

Two cases in which the effectiveness of “laryngospasm notch” pressure against laryngospasm was confirmed by imaging examinations

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Abstract We report two cases in which development of laryngospasm and release of the spasm immediately after applying pressure in the “laryngospasm notch” was confirmed by ultrasonographic and fiberoptic examinations. A bronchoscopy was planned under propofol sedation using a laryngeal mask airway for a 61-year-old man after subtotal esophagotomy. When a bronchoscope was advanced into the trachea, the vocal cords suddenly closed. Immediately after pressure with the fingertips was applied to the “laryngospasm notch,” the vocal cords opened, which was observed through the bronchoscope in real time. A 22-year-old woman presented for emergency caesarean section under general anesthesia. After the completion of the procedures, the patient was not yet following commands but her breathing was steady. Thus, extubation was performed; however, she began to display signs of respiratory stridor. An ultrasonographic examination revealed that the vocal cords were noted to close, which suggested that she was developing laryngospasm. With this diagnosis, pressure at the “laryngospasm notch” was applied. Immediately after this maneuver, the vocal cords opened. We reconfirmed that applying pressure in the “laryngospasm notch” was effective to release laryngospasm. Imaging studies, especially ultrasonographic examination, were useful for making the decision to apply pressure in the “laryngospasm notch.”

Keywords Laryngospasm · Laryngospasm notch · Ultrasonography

Introduction

Laryngospasm is a medical emergency that sometimes occurs during anesthetic practice. This event may lead to morbidity such as cardiac arrest, arrhythmia, pulmonary edema, bronchospasm, or gastric aspiration [1–3]. Laryngospasm that occurs during anesthesia is mainly the result of stimulation at an inappropriate depth of anesthesia including extubation, secretions or blood irritating the vocal cords, or stimulation of the airway by an artificial airway, laryngoscope, or suction catheter [4]. Once the diagnosis has been made, the main goals are identifying and removing the offending stimulus, applying airway maneuvers to open the airway, and administering anesthetic agents if the obstruction is not relieved [5]. In this article, we report two cases in which development of laryngospasm and release of the spasm immediately after applying pressure in the “laryngospasm notch” [6, 7] was confirmed by ultrasonographic and fiberoptic examinations.

Case report

Patient consent and institutional review board approval were obtained for this case presentation. The first case was a 61-year-old man, body weight (BW) 60 kg, admitted to the intensive care unit after subtotal esophagotomy for postoperative care. His trachea was extubated at the operating room. A routine bronchoscopy was planned under propofol sedation using a laryngeal mask airway (LMA). After a 80-mg bolus of propofol, a size 4 LMA (LMA

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Proseal; Intavent Orthofix, Maidenhead, UK) was successfully inserted, and sedation during the examination was maintained with a continuous infusion of 200 mg/h propofol. A bronchoscope was inserted and advanced to the larynx through the LMA while manual positive airway pressure with 100 % O₂ was applied using a Jackson-Rees circuit. When the bronchoscope was advanced into the trachea, the vocal cords suddenly closed and manual ventilation became impossible. His saturation fell to 80 %. Immediately after pressure with the fingertips applied to the retroauricular depression, the “laryngospasm notch” [6], the vocal cords opened, which was observed through the bronchoscope in real time. When the bronchoscope was again advanced into the trachea, laryngospasm again developed. Similarly, applying pressure at the laryngospasm notch relieved the laryngospasm. Subsequently, bronchoscopy was uneventfully performed.

