Case Report | Journal of Anaesthesia and Critical Care Case Reports | 2025 May-August; 11(2): 07-10

Non-Intubated Video-Assisted Thoracic Surgery and Lobar Ventilation in a Patient with Vocal Cord Palsy: A Case Report

Hoi Ching Annie Chan[1], Wai Hon Chu[1], Xianyi Timothy Yang[1], Tik Sang Cheung[1], Sau Kuk Anna Poon[1]

Abstract

Aim & background: Vocal cord palsy and glottic stenosis are significant airway challenges to both surgeons and anaesthesiologists. Meanwhile, difficult ventilation is often encountered in patients with previous contralateral lung resection, especially during one-lung ventilation. This case report discusses the application of non-intubated video-assisted thoracic surgery in a patient with pre-existing vocal cord palsy and previous contralateral lung lobectomy going for right lung wedge resection. The surgical approach, challenges faced, anaesthetic techniques and outcomes are explored, highlighting the significance of non-intubated video-assisted thoracic surgeries in complex thoracic surgeries in patients with vocal cord palsy.

Case report: A 73-year-old lady with a history of left upper lobectomy complicated with postoperative vocal cord palsy was undergoing a right lung wedge resection for suspected recurrent lung cancer under video-assisted thoracoscopy. We proceeded with non-intubated video-assisted thoracic surgery to reduce instrumentation and airway trauma.

Conclusion: Non-intubated video-assisted thoracic surgery is an alternative for one-lung ventilation in patients with vocal cord palsy to reduce airway instrumentation, even in patients with previous contralateral lobectomy. Proper titration of medication, close monitoring, a contingency plan and open communication with the operating team are crucial.

Keywords: Vocal cord palsy, One-lung ventilation, Single-lobe ventilation, NIVATS, Tubeless VATS

Introduction

This novel case report discusses the application of Non-Intubated Video-Assisted Thoracic Surgery (NIVATS) in a patient with pre-existing vocal cord palsy and previous contralateral lung lobectomy.

One-lung ventilation (OLV) is a mainstay in the world of thoracic surgery [1]. Although traditional techniques of double-lumen endobronchial tubes (DLT) and bronchial blockers (BB) can achieve adequate lung isolation in most patients [1], anaesthesiologists are exploring modifications in OLV techniques tailored to different patient groups with the increasing complexities in surgical procedures. While postoperative vocal cord palsy can result in respiratory failure and significant functional limitations such as dysphonia and aspiration [2], a comprehensive airway plan and communication with surgeons are crucial in these patients to reduce further trauma during airway manipulation and surgery in OLV, which is not uncommon with double-lumen endobronchial tubes and bronchial blockers [1].

Case Presentation

A 73-year-old Chinese lady, Ms A, with a history of tuberculosis and lung adenocarcinoma, was admitted for a right lower lobe wedge resection for a 1.1 cm right lung base ground-glass nodule under video-assisted thoracoscopy (VATS). She had a previous left upper lobectomy under VATS in January 2024 for an incidental left upper lobe adenocarcinoma, where one-lung ventilation was achieved with a 7.5 mm ID endotracheal tube and a Fr 9 Univent™ bronchial blocker. However, she had voice hoarseness postoperatively, and flexible laryngoscopy confirmed a left vocal cord palsy. She received injection thyroplasty in April 2024 and completed chemotherapy with alimta and cisplatin in July 2024. Follow-up computed tomography (CT) scan in July 2024 showed a known right lower lobe ground-glass nodule had enlarged to 1.1 cm, suspicious of neoplasm. Therefore, a right lower lobe wedge resection under VATS was scheduled in November 2024.

Preoperative Assessment

Before her second operation, Ms A's lung function test (post-left upper lobectomy) showed a forced vital capacity (FVC) of 1.43 litres (72%), forced expiratory volume (FEV1) of 1.32 litres (91%). Her DLCO was 58%. Her exercise tolerance was three flights of stairs and her Mallampati grading was 3. The surgical plan was sublobar resection, given her history of previous lobectomy and suboptimal lung function. The anaesthetic plan for Ms A, with American Society of Anesthesiologists (ASA) physical status classification system class

[1]Department of Anaesthesiology, Perioperative and Pain Medicine, Queen Elizabeth Hospital, Hong Kong.

Address of Correspondence
Dr. Hoi Ching Annie Chan,
Department of Anaesthesiology, Perioperative and Pain Medicine, Queen Elizabeth Hospital, Hong Kong.
E-mail: chcqeh@gmail.com

Submitted: 28/05/2025; Reviewed: 12/06/2025; Accepted: 14/07/2025; Published: 10/08/2025

DOI: https://doi.org/10.13107/jaccr.2025.v11.i02.274

2, was general anaesthesia with postoperative patient-controlled-analgesia. Speech therapist follow-up showed a slight improvement in her hoarseness after the thyroplasty but still with frequent phonation breaks and dysphagia.

