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CASE REPORT AIRWAY MANAGEMENT

Combined laryngospasm and bronchospasm during general anesthesia with i-gel® supraglottic airway: a case report

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ABSTRACT

Supraglottic airways (SGAs) are integral to airway management during general anesthesia. However, they can precipitate serious airway complications such as laryngospasm and bronchospasm, particularly when anesthesia is light or airway irritation occurs. We report a rare case of concurrent laryngospasm and bronchospasm following i-gel® insertion and describe the successful management.

A 55-year-old male was scheduled for general anesthesia for carpal tunnel release. He was a chronic smoker but had no underlying systemic diseases. An i-gel® was inserted after standard induction. Approximately 10 minutes into the surgery, the patient began

to hiccup, followed by inadequate ventilation and loss of end-tidal CO_2 tracing. Suspecting laryngospasm, the i-gel® was removed, and mask ventilation attempted. As ventilation remained poor, immediate endotracheal intubation was performed following succinylcholine administration. After intubation, severe wheezing was auscultated bilaterally, accompanied by low tidal volumes and high peak inspiratory pressures, consistent with bronchospasm. Intramuscular epinephrine was administered and resulted in rapid improvement in ventilation. Laryngospasm occurring during SGA use may concurrently trigger bronchospasm, warranting particular caution in smokers. This case underscores the importance of recognizing the complex nature of acute airway complications during SGA use and implementing prompt and appropriate management.

Keywords: i-gel®; supraglottic airway; laryngospasm; bronchospasm; epinephrine

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1. INTRODUCTION

Supraglottic airways (SGAs) are a well-established and effective alternative to endotracheal intubation for airway management during general anesthesia.[1,2] The i-gel® is a type of non-inflatable SGA designed to seal the perilaryngeal structures.[3] Although SGAs generally cause less stimulation of the airway reflexes than endotracheal tubes (ETTs), severe airway complications, such as laryngospasm and bronchospasm, can still occur

when the depth of anesthesia is inadequate or airway irritation is present.[4] Laryngospasm is characterized by closure of the glottis, while bronchospasm involves contraction of the smooth muscles of the lower airways.[5] Their simultaneous occurrence is rare but can be life-threatening.[6] We report a rare case of a patient, a chronic smoker without prior airway disease, who experienced a concurrent, life-threatening episode of laryngospasm and bronchospasm following i-gel® insertion, and describe the successful emergency management.

2. CASE REPORT

A 55-year-old male patient (172 cm, 75 kg) presented to the operating room for general anesthesia for bilateral carpal release. The patient was a chronic smoker and reported no underlying systemic or respiratory diseases. Preoperative laboratory results, chest X-ray, and electrocardiogram were all within normal limits. A SGA (i-gel®) was selected instead of endotracheal intubation.

After standard monitoring was applied, anesthesia was induced with propofol 120 mg. Once spontaneous respiration ceased, manual ventilation with 100% oxygen and sevoflurane was initiated. With adequate anesthetic depth (without neuromuscular blockade), a #4 i-gel® was inserted. Following surgical draping by the orthopedic team, the operation started.

Approximately 10 minutes into the procedure, the patient developed hiccups, suggesting light anesthesia. The inserted i-gel® was initially withdrawn slightly, and repositioning was attempted. However, effective ventilation was not achieved, and no end-tidal CO_2 tracing was detected. On physical examination, the patient exhibited severe inspiratory stridor along with pronounced intercostal and subcostal retractions, indicative of upper airway obstruction. Suspecting laryngospasm, we decided to remove the i-gel® and initiate continuous positive pressure ventilation via a facial mask with 100% oxygen. As proper ventilation could not be established and the patient's condition was clearly related to laryngospasm, endotracheal intubation was performed immediately following the administration of succinylcholine 100 mg.

