

Research article

DOI: 10.59715/pntjimp.3.2.10

## Early outcome of complete thoracoscopic lobectomy in non-small lung cancer in Binh Dan Hospital

Nguyen Van Viet Thanh<sup>1,2</sup>, Tran Cong Quyen<sup>2</sup>, Ho Huynh Long<sup>2</sup>, Ly Bao Duy<sup>2</sup>, Vu Hoang Minh Tin<sup>2</sup>, Tran Minh Thien<sup>2</sup>

<sup>1</sup>Department of General Surgery of Pham Ngoc Thach Medical University

<sup>2</sup>Thoracic and Thyroid Surgery Department, Binh Dan Hospital

### Abstract

**Objective:** Access early outcomes of complete thoracoscopic lobectomy in non-small lung cancer.

**Subject and method:** Retrospective description. 50 patients had performed complete thoracoscopic lobectomy to treat Non-small cell lung cancer in Thoracic and Thyroid department, Binh Dan Hospital from 2015 to 2022.

**Result:** Average age: 63,32 ± 9,88 years old. Male: female: 1.7: 1, elder, smoking are risk factors. Average operation time was 179.9 minutes. Average blood loss was 130.6 ml. Bleeding complication in surgery was 2%. The average complications was 12 %: postoperative pneumonia and gas leakage. No serious complications or death. Postoperative pain was quite low. The average length of hospital stay were 8.6 days. Good treatment result: 92 %.

**Conclusion:** Complete thoracoscopic lobectomy in non-small lung cancer is safe and proper treatment, few complications, good early results: rapid recovery, less pain after surgery.

**Key words:** Endoscopic thoracic surgery, complete thoracoscopic lobectomy, non-small cell lung cancer, lung cancer.

**Received:** 15/12/2023

**Revised:** 20/02/2024

**Accepted:** 20/4/2024

**Author contact:**

Nguyen Van Viet Thanh

**Email:** nguyenvanvietthanh

@gmail.com

**Phone:** 0977903015

### 1. INTRODUCTION

Lung cancer (LC) is a common type of cancer, causing the highest mortality worldwide and in Vietnam. Approximately 1.8 million people are diagnosed and 1.59 million people die from LC each year. In Vietnam, there are over 20,000 new LC patients detected annually. Non-small cell lung cancer (NSCLC) accounts for 75 - 80% of LC patients. Early detection of the disease and timely treatment improve prognosis and prolong survival. Definitive treatment for NSCLC is surgery in early stages, with a 5-year survival rate of up to 40%, and some studies have shown a 5-year survival rate of 50-90%. However, the majority of lung resection surgeries for both benign and malignant lung diseases are currently performed using open or minimally invasive thoracotomy. In the United States and England, in the period from 2000 to

2010, video-assisted thoracoscopic surgeries accounted for 5 to 20%. In the years around 2016, video-assisted thoracic surgery (VATS) became widely performed in Western countries such as the United States, Japan, and others. However, most of these procedures were VATS with small incisions combined with thoracotomy to create an operating channel [1], [2], [4]. There hasn't been extensive research on the outcomes of complete thoracoscopic lobectomy in treating thoracic diseases in general and non-small cell lung cancer (NSCLC) in particular. Therefore, we conducted this study with the aim of evaluating the early outcomes of complete thoracoscopic lobectomy in treating NSCLC. Through our research objectives, we aim to assess the safety and early outcomes of complete thoracoscopic lobectomy in treating stage I, II, and IIIA NSCLC.

## 2. SUBJECT AND METHOD

### Subject

Fifty patients underwent complete thoroscopic lobectomy (CTL) for the treatment of non-small cell lung cancer (NSCLC) at the Thoracic and Thyroid Surgery Department of Binh Dan Hospital from September 2015 to September 2022.

### Method

Retrospective, case series description.

