

Vocal Cord Paralysis in a Short-Statured Adult after Laryngeal Mask Airway General Anesthesia: A Case Report

Yongli yang

Gansu Provincial Maternal and Child Health Hospital

Xudong han

dfvkv02@163.com

Gansu Provincial Maternal and Child Health Hospital

Qian tong

Gansu Provincial Maternal and Child Health Hospital

Yinhua zhang

Gansu Provincial Maternal and Child Health Hospital

Weijiao liu

Gansu Provincial Maternal and Child Health Hospital

Case Report

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Abstract

Background

Laryngeal mask airway general anesthesia is widely used in clinical anesthesia due to its advantages such as ease of insertion and minimal airway stimulation. However, due to the unique anatomical structure of short-statured adult patients, laryngeal mask placement may increase the risk of vocal cord paralysis. We report a case of left vocal cord paralysis in a short-statured adult (125cm) who underwent gynecological surgery under laryngeal mask airway general anesthesia.

Case presentation:

A 46-year-old female patient with a height of 125 cm underwent laparoscopic total hysterectomy with bilateral adnexectomy and abdominal drainage under general anesthesia using a size 4 laryngeal mask airway. The procedure included CO₂ insufflation for pneumoperitoneum, with the patient positioned in 25° Trendelenburg position. After extubation, the patient reported and developed hoarseness and difficulty speaking. Laryngoscopy revealed paralysis of the left vocal cord. The patient was managed conservatively with voice rest and speech therapy and showed gradual improvement over the following weeks. Fifty days after discharge, the patient remains hoarse and is currently receiving oral neurotrophic medication and traditional Chinese acupuncture. We will continue to monitor the patient's progress.

Conclusion:

This case underscores the potential risk of recurrent laryngeal nerve injury in short-statured patients undergoing laparoscopic surgery with a laryngeal mask airway in place. The interplay between patient anatomy, airway device size, and surgical positioning may predispose to nerve compression. Clinicians should maintain a high index of suspicion for this complication, particularly in patients of short stature.

Introduction

After its introduction into clinical practice, the laryngeal mask has been widely adopted owing to its ease of operation insertion, minimal airway irritation, and high patient comfort. With the advent of the double-lumen laryngeal mask, which incorporates a dedicated channel for gastric tube placement, it can also be applied to patients undergoing laparoscopic surgery in the Trendelenburg position. As the clinical application of the laryngeal mask continues to expand, related complications have increasingly drawn attention, including sore throat, hoarseness, arytenoid joint dislocation, and vocal cord paralysis. Laryngeal mask-related vocal cord paralysis is a rare complication, but cases have been reported: the earliest, by S Inomata in 1995, described transient vocal cord paralysis after laryngeal mask use; Subsequently, a few cases of vocal cord paralysis following laryngeal mask insertion have also been reported. In 2014, Thiruvengkatarajan noted in a review that laryngeal mask-related vocal cord paralysis is primarily caused by laryngeal nerve injury, with pressure-induced nerve injury as the core trigger, and may also be associated with incorrect laryngeal mask size selection, patient positioning, laryngeal mask cuff

pressure, and non-standardized insertion technique. Existing reports have predominantly focused on factors such as the design, model, and cuff pressure of the laryngeal mask airway itself. To date, no study has analyzed abnormal patient height as an independent risk factor. This article reports a case of vocal cord paralysis in an adult female patient with a height of only 125 cm after laryngeal mask airway general anesthesia for laparoscopic gynecological surgery. Considering the patient's unique body habitus, it explores the potential association among the Trendelenburg position, pneumoperitoneum, and laryngeal nerve injury from an anatomical perspective, aiming to provide a reference for the clinical application of laryngeal mask airways in patients with atypical body habitus.

Case Report

The patient was a 46-year-old female, Han chinese, 125 cm in height and weighing 55 kg, admitted for a 'submucosal uterine leiomyoma' and scheduled for laparoscopic total hysterectomy under general anesthesia. Preoperatively, the patient denied any history of systemic diseases, neck surgery, or thyroid surgery, and had no preoperative hoarseness, dysphagia, or other discomforts; preoperative chest X-ray revealed increased bronchovascular markings; Laboratory tests revealed a hemoglobin level of 76 g/L; other test results showed no significant abnormalities.

