

Research article

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## Early outcome of complete thoracoscopic in pulmonary metastasectomy from colorectal cancer in Binh Dan Hospital

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### Abstract

**Objective:** Access early outcomes of complete thoracoscopic in pulmonary metastasectomy from colorectal cancer.

**Subject and method:** Retrospective description. 12 patients had performed complete thoracoscopic in pulmonary metastasectomy from colorectal cancer in Thoracic and Thyroid department, Binh Dan Hospital from 2017 to 2022

**Result:** Average age:  $62,67 \pm 8,15$  years old. Male: female ratio: 5: 1. Rectal cancer is the most common type of primary cancer, accounting for 75% of cases (9 of 12 patients). The interval between resection of the primary tumor and the diagnosis of lung metastasis (the “disease-free interval” or “DFI”) was  $\geq 24$  months in 10 patients (83.3%) and was  $< 24$  months in 2 patients (16.7%). The mean disease-free time was 35 months. 10 patients who had only one pulmonary metastasis underwent complete thoracoscopic lobectomy, and 2/12 (17%) patients who were diagnosed with having more than one metastasis (two metastases in the lower and middle lobes) underwent laparoscopic complete lobectomy of the right upper and lower lobes. The average duration of an operation is  $168,33 \pm 20,04$  minutes. The average blood loss is  $124,17 \pm 53,34$  ml. No major intraoperative complications were recorded. Postoperative mild complications occurred in 8.3% of cases: postoperative pneumonia. There were no serious complications or deaths. The average length of a hospital stay is  $6,92 \pm 1,39$  days. Good treatment results with low postoperative pain.

**Conclusion:** Complete thoracoscopic lobectomy for pulmonary metastasectomy is safe in technique and oncology, with few complications and good early results: rapid recovery and less pain after surgery.

**Key words:** Complete thoracoscopic lobectomy, pulmonary metastasectomy, pulmonary metastasectomy from colorectal cancer.

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### 1. INTRODUCTION

Secondary lung cancer or lung metastasis is common, accounting for 30% of advanced cancers. Colorectal cancer is one of the most common cancers that metastasize to the lungs. Every year, 1,360,000 new cases are diagnosed, with 10-30% progressing to lung metastasis [8]. Treatment for pulmonary metastases is multimodal, including chemotherapy, radiotherapy, and surgery. However, surgery (PT) continues to play a crucial function in

cases where surgery is indicated [2]. Surgery to treat pulmonary metastases improves the prognosis and the 5-year survival rate [9]. Pulmonary metastases patients from colorectal cancer who undergo surgery have a better prognosis, with a 5-year survival rate of 46.7%, compared to 3.9% in non-surgical cases [3], [7], [8]. Video-assisted thoracoscopic surgery (VATS) is the preferred surgical treatment for lung cancer in general, as well as for pulmonary metastases, particularly those developed from

colorectal cancer. VATS has better oncological efficacy, safety, and early outcomes compared to open surgery [3], [8], [9]. Many studies on the efficacy of complete thoracoscopic lobectomy in treating pulmonary metastases from colorectal cancer are still in progress. There is currently no research in Vietnam on complete thoracoscopic lobectomy for treating pulmonary metastases of colorectal cancer. Binh Dan Hospital specializes in Thoracic and Digestive Surgery, where pulmonary metastases from colorectal cancer are common. Due to its novelty and urgency, research into the safety and efficacy of complete thoracoscopic lobectomy in treating pulmonary metastases from colorectal cancer is required. Therefore, the research group conducted this study with these following objectives:

- Pathological characteristics of complete thoracoscopic lobectomy for pulmonary metastasectomy at Binh Dan Hospital.
- Assessing the safety of complete thoracoscopic lobectomy for pulmonary metastasectomy at Binh Dan Hospital.
- Evaluating short-term outcomes of complete thoracoscopic lobectomy for pulmonary metastasectomy

## 2. SUBJECT AND METHOD

### Subject

Twelve patients underwent complete thoracoscopic lobectomy for pulmonary metastasectomy from colorectal cancer at The Thoracic and Thyroid department, Binh Dan Hospital from January 2017 to November 2022.

Method: Retrospective, case series description.

### Selection Criteria

- Patients with a history of primary colorectal cancer now metastasized to the lungs.
- Patients meeting the indications for surgical treatment of pulmonary metastases.
- Patients indicated for complete thoracoscopic lobectomy for treating lung metastases from colorectal cancer.
- Patients with histopathological results confirming lung metastases originating from previously diagnosed colorectal cancer.
- Patients with complete medical records and documentation.

### Exclusion Criteria

- Patients after complete thoracoscopic lobectomy for treatment with histopathological results indicating primary lung cancer or other lung diseases.
- Patients with primary cancer metastasized to organs other than the lungs.
- Patients with recurrent secondary lung cancer requiring surgical intervention again.