**Selection criteria:** Localized non-metastatic stage of lung cancer (M0); pTNM classification I, II, IIIA (T3-4, N0-1) based on AJCC 8 (2017); Patients meeting the above criteria were selected for complete thoroscopic lobectomy (CTL) preoperatively. The surgical method involved CTL with lymph node dissection of N1 segment in the lung and removal of at least 3 lymph nodes in the mediastinum; Postoperative pathological results indicated non-small cell lung cancer (NSCLC) (adenocarcinoma, squamous cell carcinoma, bronchial gland carcinoma, large cell carcinoma).

**Data analysis:** data collected from the study's medical records will be encoded and analyzed using statistical software SPSS 22.

## 3. RESULTS AND DISCUSSION

### \* Pathological characteristics of patients in the study.

The average age was  $63.32 \pm 9.88$  years. The oldest patient was 87 years old, and the youngest was 43 years old at the time of surgery. Males accounted for 62% (31 patients), which is 1.7 times higher than females. Fifty-four percent (27 patients) were smokers, with an average of  $14.33 \pm 4.02$  pack-years. Sixty-four percent of patients (32 patients) were incidentally diagnosed, while 36% (18 patients) were admitted with varying degrees of cough and chest pain.

Pre-existing medical conditions included: type 2 diabetes (16%), coronary artery disease or precursor (14%), hypertension (30%), chronic kidney disease (2%). Previous surgical history included: gallbladder cancer (2.03%), gastric cancer (2.03%), anal cancer (2.03%), rectal cancer (23.94%).

The average diameter of the tumor ranged  $35 \pm 13$  mm. Regarding the location of the

lung tumors: 16 patients (32%) had tumors in the right upper lobe, 15 patients (30%) had tumors in the left lower lobe, 9 patients (18%) had tumors in the right middle lobe, and tumors in both left upper lobe and right middle lobe accounted for 10% of patients.

Twenty-eight percent of patients underwent bronchoscopy, and 54% underwent computed tomography-guided lung biopsy. Preoperative pathological diagnosis showed squamous cell carcinoma in 14.8% of cases, adenocarcinoma in 59.3%, and inflammatory tissue in 25.9%. Postoperative pathological diagnosis revealed squamous cell carcinoma in 20% of cases, adenocarcinoma in 52%, and bronchial gland carcinoma in 28%. Among the adenocarcinoma group, 26 patients had immunohistochemistry results showing TTF1(+), CK 7(+), CK20(-), and CDX2(-), indicating primary glandular epithelial carcinoma originating from the lung.

### The correlation between cancer markers and pathology in the study

Thirty-six patients (72%) had elevated serum Cyfra21.1 levels, while fifteen (30%) had elevated CA19.9 values. Fifteen patients displayed high levels of Cyfra21.1 and CA19.9. Elevated levels of both cancer markers indicate the existence of non-small cell lung cancer (NSCLC), especially in adenocarcinoma and squamous cell carcinoma forms. Serum Cyfra21.1 levels were statistically substantially linked with CA19.9 levels and tumor size in identifying non-small cell lung cancer (NSCLC), notably in the glandular epithelial carcinoma group, according to the study by authors S. Lee and Yuki Sato.

### \* Assessing the safety of complete thoroscopic lobectomy (CTL) in treating stage I, II, and IIIA non-small cell lung cancer (NSCLC)

#### The indication for complete thoroscopic lobectomy in the treatment of lung cancer and the surgical procedure performed

Early stage I, II, IIIA non-small cell lung cancer (NSCLC) (T3-4 N0-1) without metastasis to the mediastinal lymph nodes or below the trachea (N2) is an absolute indication for surgery [4], [6]. The study we performed included 50 patients, all of whom were indicated for surgery

in early stages I, II, or IIIA (T3-4, N0-1), with stage IIIA accounting for the majority (17 patients, 34%), followed by stages IA and IIB (26% and 24%, respectively). We successfully performed complete thoracoscopic lobectomy in 98% of patients (with a high success rate in the right upper and left lower lobe at 9 and 8 patients, respectively), with a single patient requiring conversion to open surgery for lower right lobe lobectomy due to bleeding.