Preoperative routine fasting and fluid restriction were observed. After entering the operating room, electrocardiogram, blood pressure, and pulse oximetry were monitored. After preoxygenation, dexamethasone 10 mg, sufentanil 15 µg, ciprofol 32 mg, and rocuronium bromide 50 mg were administered intravenously in sequence for anesthesia induction. After loss of consciousness, mask ventilation with positive pressure was provided for 3 minutes. A size 4.0 disposable double-lumen laryngeal mask was successfully inserted on the first attempt, and the cuff was not inflated after insertion. A disposable gastric tube was inserted through the side port of the laryngeal mask to a depth of 45 cm. Respiratory parameters were set as follows: FiO₂ 45%, VT 350 ml, RR 12 bpm, and peak airway pressure maintained at 15–30 cmH₂O. Anesthesia was maintained with continuous infusion of propofol 4–5 mg/kg/h and remifentanyl 0.2–0.5 µg/kg/min, with intermittent boluses of rocuronium bromide to maintain muscle relaxation. Pneumoperitoneum pressure was set at 12 cmH₂O, and intraoperative respiratory parameters were adjusted to maintain end-tidal carbon dioxide partial pressure at 35–45 mmHg. At the same time, maintain the airway pressure at 15–30 cm H₂O throughout the operation. The surgical procedure was laparoscopic total hysterectomy with bilateral adnexectomy and abdominal drainage. The patient was placed in a 25° Trendelenburg position. Because of the patient's pelvic dysplasia, the surgical procedure was difficult. After unsuccessful transvaginal uterine removal, the extraction was converted to a transabdominal approach via a small incision. The total operative time was 3 hours and 5 minutes, and the anesthesia duration was 3 hours and 20 minutes; No adverse events such as laryngeal mask displacement or air leakage occurred during the procedure. Approximately 20 ml of light yellow, clear digestive fluid was drained via the gastric tube. At the conclusion of surgery, the anesthetic agents were discontinued. Once the patient had resumed spontaneous breathing and regained consciousness, the laryngeal mask and gastric tube were removed. At the time of extubation, the patient reported hoarseness, for which no specific treatment was administered. On postoperative

days 2 and 3, follow-up visits revealed no intervention was administered. On postoperative day 4, the patient's hoarseness worsened further, accompanied by difficulty eating and dysphonia, therefore, an otolaryngology consultation was requested. Electronic laryngoscopy (Fig. 1) revealed pharyngeal mucosal congestion, fixation of the left cricoarytenoid joint and vocal cord, left vocal cord laxity and limited mobility; the right vocal cord movement was normal. The diagnosis considered was left vocal cord paralysis. Further examination with neck CT, MRI, and laryngeal electromyography was recommended. The patient was simultaneously instructed to maintain voice rest and avoid forceful coughing and throat clearing, and also received nebulized inhalation and neurotrophic drug therapy. The patient refused further examinations and specialist otolaryngological treatment, and requested discharge. After repeated failed attempts at communication, she was discharged against medical advice on postoperative day 6. At discharge, the patient still exhibited hoarseness and difficulty eating. She was instructed to continue voice rest after discharge, avoid forceful coughing and throat clearing, and was advised to seek further otolaryngological evaluation and treatment. The patient is currently under regular follow-up.

Discussion

Vocal cord paralysis is a clinical syndrome in which the nerves controlling vocal cord movement are diseased or injured, leading to partial or complete loss of vocal cord function. It is a clinical condition rather than an independent disease. Typical clinical manifestations of vocal cord paralysis include hoarseness, dysphonia, choking during drinking or eating, and weak cough. In this case, the patient developed hoarseness, difficulty eating, dysphonia, and other symptoms after general anesthesia with laryngeal mask ventilation. It is important to note that postoperative hoarseness, aside from vocal cord paralysis, warrants differential diagnosis with cricoarytenoid joint dislocation. Laryngoscopic findings for cricoarytenoid joint dislocation include mucosal edema in the arytenoid region and asymmetry of the bilateral arytenoid cartilages. Vocal cord paralysis is characterized by fixation of the vocal cord in a paramedian or intermediate position, a bowed and relaxed appearance, and normal structure of the arytenoid cartilage. To further clarify the diagnosis, laryngeal electromyography is the key diagnostic tool for differentiating nerve injury from joint dislocation: in patients with vocal cord paralysis, the electromyogram typically shows reduced or absent electrical activity of the vocalis muscle on the affected side, whereas in patients with cricoarytenoid joint dislocation, it usually reveals no abnormalities. In this case, the patient refused further examination, precluding a definitive pathological diagnosis. Nevertheless, the clinical diagnosis of left vocal cord paralysis was established based on clinical symptoms, signs, and electronic laryngoscopy findings.

