

World Journal of *Clinical Cases*

World J Clin Cases 2023 April 6; 11(10): 2123-2362



EVIDENCE REVIEW

- 2123 Fractional flow reserve and non-hyperemic indices: Essential tools for percutaneous coronary interventions
Boutaleb AM, Ghafari C, Ungureanu C, Carlier S

REVIEW

- 2140 Diagnosis, treatment protocols, and outcomes of liver transplant recipients infected with COVID-19
Hashem M, El-Kassas M

MINIREVIEWS

- 2160 Treatment of stellate ganglion block in diseases: Its role and application prospect
Deng JJ, Zhang CL, Liu DW, Huang T, Xu J, Liu QY, Zhang YN
- 2168 Clinical application of SARS-CoV-2 antibody detection and monoclonal antibody therapies against COVID-19
Sun J, Yang ZD, Xie X, Li L, Zeng HS, Gong B, Xu JQ, Wu JH, Qu BB, Song GW
- 2181 Cheesy material on macroscopic on-site evaluation after endoscopic ultrasound-guided fine-needle biopsy: Don't miss the tuberculosis
Delsa H, Bellahammou K, Okasha HH, Ghalim F
- 2189 Liver manifestations in COVID-19 patients: A review article
Helou M, Nasr J, El Osta N, Jabbour E, Husni R
- 2201 Breast reconstruction: Review of current autologous and implant-based techniques and long-term oncologic outcome
Malekpour M, Malekpour F, Wang HTH
- 2213 Update on the current management of persistent and recurrent primary hyperparathyroidism after parathyroidectomy
Pavlidis ET, Pavlidis TE

ORIGINAL ARTICLE**Retrospective Study**

- 2226 Hepatobiliary system and intestinal injury in new coronavirus infection (COVID-19): A retrospective study
Kozlov KV, Zhdanov KV, Ratnikova AK, Ratnikov VA, Tishkov AV, Grinevich V, Kravchuk YA, Miklush PI, Nikiforova PO, Gordienko VV, Popov AF, Andryukov BG
- 2237 Impact of lockdown policies during the COVID-19 outbreak on a trauma center of a tertiary hospital in China
Shen BS, Cheng WY, Liang ZR, Tang Q, Li KY

Observational Study

- 2246 Interaction between the left ventricular ejection fraction and left ventricular strain and its relationship with coronary stenosis
Gui HY, Liu SW, Zhu DF

CASE REPORT

- 2254 Neonatal hyperinsulinism with an *ABCC8* mutation: A case report
Liu MT, Yang HX
- 2260 Unilateral contrast-induced encephalopathy with contrast medium exudation: A case report
Zhang ZY, Lv H, Wang PJ, Zhao DY, Zhang LY, Wang JY, Hao JH
- 2267 Diagnosis and treatment of primary seminoma of the prostate: A case report and review of literature
Cao ZL, Lian BJ, Chen WY, Fang XD, Jin HY, Zhang K, Qi XP
- 2276 Primary intra-abdominal paraganglioma: A case report
Guo W, Li WW, Chen MJ, Hu LY, Wang XG
- 2282 Successful surgical treatment of bronchopleural fistula caused by severe pulmonary tuberculosis: A case report and review of literature
Shen L, Jiang YH, Dai XY
- 2290 Clinical and genetic features of Kenny-Caffey syndrome type 2 with multiple electrolyte disturbances: A case report
Yuan N, Lu L, Xing XP, Wang O, Jiang Y, Wu J, He MH, Wang XJ, Cao LW
- 2301 Dupilumab for treatment of severe atopic dermatitis accompanied by lichenoid amyloidosis in adults: Two case reports
Zhao XQ, Zhu WJ, Mou Y, Xu M, Xia JX
- 2308 Reabsorption of intervertebral disc prolapse after conservative treatment with traditional Chinese medicine: A case report
Wang CA, Zhao HF, Ju J, Kong L, Sun CJ, Zheng YK, Zhang F, Hou GJ, Guo CC, Cao SN, Wang DD, Shi B
- 2315 Development of subdural empyema from subdural effusion after suppurative encephalitis: A case report
Yang RX, Chen B, Zhang Y, Yang Y, Xie S, He L, Shi J
- 2321 Treatment of periprosthetic knee infection and coexistent periprosthetic fracture: A case report and literature review
Hao LJ, Wen PF, Zhang YM, Song W, Chen J, Ma T
- 2329 Formation of a rare curve-shaped thoracolith documented on serial chest computed tomography images: A case report
Hsu FC, Huang TW, Pu TW
- 2336 Neurofibromatosis type 1 with multiple gastrointestinal stromal tumors: A case report
Yao MQ, Jiang YP, Yi BH, Yang Y, Sun DZ, Fan JX

