

Successful nonintubated uniportal video-assisted thoracoscopic left upper lobectomy: a case report

Sėkminga vienos angos videotorakoskopinė kairio plaučio viršutinė lobektomija neintubuotam pacientui: klinikinis atvejis

Lina Pankratjevaitė¹, Diana Samiatina-Morkūnienė²

¹ Department of Surgery, Medical Academy, Hospital of Lithuanian University of Health Sciences, Eivenių Str. 2, LT-50009 Kaunas, Lithuania

² Department of Thoracic Surgery, Medical Academy, Hospital of Lithuanian University of Health Sciences, Eivenių Str. 2, LT-50009 Kaunas, Lithuania
E-mail: dsamiatina@yahoo.de

¹ Lietuvos sveikatos mokslų universiteto ligoninė, Medicinos akademija, Chirurgijos skyrius, Eivenių g. 2, LT-50009 Kaunas

² Lietuvos sveikatos mokslų universiteto ligoninė, Medicinos akademija, Krūtinės chirurgijos skyrius, Eivenių g. 2, LT-50009 Kaunas
El. paštas: dsamiatina@yahoo.de

Background

Video assisted thoracic surgery (VATS) started to spread worldwide over the past twenty years. It had developed from three ports to uniportal VATS. VATS provides less pain and shorter recovery time compared with conventional thoracotomy. Moreover, major thoracoscopic lungs resections can be performed on a nonintubated patient.

Case report

We report a case of a 68-year-old patient with a non-small cell lung cancer who underwent a successful nonintubated uniportal VATS left upper lobectomy for the first time in the history of Lithuania and the Hospital of Lithuanian University of Health Sciences.

Conclusions. Nonintubated uniportal VATS lobectomy for cancer is a safe and effective procedure.

Key words: nonintubated patient, video assisted thoracic surgery, uniportal VATS, lobectomy.

Ižanga

Videotorakoskopinė chirurgija (VATS) visame pasaulyje pirmuosius žingsnius žengė daugiau nei prieš dvidešimt metų. Įprastinė trijų angų VATS buvo patobulinta iki vienos angos VATS. Pacientai, kuriems atliktos minimaliai invazinės operacijos, jaučia mažesnę pooperacinį skausmą, greičiau sveiksta. Be to, didelės torakoskopinės plaučių rezekcijos gali būti atliekamos ir neintubuotiems pacientams.

Klinikinis atvejis

Lietuvos sveikatos mokslų universiteto ligoninėje pirmą kartą Lietuvos istorijoje sėkmingai atlikta vienos angos videotorakoskopinė kairė viršutinė lobektomija 68 metų pacientui, sirgusiam nesmulkiašteliniu plaučių vėžiu.

Išvados

Neintubuotam pacientui atlikta vienos angos VATS lobektomija, esant vėžio pažeistai plaučio skilčiai, yra saugi ir efektyvi operacija.

Reikšminiai žodžiai: neintubuotas pacientas, videotorakoskopinė chirurgija, vienos angos VATS, lobektomija

Introduction

Traditional thoracotomy was used for treating thoracic diseases for many years. But in 1990s, video assisted thoracic surgery (VATS) has made a revolution [1]. Thoracic surgeons started to perform surgeries through the few small incisions in the chest. The conventional three ports VATS progressed to uniportal VATS [2]. VATS has a lot of advantages compared with the classical thoracic surgery. VATS is associated with less invasive injury of the intercostal space because it does not require any rib spreading [3], it characterizes less postoperative pain [4, 5]. After VATS, patients stay in the hospital shorter and their recovery period is faster compared with conventional open surgery [3]. VATS group patients lost less blood, too [6]. Moreover, VATS lobectomy is a safe and effective procedure in treating lung cancer [5–8].

Furthermore, thoracoscopic major pulmonary resection can be performed on a nonintubated person. The initial VATS pulmonary lobectomy was described in 1992 [9]. The first nonintubated VATS lobectomy was reported in 2007 [10]. The first uniportal VATS lobectomy under spontaneous ventilation was performed in 2014 [11]. Intubated general anaesthesia is often associated with postoperative nausea and vomiting [11], postoperative throat discomfort, such as cough or pain [12], artificial ventilation-induced lung injury [13, 14], residual neuromuscular blockage [15], delayed postoperative recovery [16]. The surgery on nonintubated patients prevents from the general anaesthesia and intubation-related complications.