Anaesthetic technique

The initial airway plan was a single-lumen endotracheal tube (SLT) with bronchial blocker or NIVATS, instead of a large bore double-lumen endobronchial tube. Anaesthesia was induced with total intravenous anaesthesia, using intravenous infusion of remifentanil 0.1 mcg/kg/min and target-controlled infusion (TCI) propofol 4.5 mcg/ml with Bispectral Index monitoring (BIS)™ to keep the patient in spontaneous ventilation. Larynx topicalization with 40 mg 10% lignocaine spray was given after the patient was sedated. Video laryngoscopy was performed with size 3 Macintosh blade to confirm a grade 1 larynx, but with a very narrow glottis of less than 1cm in diameter. With the history of vocal cord palsy, there was a high risk of vocal cord damage resulting in bilateral vocal cord palsy even with single-lumen endotracheal tube intubation. Therefore, we performed NIVATS with laryngeal mask airway (LMA) insertion with a size 4 ProSeal™ LMA. Low dose TCI remifentanil of 0.6 mcg/ml and TCI propofol 2 mcg/ml were used for the maintenance of anesthesia. Fiberoptic bronchoscopy was performed through ProSeal™ LMA. LungPoint virtual bronchoscopic navigation was done to the target subsegmental bronchus. The surgeons injected indocyanine-green dye with contrast through a microcatheter, and fluoroscopy confirmed a subsolid nodule in the posterobasal right lower lobe. We then placed the patient in a left lateral bridged position and spontaneous pneumothorax was achieved after incisions for port insertion. Wound infiltration with 7 ml 2% lignocaine with 5mcg/ml adrenaline and 3 ml for right paratracheal vagal nerve block were done. Wedge resection under VAT with 2-port technique was performed, followed by intercostal nerve block with 15 ml 0.5% levobupivacaine. The lungs re-expanded well at the end of the procedure after hemostasis. Patient regained full consciousness with good respiratory effort before LMA was removed. Total surgery time was 2 hours 16 minutes and anaesthesia time was 2 hours 54 minutes. Total blood loss was 200 ml.

Postoperative Course

Ms A was fully conscious with stable hemodynamics and breathing in room air. She was subsequently put on oral oxycodone for 5 days in the general ward. She was weaned off oxygen and the chest drain was removed on postoperative day 3. Her voice was breathy and weak on postoperative day 1 with wound pain. With chest physiotherapy and pain control, her hoarseness improved compared to her preoperative voice. She was discharged on postoperative day 5.

Outcomes

Pathological report returned to be moderately differentiated adenocarcinoma with clear margin. She was started with a 3-year course of adjuvant osimertinib for recurrent lung cancer. Flexible laryngoscopy showed that the left vocal cord was sluggish but the right cord was mobile with good compensation. She had no further dysphagia.

Discussion

Vocal cord palsy is a serious postoperative complication. Early studies have shown that the incidence of post-leftlobectomy/pneumonectomy vocal cord dysfunction is 31%, with a mortality rate of 19% [2]. Postoperative vocal cord paralysis has been reported in 0.043-0.077% patients after general anaesthesia [3, 4], with higher risks in patients >=50 years old, with preexisting hypertension/diabetes or prolonged intubation especially >=6 hours [4]. Mechanism proposed was the compromise of blood supply and direct compression of recurrent laryngeal nerve by the pressurized cuff [4]. While traditional OLV techniques include double-lumen tubes, bronchial blockers and deliberate endobronchial intubation with single-lumen endotracheal tubes, double-lumen tubes have been the most popular choice which allow safe and reproducible intubations with suction and bronchoscopy [5]. However, the incidence of hoarseness is significantly higher after DLT placement (44%) than with bronchial blockers (17%) [1]. It is proposed that the vocal cord could be traumatized by the curved endobronchial lumen in DLTs during intubation [1]. Commonly used DLTs have larger diameters than SLTs which may increase this risk. Endotracheal tubes of sizes 8.5 mm and 7.5 mm ID would correlate to only Fr 32-36 DLTs, which are smaller than DLTs commonly used in adult men and women eg. Fr 37-39 [1, 5]. The incidence of postoperative hoarseness may be related to the size of endotracheal tube used [6]. Another option for OLV would be endotracheal tube with co-axial or independent insertion of bronchial blocker, collapsing the operative lobe/lung for operation [5]. Nevertheless, the insertion of bronchial blockers usually requires an endotracheal tube of at least size 8 mm ID to facilitate effective ventilation with the blocker in-situ [5], which may increase the risk of vocal cord injury in patients with history of glottic stenosis. It is suggested that laryngeal masks (LMA) can reduce the mechanical damage to the larynx and vocal cord [4], hence can be considered in high risk cases. We considered LMA-NIVATS as an alternative in this case to reduce the instrumentation through the glottis, despite the potentially difficult airway.