The exact pathogenesis of vocal cord paralysis caused by laryngeal mask insertion remains unclear. Current research⁴ suggests that direct compression-related nerve injury is the most likely pathological mechanism. After laryngeal mask insertion, its cuff is positioned in the laryngopharynx, adjacent to the anatomical site where the recurrent laryngeal nerve enters the larynx; When the cuff is overinflated⁸, malpositioned, or the laryngeal mask size is inappropriate, it can directly compress the anterior branch of

the recurrent laryngeal nerve, inducing local demyelinating changes^[1], ultimately leading to vocal cord paralysis. Because the left recurrent laryngeal nerve ascends behind the aortic arch to the larynx, its course is significantly longer than that of the right, making the risk of injury higher on the left side; consequently, left vocal cord paralysis is more common in clinical practice.

The combination of the Trendelenburg lithotomy position and CO₂ pneumoperitoneum is a commonly used positioning method in gynecological laparoscopic surgery. These two factors can increase the risk of recurrent laryngeal nerve injury through multiple pathways: First, CO₂ pneumoperitoneum raises intra-abdominal pressure, causing the diaphragm to elevate. When combined with the Trendelenburg position, abdominal organs shift cephalad under gravity, further displacing the diaphragm and increasing intrathoracic pressure. This increases the contact area and contact pressure between the laryngeal mask and the perilaryngeal tissues, thus raising the risk of recurrent laryngeal nerve compression. Meanwhile, elevated intrathoracic pressure can cause slight mediastinal displacement, making the recurrent laryngeal nerve—which courses through the mediastinum—more susceptible to traction and compression, which further increases the likelihood of injury. Second, the Trendelenburg position places the patient's head below the cardiac level, thereby impeding cervical venous return. When superimposed on this, the increase in intrathoracic pressure induced by pneumoperitoneum further obstructs venous return, which collectively aggravates laryngeal mucosal congestion and edema. When combined with the mechanical compression exerted by the laryngeal mask, this factor further elevates the risk of nerve compression. Additionally, improper head fixation or excessive neck extension in the head-down position may cause displacement of the laryngeal mask, which alters the site at which the cuff compresses the recurrent laryngeal nerve and increases the risk of nerve injury. Third, the combination of head-down position and pneumoperitoneum can lead to decreased lung compliance and elevated airway pressure; To maintain adequate ventilation, the anesthesiologist typically needs to increase the cuff inflation volume of the laryngeal mask or adjust its position, further increasing the risk of recurrent laryngeal nerve compression. Fourth, as operative time lengthens, the cumulative damaging effect of the aforementioned risk factors on the recurrent laryngeal nerve becomes more pronounced, and the risk of nerve injury increases accordingly.

Furthermore, the existing literature includes case reports of postoperative vocal cord paralysis induced by gastric tube insertion: From an anatomical perspective, the gastric tube can directly compress the larynx, resulting in compression or traction of the recurrent laryngeal nerve. Especially when the laryngeal mask has already occupied part of the hypopharyngeal space, the additional compression exerted by the gastric tube may further increase the risk of nerve injury. Repeated manipulation or forceful insertion during gastric tube placement can also cause laryngeal mucosal injury and edema, which indirectly aggravates compression of the recurrent laryngeal nerve. Previous cases have predominantly involved bilateral vocal cord paralysis with prolonged gastric tube retention, suggesting an association between gastric tube placement and vocal cord paralysis. Reports of vocal cord paralysis induced by a single gastric tube insertion are rare. Therefore, whether short-term gastric tube insertion is an independent risk factor for nerve injury in patients receiving laryngeal mask ventilation still requires further clinical evidence to confirm.