We report a case of a 68-year-old patient with a non-small cell lung cancer who underwent a successful nonintubated uniportal VATS left upper lobectomy for the first time in the history of the Hospital of Lithuanian University of Health Sciences (LUHS). The surgery was performed by thoracic surgeon from Spain Diego Gonzalez-Rivas and local thoracic surgeons.

Case report

A 68-year-old male was consulted by pulmonologists for dry cough, dizziness. His past medical history was significant for right hemicolectomy one and a half year ago because of ascendant colon tumour (pT4aN1aM0, G2 st. IIIB). After that, he got eight courses of adjuvant chemotherapy by FOLFOX scheme. The patient was a smoker for more than 45 years (smokes 20 cigarettes per day). During physical examination his blood pressure was 130/80 mmHg, heart rate 80 times per min. There was no pathologic sound in auscultation of the lungs. Blood laboratory findings revealed mild anaemia (red blood cells (RBC) $3.52 \times 10^{12}/l$, haemoglobin (HGB) 119g/l), other was within normal limits (white blood cells (WBC) $4.01 \times 10^9/l$, platelets (PLT) $189 \times 10^9/l$). His body mass index was 24.5 kg/m^2 . Chest x-ray revealed a $5.5 \times 4.0 \times 3.0 \text{ cm}$ size tumour in left 1-2 segments (Figure 1). Then fibrobronchoscopy was done and the tumour biopsy was taken (Figure 2). Histopathological examination of the biopsy material has shown an infiltrative squamous cell carcinoma, G3. After that computed tomography scan was done (Figure 3). It demonstrated a $4.0 \times 2.5 \times 2.4 \text{ cm}$ size tumour in the left lung upper lobe. Then positron emission tomography / computed tomography has been performed. It specified tumour in the left upper lobe (Figure 4). A tumorous infiltration which extended to the front till the parietal pleura was observed. Tumour accumulated Fluorodeoxyglucose (FDG). Mediastinal lymph nodes were small and their accumulation of FDG was minimal.

The patient was proposed for nonintubated uniportal VATS left upper lobectomy. The patient was under spontaneous ventilation during the operation: nasal cannulas were used to have a control of the airway. Propofol and Remifentanil were infused for sedation and anaesthesia during the surgery. The patient was placed



Figure 1. Chest x-ray is showing solid mass in left lung S1-2

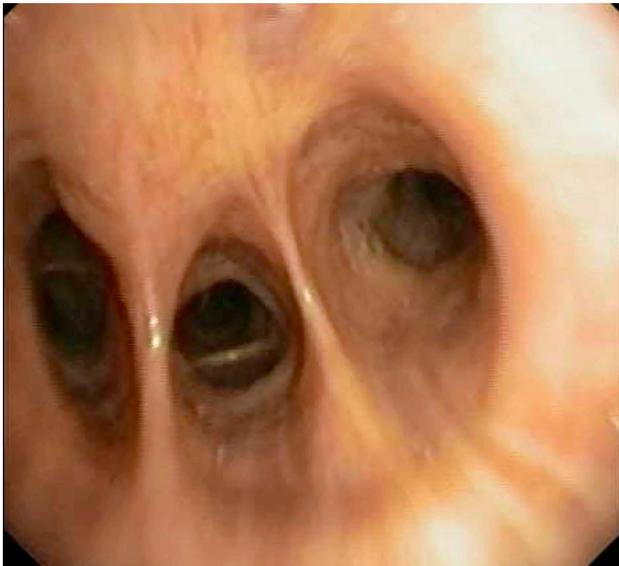


Figure 2. Image during the bronchoscopy

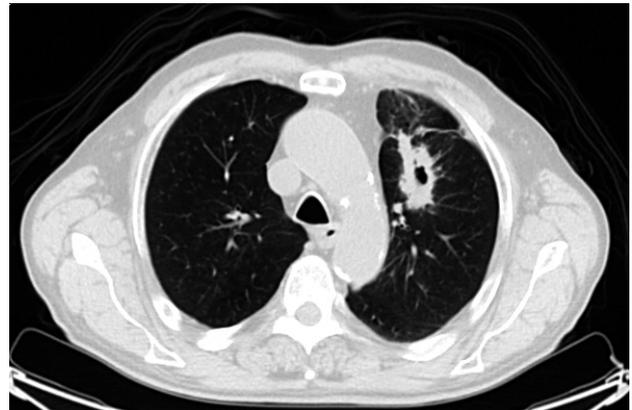


Figure 3. Computed tomography scan demonstrated tumour in the left lung upper lobe