NIVATS refers to non-intubated video-assisted thoracic surgery in spontaneously breathing patients, without mechanical ventilation and general anaesthesia [7]. It consists of the support of airway and respiration, patient comfort and analgesia, as well as techniques for conversion and cough suppression [8]. The creation of a surgical pneumothorax during spontaneous ventilation results in a decrease in lung volume that permits surgery [9]. There are different protocols for NIVATS in different centres, with level of sedation ranging from conscious to general anaesthesia, with oxygen provided with simple nasal cannula to LMA. Analgesic plan can also range from intravenous analgesics to regional blocks or thoracic epidural catheters [10]. NIVATS have been widely used in procedures involving pleura, lung (eg. wedge resection and lobectomy) and mediastinum (eg. thymectomy) [10]. NIVATS may benefit high risk patients including elderly, severe emphysema, interstitial lung disease and myasthenia gravis where avoiding intubation and mechanical ventilation is considered beneficial [10]. However, it is contraindicated in patients with difficult airway, ASA class >3, hemodynamic instability, morbid obesity, extensive pleural adhesions and previous thoracotomies [9]. NIVATS can be performed with simple / high-flow oxygen nasal

cannula or supraglottic airway without an additional bronchial blocker [8], which allows less instrumentation through the glottis to reduce airway trauma. Furthermore, side effects of general anaesthesia (eg. arrhythmia, cognitive impairment) and mechanical ventilation can be reduced in NIVATS [7]. NIVATS permits a faster postoperative recovery of respiratory muscle functions [10]. It has been reported to decrease operative time (-37 to -42 mins), stress response, chest drain time (-0.3 days) and hospital length of stay (-0.6 to -1.4 days) [8].

Although the risk for vocal cord palsy can be reduced with the use of LMA NIVATS in our case, there are several limitations. Firstly, there is a risk of conversion to intubation with mechanical ventilation in case of massive pleural adhesions and major bleeding intraoperatively [10]. Therefore, effective communication with the surgical team is essential for timely detection of changes in condition. Also the anesthetic team should be vigilant in managing the patient's airway at any time, even with the possibility in lateral decubitus position [10].

Secondly, there could be excessive patient movement and coughing as diaphragmatic contraction is intact in NIVATS and can be stimulated with surgical manipulation [9]. It is reduced by vagal blockade with topical lignocaine, vagal/phrenic nerve block by surgeons or systemic opioids [8]. Thirdly, intraoperative hypoxemia and hypercapnia can be prominent due to respiratory suppression or laryngospasm. Persistent or severe hypoxemia and hypercapnia are indications for conversion to GA [8]. Other indications for GA conversion include uncontrollable cough reflex, unsatisfactory lung collapse and acidosis due to poor ventilation [9]. The conversion rate would be 2.8-10%, from NIVATS to intubation [8]. The patient in our case had a previous left upper lobectomy, so only the left lower lobe was ventilated throughout the surgery, with FiO_2 100%. We experienced transient desaturation and hypercapnia intraoperatively. However, they were responsive to 5-10 cm H_2O of intermittent positive end-expiratory pressure (PEEP) via the LMA to the ventilated lobe to reduce atelectasis. This reinforces the importance of communication with surgeons, as giving PEEP may inflate the operated lung, hindering surgical access [11]. There has been a reported case of successful one-lobe ventilation in patients with history of contralateral lung resection in open surgery under DLT ventilation [11]. Lung isolation techniques with selective lobar blockade and high-frequency jet ventilation to residual lobe have been used in patients with previous contralateral lobectomy in some cases, and expertise in proper lobar blockade and insertion of injection cannula for jet ventilation were required [12]. This case report shows NIVATS can serve as an alternative for OLV even with single lobar ventilation.

Conclusion

As far as we know, this is the first case report of NIVATS for a patient with vocal cord palsy and previous lobectomy. Vocal cord palsy is a challenge to both anaesthetists and surgeons during lung isolation. To reduce potential airway trauma, NIVATS is an alternative in patients with pre-existing vocal cord palsy. Although further study on the consistency of NIVATS in patients with difficult ventilation is still pending, lobar ventilation with NIVATS could be possible with careful monitoring, providing an alternative for patients with history of contralateral lung resection.