To treat non-small cell lung cancer (NSCLC), author N. Stephens recommends a complete thoracoscopic lobectomy with lymph node dissection of N1 stations and removal of at least 3 lymph nodes in the mediastinum. In our study, all cases of complete thoracoscopic lobectomy were conducted using this approach. The postoperative pathological investigation revealed no occurrences of metastases to the N2 lymph nodes [2]

As a result, for my study, selecting patients for complete thoracoscopic lobectomy in stages I, II, and IIIA (T3-4, N0-1) was appropriate in terms of surgical indication and oncological considerations when selecting the method of complete thoracoscopic lobectomy to treat early-stage non-small cell lung cancer.

#### **Bleeding volume, operation time**

The volume of blood loss and duration of operation are considerations in determining the safety and practicality of the complete thoracoscopic lobectomy (CTL) procedure. Increased blood loss can lead to complications during and after surgery, such as organ failure or cardiovascular events. Longer surgical duration increases the patient's risk of surgical and anesthesia-related problems, postoperative lung collapse, mucus retention resulting in pneumonia, prolonged respiratory and ventilator support post-surgery, and postoperative mortality

Our study's average blood loss was 130.6 milliliters. There was one case of intraoperative bleeding, resulting in a blood loss of 500 mL. The average operation time was 179.9 minutes. Similarly, McKenna (blood loss 150 ml, surgical time not recorded), Khalid Amed (100 ml, 204 minutes), and Nguyen Hoang Binh (90 ml, 216 minutes) all reported shorter surgical times and similar blood loss.

#### **Conversion to open surgery and postoperative complications.**

**Postoperative air leaks complications (PAL):** Complete thoracoscopic lobectomy (CTL) uses appropriate stapler techniques adapted to each kind of tissue and bronchus, decreasing postoperative air leak issues from both the lung parenchyma and the airways. The PAL rate in my study was 6 out of 50 participants, or 12%. There were no reports of bronchopleural fistula (BPF) problems. Bryan A. Whitson reported that PAL rates following open surgery are 15%, and prolonged PAL is 5% [3]. Our study also yielded similar results.

**Postoperative pneumonia:** The incidence of postoperative pneumonia is decreasing, with rates ranging from 0.15 to 2.9%. In our study, postoperative pneumonia occurred in six patients (12%), with mild severity and stable care in internal medicine. This result is consistent with Bryan A. Whitson and colleagues' report of a 13.2% incidence of postoperative pneumonia in patients experiencing open lobectomy for non-small cell lung cancer (NSCLC). This group of patients had a history of smoking more than 15 packs.year, which corresponds to risk factors for postoperative pneumonia, such as impaired lung function, smoking, respiratory infection, chronic obstructive pulmonary disease, age over 75, obesity, and post-operative pain. [5]

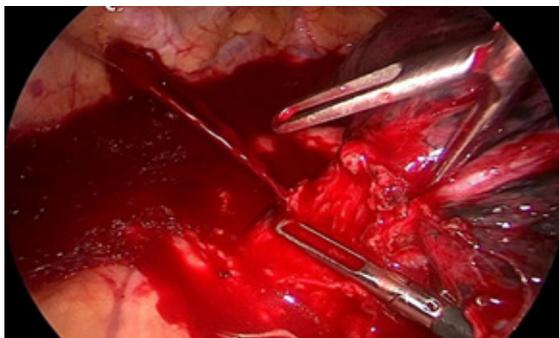
**Postoperative surgical site infection complications:** There were no postoperative surgical site infection complications, nor were there any subcutaneous emphysema complications, as in open surgery or VATS with small incisions. Open surgery or VATS using minor incisions: The small opening used for observation and manipulation during open surgery or VATS can raise the risk of infection, bleeding, or chronic pain by damaging the intercostal neurovascular bundles. This is one of the significant benefits of complete thoracoscopic lobectomy over minor incision VATS or open surgery.