in a right-lateral position. The operation field was prepared routinely. The skin and the intercostal space were infiltrated with local anaesthetic Bupivacaine. A 3-cm length incision was made in the fifth intercostal space in the anterior axillar line. 10-mm thoracoscope with other instruments were introduced through the incision. The pleural cavity was explored. There were few adhesions found, which were cut. After that, a left upper lobectomy and lymph node dissection was performed (Figure 5). A single chest tube was placed. The total surgical time was 100 minutes. There were no complications du-

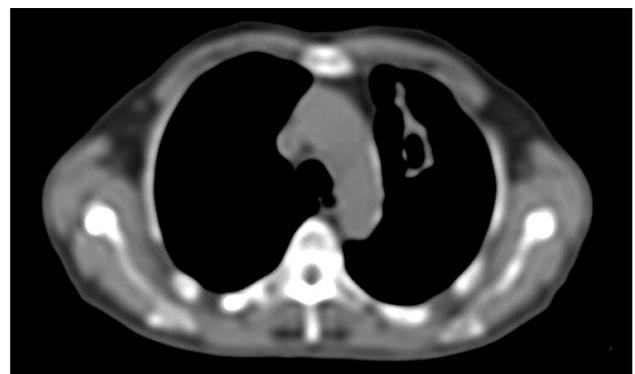


Figure 4. The FDG accumulating tumour in the left upper lobe was specified by positron emission tomography / computed tomography

ring or after the surgery. The chest tube was removed on the third day (Figure 6). Fourth day after the operation the patient left the hospital.

The pathological examination of surgical material has revealed 5cm diameter infiltrative squamous cell carcinoma with lymph node involvement (a total of six lymph nodes were studied, pT2aN2R0, G2).

The first nonintubated uniportal VATS left upper lobectomy in the Hospital of Lithuanian University

of Health Sciences was performed by thoracic surgeon from Spain Diego Gonzalez-Rivas and the local thoracic surgeons in November 2015. The sedation of the patient during the surgery was controlled by anaesthesiologist from Spain Humberto Aymerich Cano with colleagues from Lithuania.

Discussion

Video assisted thoracic surgery (VATS) started to spread worldwide over the past twenty years [1]. Surgeon thoracoscopically can do a lot of procedures: to take biopsy, to do small resection of the lung, to remove one lobe of the lung or even to do pneumonectomy. The first VATS pulmonary lobectomy was reported in 1992 [9]. Since then, thousands of VATS lobectomies were performed worldwide. VATS was progressing very fast. In the beginning, conventional three ports VATS was changed to needlescopic, later to two ports and finally to uniportal VATS [2].

Anaesthesiology is another area where thoracic surgery is progressing. Some surgeons are doing VATS for nonintubated patients. First uniportal VATS lobectomy for nonintubated patient was performed in 2014 [11]. Facial masks or nasal cannulas are used to have a control of the airway. The nonintubated procedures help to avoid with general anaesthesia, tracheal intubation and mechanical one-lung ventilation-related complications, such as respiration depression, postoperative nausea, and vomiting [11], postoperative throat discomfort (cough or pain) [12], ventilation-induced lung injury [13, 14], residual neuromuscular blockage [15], delayed postoperative recovery [16], etc. According to the literature, mechanical lung ventilation causes lung injury in about 4% of major lung resections and mortality rate in such cases is very high – 25% [17]. Moreover, anaesthesia without intubation is associated with short hospital stay and the ability to discharge patients from the hospital on the same day after the surgical treatment [10]. However, special selection criteria must be applied before nonintubated VATS major pulmonary resections can be performed on a patient: the doctor has to evaluate indications and contraindications, patients exclusion criteria, the most appropriate anaesthetic technique for the surgical procedure, criteria for the conversion to the general anaesthesia (a patient might need an urgent