The specific risk factor for this patient was a height of only 125 cm. The reference range for normal adult female height is approximately 155–165 cm. The patient's height was significantly below this range, resulting in a relatively compact laryngeal anatomy. The relative space between the laryngeal mask and laryngeal tissues is narrower, which shortens the buffer distance between the recurrent laryngeal nerve and the cuff. Consequently, even when the cuff inflation volume remains within the standard range, the risk of recurrent laryngeal nerve compression is significantly higher than that in patients with normal stature. Meanwhile, intraoperative pelvic structural variations were observed in this patient, suggesting that anatomical variations may also be present in the neck. However, this speculation cannot be confirmed, as no cervical CT or MRI examination was performed. Furthermore, a 2020 study on recurrent laryngeal nerve diameter indicated that female patients with a height of < 160 cm and a BMI of < 25 kg/m² had significantly smaller recurrent laryngeal nerve diameters, and nerve injury was more likely to occur in patients with thinner recurrent laryngeal nerves. This patient, with a height of only 125 cm, most likely has a recurrent laryngeal nerve diameter significantly smaller than that of the general population, resulting in a lower tolerance threshold to mechanical compression and a higher susceptibility to neural functional impairment under the same pressure.

In summary, the mechanism of vocal cord paralysis in this patient is as follows: Under the special physiological conditions of a head-down position combined with pneumoperitoneum, the patient's height was only 125 cm, with compact laryngeal anatomy, a slender recurrent laryngeal nerve, and possible anatomical variations. The combined effect of these factors caused the compression exerted by the laryngeal mask cuff on the recurrent laryngeal nerve to exceed its tolerance threshold, ultimately leading to left recurrent laryngeal nerve injury, which is clinically manifested as postoperative left vocal cord paralysis. No similar case reports have been identified in existing literature regarding abnormal height as an independent risk factor for laryngeal mask-related vocal cord paralysis.

Conclusion

For patients with short stature, especially those whose height is significantly below the normal reference range, clinicians should fully assess the risks associated with laryngeal mask placement. Preoperative neck imaging can be performed to map laryngeal anatomy; intraoperatively, laryngeal mask size should be carefully selected, cuff inflation volume should be strictly controlled, and airway pressure changes should be closely monitored; postoperatively, vocal cord function should be routinely evaluated to enable early identification and intervention for recurrent laryngeal nerve injury.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication:

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-chief of this journal.

Availability of data and materials

All data generated or analyzed during this study are included in this published article. No additional datasets were generated or analyzed.

Competing interests:

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Author contributions:

Yongli-Yang: Conceptualized the study and supervised the overall project—drafted the manuscript .

Qian-Tong ,Weijiao-Liu and Yinhua-Zhang : Literature Review and Compilation

, collected relevant clinical data, participated in drafting and revising the manuscript.

Xudong-Han: Revised the manuscript, provided a critical review, and approved the final version.

All authors read and approved the final version of the manuscript.

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Figures



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检查号: _____

仪器型号: _____

姓 名: _____

性别: 女

年龄: 46 岁

科 别: _____

申请医师: _____

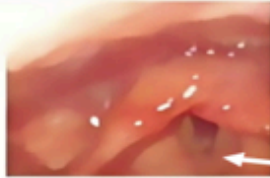
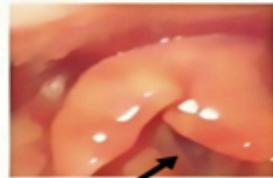
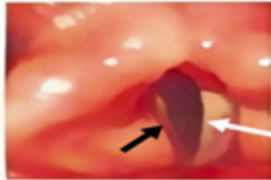
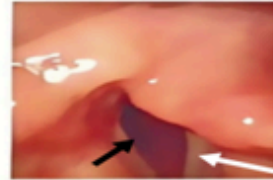
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内镜所见:

鼻腔黏膜驱动程序, 鼻中隔向左侧偏曲, 双侧下鼻甲肥大; 咽部黏膜轻度充血, 少量淋巴滤泡, 左侧劈裂关节及声带固定, 活动受限, 左侧声带松弛。右侧声带活动正常。

镜下诊断:

声带麻痹 (左)

病 理 号: _____

活检部位: _____

医生建议: _____

病理诊断: _____

诊断医师: _____

审核医生: _____

检查日期: _____

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Figure 1

Fiberoptic laryngoscopy findings. The right vocal cord (blank arrow) showing normal mobility. The left vocal cord (wight arrow) revealing laxity and restricted movement. No mucosal edema or asymmetry of the arytenoid cartilages was observed.