- 2343** Coexisting cytomegalovirus colitis in an immunocompetent patient with *Clostridioides difficile* colitis: A case report
Kim JH, Kim HS, Jeong HW
- 2349** Paradoxical vocal fold motion masquerading as post-anesthetic respiratory distress: A case report
Baek J, Jee DL, Choi YS, Kim SW, Choi EK
- 2355** Full neurological recovery from severe nonexertional heat stroke with multiple organ dysfunction: A case report
Du F, Zheng JW, Zhao YB, Yang K, Li HN

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The primary aim of *World Journal of Clinical Cases* (*WJCC*, *World J Clin Cases*) is to provide scholars and readers from various fields of clinical medicine with a platform to publish high-quality clinical research articles and communicate their research findings online.

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Paradoxical vocal fold motion masquerading as post-anesthetic respiratory distress: A case report

Jongyoon Baek, Dae-Lim Jee, Yoon Seok Choi, Sang Woo Kim, Eun Kyung Choi

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Abstract

BACKGROUND

Functional vocal cord disorders can be a differential diagnosis for postoperative upper airway obstruction requiring urgent intervention. However, this may be unfamiliar to anesthesiologists who would favor inappropriate airway intervention and increased morbidity.

CASE SUMMARY

A 61-year-old woman underwent cervical laminectomy, followed by laparoscopic cholecystectomy 10 mo later. Despite adequate reversal of neuromuscular blockade, the patient experienced repetitive respiratory difficulty with inspiratory stridor after extubation. After the second operation, the patient was diagnosed with paradoxical vocal fold motion (PVFM) by an otolaryngologist based on the clinical features and fiberoptic bronchoscopy results, and the patient was successfully treated.

CONCLUSION

PVFM should be considered a differential diagnosis if a patient presents with stridor after general anesthesia.

Key Words: Anesthesiology; Vocal fold; Paradoxical motion; Postoperative respiratory distress; Case report

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Core Tip: Postoperative upper airway obstruction after general anesthesia requires urgent airway intervention. Postoperative stridor is a common cause of laryngeal spasm, but functional vocal cord disorders may also be a cause. However, anesthesiologists may be unfamiliar with functional vocal cord disorders, and this may lead to inappropriate interventions. We present the case of a patient with post-extubation repetitive stridor who was postoperatively diagnosed with paradoxical vocal fold motion (PVFM) by an otolaryngologist and discuss the diagnosis and treatment of PVFM. Our case presentation showed that PVFM should be considered in the differential diagnosis of postoperative stridor.

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INTRODUCTION

Postoperative upper airway obstruction after general anesthesia is a significant problem that can cause severe complications that require urgent airway intervention. In addition to common causes, such as laryngeal spasm induced by residual muscle relaxants, a functional vocal cord disorder can also be a differential diagnosis of postoperative stridor[1,2]. However, as this cause may be unfamiliar to those in anesthesiology, it could lead to inappropriate airway interventions and increased morbidity.