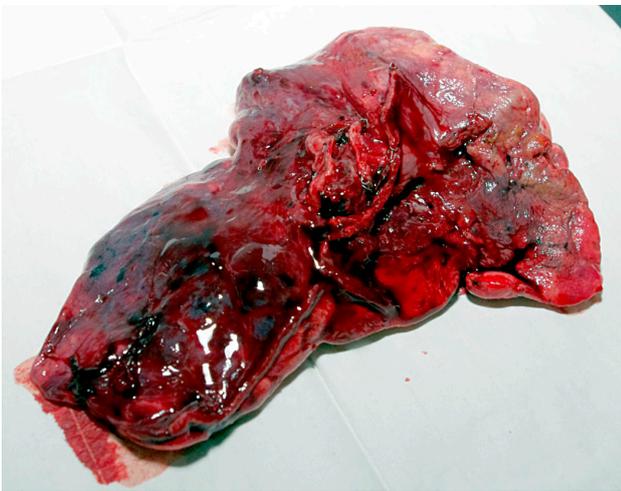


Figure 5. Removed upper left lobe with tumour



Figure 6. The patient with chest tube

intubation during the surgery) [17]. In addition, during nonintubated VATS, the surgeon might have technical problems caused by patient movements during the surgery, patient coughing or diaphragmatic displacement [17]. Because of the above mentioned reasons such procedures must be performed only by experienced anaesthesiologists and thoracic surgeons who are skilled in VATS [11].

When uniportal VATS left upper lobectomy is performed, the utility incision is usually placed in the 5th intercostal space, without any trocar or rib spreader. It is recommended to divide the arterial trunks before dissecting the vein – it helps easily expose the vein [18]. The bronchus can be dissected after the main blood vessels are divided and stapled [18].

According to the literature, VATS is effective as thoracotomy for treating many thoracic diseases [12]. Moreover, it has a lot of advantages. VATS is associated with less blood loss [6], with less postoperative pain [4, 5], shorter stay in hospital, and faster recovery period compared with conventional thoracotomy [3]. Furthermore, in comparison with conventional three ports

VATS, uniportal VATS is associated with less postoperative pain, postoperative stay and hospital cost [19]. Worldwide literature shows that VATS lobectomy is a safe and effective procedure for local lung cancer treatment [5–8]. Additionally, uniportal VATS lobectomy compared with conventional VATS showed better safety and efficacy in the surgical resection of non-small cell lung cancer [20].

Conclusions

This paper presents the initial successful nonintubated uniportal VATS lobectomy in the history of Lithuania. Nonintubated uniportal VATS procedures are safe and effective. It lets to avoid the general anaesthesia, tracheal intubation, and mechanical ventilation-related complications. Moreover, these patients recover faster and leave hospital earlier than those who undergone traditional thoracotomy. We hope our example of successfully performed uniportal VATS lobectomy for nonintubated patient will encourage Lithuanian surgeons to start doing such surgery in daily work.