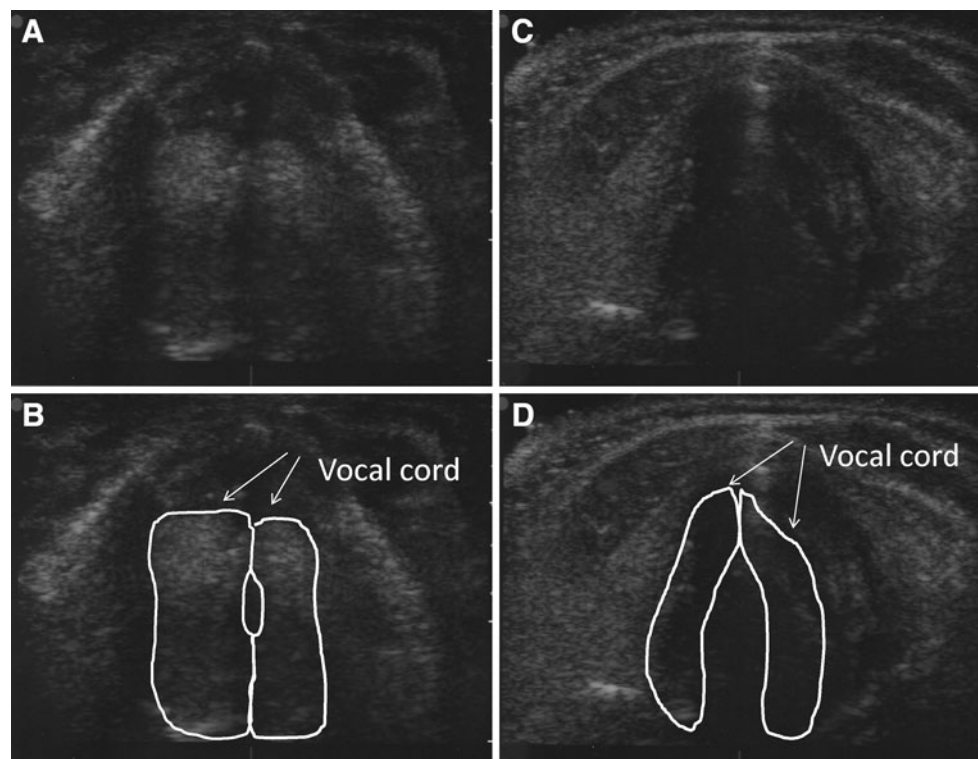
Case 2, a 22-year-old woman of BW 58 kg, presented for emergency caesarean section under general anesthesia. Anesthesia was induced with propofol, rocuronium was administered, and her trachea was intubated with a 7.0 endotracheal tube with a rapid sequence method. Surgical incision was made during anesthesia induction, and delivery was completed immediately after induction. Anesthesia was maintained using propofol and fentanyl. After the completion of the procedures, neuromuscular blockade was reversed with sugammadex. The patient was not yet following commands, but her breathing was steady and calm,

coughing and swallowing reflexes were observed, and her oxygen saturation remained at 100 %. Thus, extubation was performed; however, she began to display signs of respiratory stridor. Positive pressure with 100 % oxygen and jaw thrust were administered by mask. However, she showed a decrease in oxygen saturation to 80 %. A linear transducer (S-Nerve Transducer L38x/10-5; SonoSite, Bothell, WA, USA) of a portable ultrasound unit (S-Nerve; SonoSite), which was available at the operating room, was applied over the thyroid cartilage. The vocal cords were noted to be closed, which suggested that she was developing laryngospasm. With this diagnosis, pressure at the laryngospasm notch was applied. Immediately after this maneuver, the vocal cords opened and her saturation returned to 100 %. The patient showed rapid improvement of the breathing pattern. Her subsequent course was uneventful.

Discussion

Many methods and techniques of airway manipulation for laryngospasm have been proposed. These interventions include chin lift, jaw thrust, continuous positive airway pressure (CPAP), and positive pressure ventilation with a facemask and 100 % O₂. These maneuvers are popular because they have been shown to improve the patency of the upper airway in case of airway obstruction [5]. In contrast to these maneuvers, pressure in the

Fig. 1 **a** Appearance of closing vocal cords in ultrasonographic view. **b** Drawings added to **a** to indicate the vocal cords. **c** Appearance of opening vocal cords in ultrasonographic view. **d** Drawings added to **c** to indicate the vocal cords



laryngospasm notch is rather specific for treatment of laryngospasm [6]. Therefore, prompt and precise diagnosis is required for the decision to apply pressure in the laryngospasm notch. The mechanisms by which the maneuver releases laryngospasm is unknown. However, possible mechanisms have been proposed. The laryngospasm notch area is innervated in part by the glossopharyngeal nerve, which in turn has connections with the vagus nerve and the superior cervical sympathetic ganglion. Therefore, painful stimulus in this area might relax the vocal folds and vocal cords by way of either the parasympathetic or the sympathetic nerve system [6, 7].

We happened to observe laryngospasm during fiberoptic bronchoscopy. Thus, the fiberoptic scope was useful at that time; however, in other cases it could take time to prepare and might provide another stimulus against the larynx. Therefore, it is not recommended to use the fiberoptic scope for definitive diagnosis in critical situations. It has been reported that ultrasonography of the upper airway is capable of providing detailed anatomic information and has numerous potential clinical applications [8]. Singh et al. imaged the best view of the vocal cords with a linear transducer oriented in a transverse plane over the thyroid cartilage [6]. We also confirmed closure of the vocal cords with ultrasonographic evaluation. For reference, representative findings of the vocal cords with a linear transducer are presented in Fig. 1a–d.

After definitive diagnosis of laryngospasm using an imaging study, we applied pressure in the laryngospasm notch, which was dramatically effective to relieve laryngospasm. It is reasonable to suppose that relief of laryngospasm by pressure in the laryngospasm notch as

observed in real time is excellent evidence that applying pressure in the laryngospasm notch is a first-line treatment against laryngospasm.

In conclusion, we reconfirmed that applying pressure in the laryngospasm notch was effective to release laryngospasm. The imaging studies, especially ultrasonographic examination, were useful for decision making for application of pressure in the laryngospasm notch.

Conflict of interest This case report does not include any conflict of interest. This case report was supported by only departmental sources.

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