Here, we present the case of a patient with repetitive stridor after extubation who was postoperatively diagnosed with paradoxical vocal fold motion (PVFM) by an otolaryngologist.

CASE PRESENTATION

Chief complaints

A 61-year-old woman (weight, 70 kg; height, 155 cm; body mass index, 29.14) developed respiratory difficulties with inspiratory stridor after extubation for each of her surgeries.

History of present illness

First surgery: The patient underwent a cervical laminectomy to resect an extradural tumor at the C2 to C3 vertebral level. No premedication was administered, and standard anesthetic monitoring, including electrocardiogram, non-invasive blood pressure, and pulse oximetry, was conducted after arriving at the operating room. Anesthesia was induced with propofol and rocuronium, and a 7.5 mm armored endotracheal tube was used, without difficulty, during intubation. The Cormack-Lehane grade observed on laryngoscopy during intubation was grade 1. Anesthesia was maintained with desflurane and 50% oxygen for 3 h and 30 min. There were no notable intraoperative events. Pyridostigmine and glycopyrrolate were injected to reverse the neuromuscular blockade, and the patient was extubated without difficulty. Spontaneous breathing was maintained immediately after extubation, and no abnormal respiratory signs were observed. However, 5 min after arriving at the post-anesthesia care unit (PACU), breathing difficulties and tachypnea were observed. The patient developed respiratory difficulty with inspiratory stridor.

Second surgery: Ten months after the first surgery, the patient was scheduled to undergo laparoscopic cholecystectomy for gallstones and polyps. Preoperative evaluations conducted by an otolaryngologist revealed normal structure and movement of the vocal cords. Intravenous propofol and rocuronium were administered to induce anesthesia. Before intubation with the endotracheal tube, intravenous lidocaine was administered to attenuate airway reflexes and hemodynamic fluctuations. As a vocal cord disorder developed after the previous operation, a 6.5 mm cuffed endotracheal tube was used with special caution, and dexamethasone 5 mg was administered 30 min before extubation. Anesthesia was maintained with desflurane, 50% oxygen, and an infusion of 0.5-1.5 µg/kg/min of remifentanyl for 50 min. There were no special intraoperative events. After clinical confirmation of adequate neuromuscular blockade reversal using train-of-four (TOF), the endotracheal tube was removed. Shortly after extubation, the patient developed respiratory difficulty, and stridor was heard again. An O₂ mask was applied with 100% oxygen, and breathing was assisted with a bag-valve mask. Despite these efforts, the respiratory distress and inspiratory stridor did not improve.

History of past illness

There were no abnormal findings in the preoperative evaluation, including physical examination,

laboratory tests, electrocardiogram, and chest X-ray. The patient had an average-sized neck, and the preoperative Mallampati score was grade 1.

Personal and family history

Three years before the present admission, the patient was diagnosed with thyroid cancer and had undergone total thyroidectomy. No perioperative complications related to anesthesia were observed at that time. The patient's medical history was unremarkable. The patient did not smoke or drink alcohol and had no history of allergies.

Physical examination

First surgery: Immediately after extubation, the patient's oxygen saturation (SpO₂) in the operating room was 99%. After arriving at the PACU, 100% oxygen was administered at 2 L/min *via* a nasal cannula; SpO₂ was 99%. Complete clinical reversal was confirmed by observing a TOF (peripheral nerve stimulator) after the development of inspiratory stridor.

Second surgery: Adequate reversal of neuromuscular blockade was clinically confirmed by TOF immediately before extubation. Oxygen saturation was maintained above 98% by providing 100% oxygen immediately after the stridor started.

Laboratory examinations

The preoperative laboratory test results were within normal limits. However, mild hyperventilation (pH, 7.48; PaCO₂, 31.6 mmHg; PaO₂, 106 mmHg) was observed in arterial blood gas analysis when reintubation was performed due to postoperative stridor.