**Conversion to open surgery:** The rate of conversion to open surgery after a complete thoracoscopic lobectomy ranges between 2-6%. In McKenna's study 28 of 251 patients receiving complete thoracoscopic lobectomy

were converted to open surgery, accounting for 2.5%, due to hemorrhage during pulmonary artery dissection [7]. In our analysis, there was one case (2%).

#### **Factors affecting the occurrence of complications in complete thoracoscopic lobectomy.**

The incidence of postoperative pulmonary



**Figure 1.** Intraoperative bleeding complication (Source: Binh Dan Hospital)

#### **\*Assessment of early outcomes of complete thoracoscopic lobectomy in the treatment stage I, II, and IIIA Non-small cell lung cancer.**

##### ***The duration of chest tube drainage, postoperative recovery, and hospital discharge***

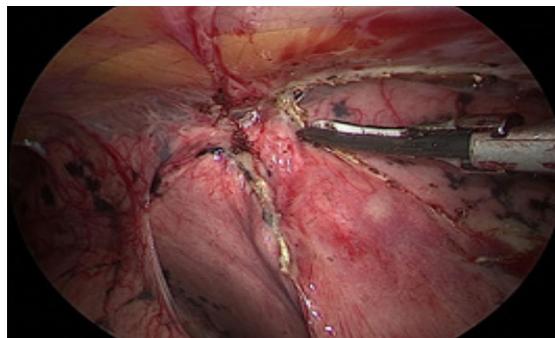
Prolonged chest tube drainage (CTD) can result in consequences such as pneumonia, tube site infections, and chronic pain. With adequate lung expansion and no surgical complications, the conditions are ideal for CTD removal early. Complete thoracoscopic lobectomy has this advantage over open surgery or VATS with minimal incisions. CTD can be removed earlier than open surgery or VATS lobectomy, according to the study by Bryan A. Whitson and Nicholas Stevens [2], [3]. On average, the chest tubes will be removed after 5.0 days. The average postoperative hospital stay is shortened to 8.6 days.

##### ***The level of postoperative pain and pain at discharge***

The author Nicholas Stephens utilized the VAS scale to assess postoperative pain: Patients who underwent a complete thoracoscopic lobectomy reported lower VAS pain levels and required less pain medication. On the first post-operative day, patients reported an average pain level of  $4.00 \pm 1.01/10$ . The average level

air leak complications in non-adherent lung patients ( $5/33 = 15\%$ ) is higher than in the group of adherent lung patients ( $1/11 = 9.1\%$ ).

Patients with incomplete interlobar fissures have a greater rate of postoperative pulmonary air leak than those with visible interlobar fissures (27.3% and 9.1%, respectively).



**Figure 2.** Natural lung adhesion (Source: Binh Dan Hospital)

of pain at discharge was  $0.84 \pm 0.79/10$ . This is explained by the smaller incisions used in complete thoracoscopic lobectomy, which cause less tissue trauma, a lower inflammatory response, and no damage to the ribs, costal joints, or thoracic vertebrae. Synthesizing evidence from numerous trials demonstrates a reduction in pain after complete thoracoscopic lobectomy compared to open surgery not only in the early postoperative period but also up to one year after surgery [2].

##### ***Early outcomes after one month of surgery.***

To assess the results and safety of complete thoracoscopic lobectomy (CTL), we evaluated the early outcomes of patients one month after surgery: regarding postoperative complications occurring within one month, accompanied by functional symptoms when patients were discharged home according to the Clavien and Anthony Yim classification of outcomes. Results were categorized as good when patients had no or minor complications, along with no abnormal functional symptoms, accounting for 36 cases, equivalent to 92% of the total surgeries [8]. This assessment partially indicates the favorable early outcomes of CTL in treating non-small cell lung cancer, with few complications and no mortality

In terms of oncology, cases receiving complete thoracoscopic lobectomy (CTL) were chosen using appropriate surgical approaches for patients in the specified CTL group, assuring the oncological suitability of this strategy. However, our study's assessment of survival prognosis, metastasis rate, and recurrence in LC patients needs to be revised, necessitating additional research with a bigger sample size and longer follow-up length.