After securing the airway, manual ventilation revealed low tidal volumes and severe bilateral wheezing, consistent with bronchospasm. Intramuscular epinephrine 300 μg was administered twice to the anterolateral thigh. The patient's tidal volume improved to 400–500 mL, and peak inspiratory pressure decreased to 10–15 cmH_2O under controlled ventilation. The remainder of the procedure proceeded uneventfully. At the end of surgery, intravenous dexamethasone 5 mg and sugammadex 200 mg (100 + 100 mg) were administered. Extubation was performed once the train-of-four (TOF) ratio exceeded 0.9. The patient was transferred safely to the post-anesthesia care unit and later to the ward without pulmonary complications.

3. DISCUSSION

This report describes a rare case of simultaneous laryngospasm and bronchospasm during general anesthesia maintained with an i-gel® SGA. Despite being a chronic smoker, the patient had no previous history of asthma or reactive airway disease, and preoperative evaluation was unremarkable. At our institution's orthopedic clinic, carpal tunnel syndrome surgery is routinely performed as a day surgery procedure. Considering the short operative time and relatively mild surgical stress, general anesthesia with controlled ventilaton utilizing a SGA is the standard of practice, often without the use of neuromuscular blocking agents. However, this approach necessitates special attention and care in patients presenting with risk factors for reactive airway disease such as a history of smoking or asthma. These patients have hyperresponsive airways, increasing the risk of perioperative events even with the use of an SGA.

The hiccup observed after i-gel® insertion likely indicated insufficient depth of anesthesia or airway irritation, both known precursors to laryngospasm.[6] The subsequent failure of mask ventilation and need for succinylcholine confirmed severe laryngospasm. Persistent wheezing and poor tidal volume after intubation suggested concurrent bronchospasm.[4,6] The relationship between laryngospasm and bronchospasm is not typically a direct causal mechanism, but rather a complex situation.[6] This involves either a strong common stimulus, like repeated airway manupulaton during i-gel® repositioning and intubation, co-activating both upper and lower airway reflexes,[6,7] or the secondary effects of laryngospasm—specifically severe physiological stress (hypoxia and negative pressure)—contributing to the development or worsening of bronchospasm.[8,9]

Although inhaled β_2-agonists are typically the first-line treatment for bronchospasm, we chose intramuscular (IM) epinephrine in this case to achieve a rapid systemic effect. This intervention was crucial, providing both prompt bronchodilation and cardiovascular support, leading to a rapid restoration of the patient's ventilation status. IM injection provides a significantly faster and higher peak plasma epinephrine concentration compared to subcutaneous injection, especially when administered in the mid-anterolateral thigh.[10,11] Given that the efficacy of epinephrine in severe bronchospasm and anaphylaxis is dose-dependent, current clinical guidelines strongly recommend IM injection as the standard of care for prompt treatment.[12,13]

This case highlights that airway complications associated with SGAs may not be limited to isolated laryngospasm but can manifest as combined airway obstruction involving bronchospasm. In patients with risk factors such as smoking, it is essential to maintain an adequate depth of anesthesia and minimize airway irritation.[4] Rapid recognition and simultaneous treatment of both conditions -- endotracheal intubation and muscle relaxation for laryngospasm, and epinephrine for bronchospasm -- were key to the successful outcome.

4. CONCLUSION

We report a rare case of concurrent development of laryngospasm and bronchospasm during general anesthesia maintained with an i-gel®. This case emphasizes the critical need to maintain an adequate depth of anesthesia and minimize airway stimulation, particularly in smokers. The successful outcome validates that a swift, multi-faceted approach involving endotracheal intubation and muscle relaxation for laryngospasm, and epinephrine administration for bronchospasm, is an effective strategy for managing this complex airway emergencies.

5. Conflict of interest

All authors declare that there was no conflict of interest.

6. Funding

The study utilized the hospital resources only, and no external or industry funding was involved.

7. Authors' contribution

All authors took part in the conduct of the study and manuscript editing.

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