REFERENCES

1. He J. History and current status of mini-invasive thoracic surgery. *J Thorac Dis* 2011; 3: 115–21. DOI: 10.3978/j.issn.2072-1439.2010.03.01
2. Sihoe ADL. The evolution of minimally invasive thoracic surgery: implications for the practice of uniportal thoracoscopic surgery. *J Thorac Dis* 2014; 6(S6): S604-S617. DOI: 10.3978/j.issn.2072-1439.2014.08.52
3. Dziedzic D, Orłowski T. The role of VATS in lung cancer surgery: current status and prospects for development. Hindawi Publishing Corporation *Minimally Invasive Surgery* Volume 2015, Article ID 938430, 6 pages <http://dx.doi.org/10.1155/2015/938430>
4. Alam N, Flores RM. Video-assisted thoracic surgery (VATS) lobectomy: the evidence base. *JLS* 2007; 11: 368–74.
5. McKenna RJ Jr, Houck W, Fuller Beeman C. Video-assisted thoracic surgery lobectomy: experience with 1,100 cases. *Ann Thorac Surg* 2006; 81: 421–6.
6. Higuchi M, Yaginuma H, Yonechi A, Kanno R, Ohishi A, Suzuki H, Gotoh M. Long-term outcomes after video-assisted thoracic surgery (VATS) lobectomy versus lobectomy via open thoracotomy for clinical stage IA non-small cell lung cancer. *Journal of Cardiothoracic Surgery* 2014; 9: 88. <http://www.cardiothoracicsurgery.org/content/9/1/88>.
7. Onaitis MW, Petersen RP, Balderson SS, Toloza E, Burfeind WR, Harpole DH Jr, D'Amico TA. Thoracoscopic lobectomy is a safe and versatile procedure: experience with 500 consecutive patients. *Ann Surg* 2006; 244: 420–5.
8. Swanson SJ, Herndon JE II, D'Amico TA, Demmy TL, McKenna RJ Jr, Green MR, Sugarbaker DJ. Video-assisted thoracic surgery lobectomy: report of CALGB 39802 – a prospective, multi-institution feasibility study. *J Clin Oncol* 2007; 25 (31): 4993–7.
9. Lewis RJ, Caccavale RJ, Sisler GE, Mackenzie JW. One hundred consecutive patients undergoing video-assisted thoracic operations. *Ann Thorac Surg* 1992; 54: 421–6.
10. Al-Abdullatif M, Wahood A, Al-Shirawi N, Arabi Y, Wahba M, Al-Jumah M, Al-Sheha S, Yamani N. Awake anaesthesia for major thoracic surgical procedures: an observational study. *Eur J Cardiothorac Surg* 2007; 32: 346–50.
11. Gonzalez-Rivas D, Fernandez R, de la Torre M, Bonome C. Uniportal video-assisted thoracoscopic left upper lobectomy under spontaneous ventilation. *J Thorac Dis* 2015; 7(3): 494–5. DOI: 10.3978/j.issn.2072-1439.2015.01.05
12. Li S, Cui F, Liu J, Xu X, Shao W, Yin W, Chen H, He J. Nonintubated uniportal video-assisted thoracoscopic surgery for

primary spontaneous pneumothorax. *Chin J Cancer Res* 2015; 27(2): 197–202. DOI: 10.3978/j.issn.1000-9604.2015.03.01

13. Gothard J. Lung injury after thoracic surgery and one lung ventilation. *Curr Opin Anaesthesiol* 2006; 19: 5–10.

14. Whitehead T, Slutsky AS. The pulmonary physician in critical care * 7: ventilator induced lung injury. *Thorax* 2002; 57: 635–42.

15. Murphy GS, Szokol JW, Marymont JH, Greenberg SB, Avram MJ, Vender JS. Residual neuromuscular blockade and critical respiratory events in the postanesthesia care unit. *Anesth Analg* 2008; 107(1): 130–7.

16. Gal TJ. Bronchial hyperresponsiveness and anesthesia: physiologic and therapeutic perspectives. *Anesth Analg* 1994; 78: 559–73.

17. Gonzalez-Rivas D, Bonome C, Fieira E, Aymerich H, Fernandez R, Delgado M et al. Non-intubated video-assisted

thoracoscopic lung resections: the future of thoracic surgery? *Eur J Cardiothorac Surg* 2015. DOI:10.1093/ejcts/ezv136.

18. Fieira Costa E, Delgado Roel M, Paradela de la Morena M, Gonzalez-Rivas D, Fernandez-Prado R, de la Torre M. Technique of uniportal VATS major pulmonary resections. *J Thorac Dis* 2014; 6(S6): S660–S664. DOI: 10.3978/j.issn.2072-1439.2014.10.21

19. Jutley RS, Khalil MW, Rocco G. Uniportal vs standard three-port VATS technique for spontaneous pneumothorax: comparison of post-operative pain and residual paraesthesia. *Eur J Cardiothorac Surg* 2005; 28: 43–6.

20. Shen Y, Wang H, Feng M, Xi Y, Tan L, Wang Q. Single-versus multiple-port thoracoscopic lobectomy for lung cancer: a propensity-matched study. *Eur J Cardiothorac Surg* 2015. DOI:10.1093/ejcts/ezv358.