#### 4. CONCLUSION

Advanced age and smoking are risk factors for lung cancer, especially non-small cell lung cancer. Elevated serum levels of Cyfra21.1 and CA 19.9 are positively correlated and increase with tumor size

Complete thoracoscopic lobectomy can be safely performed in patients with early-stage lung cancer, stages I, II, and IIIA (T3-4, N0-1), without involvement of hilar lymph nodes blocking N2. The average complication rate is 12%, with no major complications or deaths. The surgery lasts only about 179.9 minutes on average, and blood loss is negligible. The risk of surgical problems and conversion to open surgery after complete thoracoscopic lobectomy increases with certain characteristics that must be considered during surgery, such as unclear interlobar fissures. Complete thoracoscopic lobectomy can still be performed in cases of adherent lungs.

Complete thoracoscopic lobectomy efficiently treats early-stage NSCLC (stages I, II, and IIIA, T3-4, N0-1) with good early results. Patients normally recover quickly, with an average of 5 days till their chest tubes are removed; the average postoperative hospital stay is 8.6 days. They have low post-operative pain, with an average pain level of 4/10 on the first day and 1/10 at discharge.

Patients' function and activity return to normal within one month of surgery, with no severe problems documented, such as loss of capacity to work, organ dysfunction, or death.

#### REFERENCES

1. Vu Huu Vinh, Nguyen Van Khoi (2013), “Cắt thùy phổi nội soi – đường mổ và khả năng ứng dụng”, Vietnam Journal of Surgery and Endolaparosurgery, 1 (3), pp. 46-50.
2. N. Stephens, D. Rice, A. Correa, W. Hoffstetter, (2014), “Thoracoscopic lobectomy is associated with improved short-term and equivalent oncological outcomes compared with open lobectomy for clinical Stage I non-small-cell lung cancer: a propensity-matched analysis of 963 cases†”, European Journal of Cardio-Thoracic Surgery 46 pp. 607-613.
3. Bryan A. Whitson, Shawn S. Groth, Susan Duval, Scott J Swanson, (2008), “Surgery for Early-Stage Non-Small Cell Lung Cancer: A Systematic Review of the Video-Assisted Thoracoscopic Surgery Versus Thoracotomy Approaches to Lobectomy”, Ann Thorac Surg 2008, 86 pp.:2008-2018.
4. F. Al-Shahrabani, D. Vallbohmer, S. Angenendt, W. T. Knoefel, (2014), “Surgical strategies in the therapy of non-small cell lung cancer”, World J Clin Oncol, 5 (4), pp. 595-603.
5. J. Chikwe, Athanasiou Thanos, (2007), Complications of cardiothoracic surgery, Surgical complications: Diagnosis and Treatment. Editors Nadey S Hakim, Vassilios E Papalois , 1rst, Imperial College Press. London, pp. 245-300.
6. A. L. McGuire, W. M. Hopman, D. Petsikas, K. Reid, (2013), “Outcomes: wedge resection versus lobectomy for non-small cell lung cancer at the Cancer Centre of Southeastern Ontario 1998-2009”, Can J Surg, 56 (6), pp. E165-170.
7. R. J McKenna, Mahtabifard Ali , Pickens Allan , usuanco Donato, (2007), “Fast-Tracking After Video-Assisted Thoracoscopic Surgery Lobectomy, Segmentectomy, and Pneumonectomy”, Ann Thorac Surg, 84 pp. 1663-1668.
8. Anthony P. C. Yim, Kai-ming Ko, Chan-chung Ma, Wing-shun Chau, et al, (1996), “Thoracoscopic Lobectomy for Benign Diseases”, CHEST, 109 (2), pp. 554-556.