Imaging examinations

After the second surgery, an otolaryngologist performed a nasal fiberoptic bronchoscopy to resolve these repetitive episodes. No laryngeal trauma, edema, or vocal cord paralysis was observed. However, the vocal cords moved paradoxically during inspiration ([Figure 1](#)).

FINAL DIAGNOSIS

The patient was finally diagnosed with PVFM by the otolaryngologist.

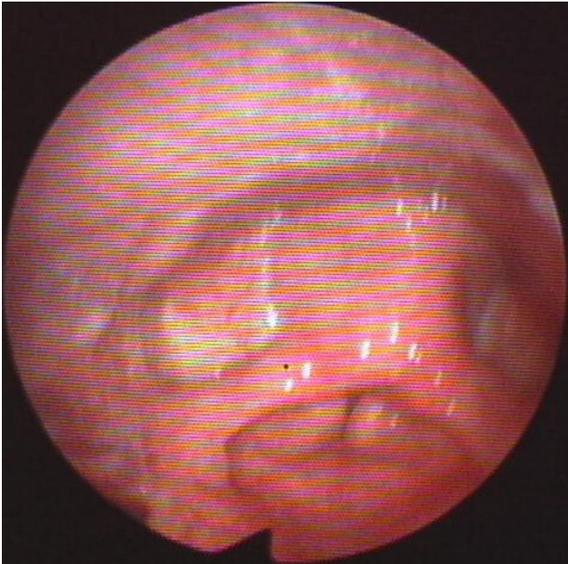
TREATMENT

First surgery

Although complete clinical reversal was confirmed, reversal agents for neuromuscular blockade were additionally administered for suspected laryngeal spasm. Intravenous lidocaine, dexamethasone, and intraoral salbutamol spray were administered to relieve respiratory distress, and the patient's head was elevated. Her vital signs, including SpO₂ remained stable, but the inspiratory stridor lasted for approximately 10 min. No other lung parenchymal sounds were noted on auscultation except for stridor. The decision to perform re-intubation was made, and intravenous propofol was given. After intubation, the patient's breathing patterns improved, and arterial blood sampling showed mild hyperventilation (pH, 7.48; PaCO₂, 31.6 mmHg; PaO₂, 106 mmHg). The SpO₂ remained at > 98% without oxygen support. After discussion with the neurosurgery department, the patient was transferred to the intensive care unit for close observation. The otolaryngologist suspected that her symptoms were due to underlying asymptomatic vocal cord paralysis after total thyroidectomy, which was not recognized before the operation, or vocal cord irritation caused by intubation. A few hours later, the patient was extubated under close observation. She developed mild hoarseness; however, her breath sounds were normal, and her SpO₂ was 99% with no stridor. The patient was discharged without further evaluation based on her wishes.

Second surgery

After fiberoptic bronchoscopy, 2 mg of midazolam was administered with reassurance for suspected PVFM. The stridor intensity was reduced, and the patient was moved to the PACU. The patient did not develop respiratory distress, and her oxygen saturation was maintained at 98%-100% on 2 L/min of oxygen *via* a nasal cannula.



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Figure 1 Nasal fiberoptic bronchoscopy image of paradoxical vocal cord motion during inspiration.

OUTCOME AND FOLLOW-UP

The patient was discharged three days after the second surgery without complications. One month later, the patient revisited the otorhinolaryngology department because of laryngeal symptoms, including chronic cough, the sensation of a lump in her throat, and repeated throat clearing. Furthermore, the patient experienced three episodes of dyspnea with stridor lasting for several minutes, similar to the events that occurred after the two surgeries while sleeping or eating. The otolaryngologist suspected PVFM clinically and prescribed a proton pump inhibitor and laryngeal control therapy. After two months of treatment, all symptoms improved, and the patient was finally diagnosed with PVFM by the otolaryngologist.