Clinical message

- NIVATS is an alternative for one-lung ventilation in patients with vocal cord palsy to reduce airway instrumentation
- Communication with operating team and contingency plan for conversion from NIVATS to GA should be available
- Ventilation for patients with previous contralateral lobectomy could be difficult, but not an absolute contraindication for subsequent NIVATS surgery

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his/her images and other clinical information to be reported in the Journal. The patient understands that his/her name and initials will not be published, and due efforts will be made to conceal his/her identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

References

1. Knoll, Heike; Ziegeler, Stephan; Schreiber, Jan-Uwe; Buchinger, Heiko; Bialas, Patric; Semyonov, Kirill; Graeter, Thomas; Mencke, Thomas. Airway Injuries after One-lung Ventilation: A Comparison between Double-lumen Tube and Endobronchial Blocker. Anesthesiology [Internet]. 2006 Sep 1 [cited 2025 May 16];105(3):471-477. Available from: https://doi.org/10.1097/00000542-200609000-00009
2. Filaire, M; Mom, T; Laurent, S; Harouna, Y; Naamee, A; Vallet, L; Normand, B; Escande, G. Vocal cord dysfunction after left lung resection for cancer. Eur J Cardio Thorac Surg [Internet]. 2001 Oct [cited 2025 May 16];20(4):705-711. Available from: https://doi.org/10.1016/s1010-7940(01)00819-3
3. Lim, Sehun; Kim, Dong-chun; Cho, Kwangrae; Kim, Myoung-hun; Moon, Sungho; Cho, Hakmoo; Ki, Seunghee. Vocal cord paralysis following general anesthesia with endotracheal intubation: a clinical review on 43 cases. Anesth Pain Med [Internet]. 2020 Apr [cited 2025 May 16];15(2):226-232. Available from: https://doi.org/10.17085/apm.2020.15.2.226
4. Kikura, M.; Suzuki, K.; Itagaki, T.; Takada, T.; Sato, S. Age and comorbidity as risk factors for vocal cord paralysis associated with tracheal intubation. Br J Anaesth [Internet]. 2007 Apr [cited 2025 May 16];98(4):524-530. Available from: https://doi.org/10.1093/bja/aem005
5. Ashok, V.; Francis, J. A practical approach to adult one-lung ventilation. BJA Educ [Internet]. 2018 Mar [cited 2025 May 16];18(3):69-74. Available from: https://doi.org/10.1016/j.bjae.2017.11.007

6. David Michael, S; Michael Joshua, B; Jochen Friedrich, D; Bruce Frederick, C. Correlation of Endotracheal Tube Size with Sore Throat and Hoarseness Following General Anesthesia. Anesthesiology [Internet]. 1987 Sep [cited 2025 May 16];67(3):419-421. Available from:

https://doi.org/10.1097/00000542-198709000-00025

7. Tacconi, Federico; Pompeo, Eugenio. Non-intubated video-assisted thoracic surgery: where does evidence stand? J Thorac Dis [Internet]. 2016 Apr [cited 2025 May 16];8(S4):S364—S375. Available from: https://doi.org/10.21037/jtd.2016.04.39

8. Schieren, Mark; Defosse, Jerome. To tube or not to tube: a skeptic's guide to nonintubated thoracic surgery. Curr Opin Anaesthesiol [Internet]. 2021 Feb [cited 2025 May 16];34(1):1-6. Available from: https://doi.org/10.1097/aco.0000000000000946

9. Grott, Matthias; Eichhorn, Martin; Eichhorn, Florian; Schmidt, Werner; Kreuter, Michael; Winter, Hauke. Thoracic surgery in the non-intubated spontaneously breathing patient. Respir Res [Internet]. 2022 [cited 2025 May 16];23(1). Available from: https://doi.org/10.1186/s12931-022-02250-z

10. Gelzinis, Theresa. The Anesthetic Management of Patients Undergoing Nonintubated Video-Assisted Thoracic Surgery. Curr Anesthesiol Rep [Internet]. 2021 Jul 16 [cited 2025 May 16]. Available from: https://doi.org/10.1007/s40140-021-00469-y

11. Reeves, R.; Denner, A.; Nel, L. One-lobe ventilation during contralateral lung resection. Anaesthesia [Internet]. 2010 [cited 2025 May 16];65(7):756-757. Available from:

https://doi.org/10.1111/j.1365-2044.2010.06400.x

12. Yasuda, Manabu; Nakanishi, Ryoichi; Shinohara, Shinji; Mori, Masataka; Ashikari, Syuhei; Oyama, Tsunehiro; Hanagiri, Takeshi. Contralateral thoracoscopic lobectomy in postlobectomy patients. J Thorac Dis [Internet]. 2017 Sep [cited 2025 May 16];9(9):3187-3192. Available from:

https://doi.org/10.21037/jtd.2017.08.107

How to Cite this Article

Chan HCA, Chu WH, Yang XT, Cheung TS, Poon SKA | Non-Intubated Video-Assisted Thoracic Surgery and Lobar Ventilation in a Patient with Vocal Cord Palsy: A Case Report | Journal of Anaesthesia and Critical Care Case Reports | May-August2025; 11(2): 07-10.