice.

REFERENCES


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DISCLOSURES
The authors have declared they have no financial relationships with any commercial interest related to the content of this activity. The authors did not discuss off-label use within the article.