DISCUSSION

After the first surgery, the patient did not receive a timely and proper diagnosis and treatment. Because the patient had no previous respiratory or psychiatric history, and there was no increased awareness of the functional causes of upper airway obstruction, PVFM was not recognized as a cause of sustained stridor and dyspnea. Consequently, the patient was reintubated in the PACU without additional fiberoptic bronchoscopic examinations to diagnose this disorder.

Postoperative upper airway obstruction presenting with inspiratory stridor is a common phenomenon in anesthesiology. Depressed laryngeal muscle activity due to residual effects of anesthetics and muscle relaxants, laryngeal edema caused by the prolonged placement of the endotracheal tube, and laryngeal stimulation by secretions such as blood and mucus can precipitate laryngospasm in partially awake or, rarely, fully awake patients[3]. In addition to the aforementioned causes, vocal cord paralysis and laryngomalacia can be considered identifiable organic etiologies of postoperative upper airway obstruction[3]. Although some cases of post-extubation stridor do not require urgent intervention, others can result in disastrous clinical symptoms requiring resuscitation, which increases patient morbidity and mortality. Therefore, accurate diagnosis and adequate treatment are necessary.

Stridor management should be directed toward the underlying cause. Stridor is usually inspiratory and is a sign of upper airway obstruction. However, not all stridor has organic cause. Typically, PVFM is a functional stridor. This condition shows paradoxical adduction of vocal cords during inspiration and occasionally during early expiration[4]. Other names for PVFM include functional inspiratory stridor, factitious asthma, and emotional laryngismus[5]. Owing to clinical presentations that mimic serious upper airway obstruction, PVFM is often misdiagnosed as several pathological states, including croup, subglottic stenosis, traumatic airway edema, laryngomalacia, and asthma[3], leading to inappropriate treatment, extensive investigation, and considerable delay in making a proper diagnosis. According to one case series, 28% of 95 patients with PVFM were intubated, and some underwent tracheostomy[6]. In this case, the patient presented with sustained respiratory difficulties with inspiratory stridor, although oxygen saturation remained within the normal range. After excluding the residual effects of muscle relaxants and anesthetics, the patient was initially treated conservatively

without improvement. After the first surgery, we had not yet considered PVFM as a differential diagnosis related to postoperative airway obstruction, and the patient was eventually reintubated to resolve severe respiratory distress. If there was an awareness of functional vocal cord disorders, fiberoptic bronchoscopy could have been performed to determine the cause of inspiratory stridor, and other treatment options such as sedation and reassurance would have been performed instead of reintubation.

PVFM can occur at any age but is more common in adult females[7]. A history of recent respiratory tract infection and stress-related psychiatric disorder is often present in PVFM. Moreover, upper airway obstruction features such as dysphonia, accessory muscle use, and stridor can be present, often resulting in a misdiagnosis of asthma[8]. The most important consideration for anesthesiologists is that PVFM can occur after general anesthesia. PVFM is a rare condition in anesthesiology and has only partly been reported in the respiratory and otorhinolaryngology fields. Therefore, clinicians should suspect PVFM in patients presenting with postoperative stridor. In other words, the differential diagnosis of postoperative stridor should include PVFM, laryngeal spasm, laryngeal edema, and vocal cord paralysis. Some case reports have discussed functional stridor after anesthesia[9,10]. A confirmative diagnosis of PVFM can be obtained by fiberoptic laryngoscopy, which reveals abnormal adduction of the vocal cords on inspiration and normal vocal cord motion during expiration[11]. However, organic disorders related to upper airway obstruction should be excluded first. Once diagnosed, short-term sedation and reassurance may help control symptoms in the acute phase, and definitive treatment includes psychotherapy, speech therapy, and patient education.

CONCLUSION

PVFM should be considered a differential diagnosis if a patient presents with an episode of upper airway obstruction after general endotracheal anesthesia without organic airway disorders. An increased awareness of functional vocal cord disorders will help make timely diagnoses and avoid potentially harmful treatments.

FOOTNOTES

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