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

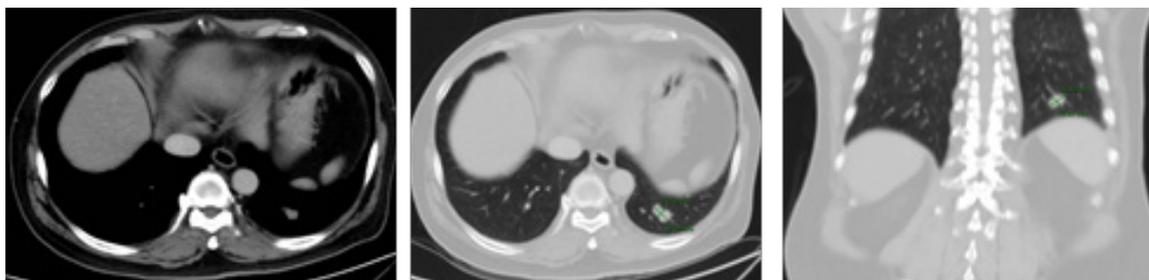
## 3. RESULTS AND DISCUSSION

- Pathological characteristics of pulmonary metastases from colorectal cancer undergone complete thoracoscopic lobectomy

Average age was  $62.67 \pm 8.15$  years. The oldest was 77 years old, while the youngest was 49. Males accounted for 83.3% (10 cases), which is five times greater than females. Two patients (16.7%) smoked, with an average of  $13.20 \pm 4.10$  pack-years. All twelve individuals (12 patients) were diagnosed during follow-up after colorectal cancer treatment.

Previous internal diseases included type 2 diabetes (16.73%), ischemic heart disease (a precursor to coronary artery disease), and hypertension (25%).

History of colorectal cancer origins recorded in patients: There were two cases of right colon cancer (16.7%), and one case of left colon cancer (8.3%). Rectal cancer accounted for the highest proportion: 9 cases, or 75%. All patients had surgery and completed eight cycles of postoperative chemotherapy. The average Disease-free Interval (DFI) was  $34.23 \pm 16.72$  months, with a variability of 12-60 months. 10 patients (83.3%) had a disease-free interval of 24 months or more, while 2 patients (16.7%) had a shorter interval. A longer disease-free period is associated with a better prognosis following secondary lung cancer surgery (typically more than 24 months).[6], [8]. Yokoyama and colleagues found that a short Disease-free Interval (DFI) (less than 24 months) and nodal metastasis stage 2 (N2) of original rectal cancer were risk factors for recurrence after lung metastasectomy, but not for overall survival.



**Figure 1.** Suspected secondary injury to the left lower lobe of the lung in patient N.D.H. (source: Binh Dan Hospital)

In our study, the tumor diameter was  $35.50 \pm 11.87$  mm. On a chest X-ray, all of the lesions were apparent, and when a CT scan was performed, the tumors were found in the positions stated in the table.

Position	The number of patients	Per %
Right upper lobe	3	25
Right middle lobe	2	16,7
Right lower lobe	4	33,3
Left upper lobe	2	16,7
Left lower lobe	1	8,3
Total	12	100%

Bronchoscopy and transthoracic lung biopsies were performed on all patients under the guidance of CT Scan. Preoperative pathological analysis indicated adenocarcinoma in all cases, accounting for 100%. Four patients (33.3%) had increased CEA levels in their blood ( $> 5$  ng/mL). The elevated CEA levels had a statistically significant correlation with the size of the metastatic lesion ( $p = 0.02$ ), indicating that the underlying malignancy had progressed from the digestive system. Currently, some research proposes CEA as a prognostic indicator before medical intervention in the treatment of secondary lung cancer originating from colorectal cancer [6], [8].

Indications for thoracoscopic lobectomy for pulmonary metastasectomy from colorectal cancer

- All patients underwent preoperative tests (echocardiography, ECG, respiratory function tests), screening for primary cancer recurrence (colonoscopy, abdominal CT scan), and screening for other metastases (chest and skull CT scan) to reassess the stage.

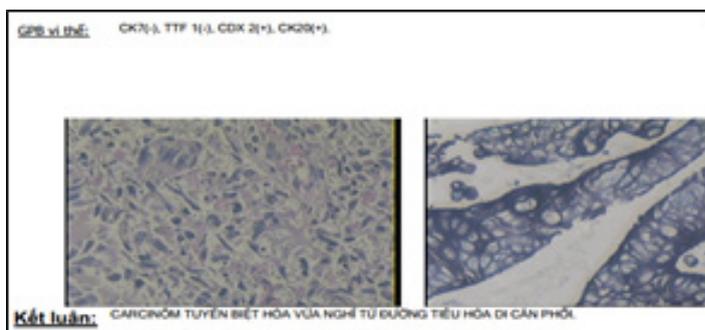
- According to M. Migliore, performing TNM classification for pulmonary metastases from colorectal cancer before surgery resulted in 100% of patients being classified as controlled primary cancer stage T1. All 12 patients were at stages with no distant lymph node metastases classified as N0 or N1. 100% of patients reported only one metastatic lesion in their lung, which was categorized as stage M1 (1 metastatic lesion). TNM staging reveals that all patients are in the locoregional stage of the chest and can be completely resected [11]

- All cases were discussed in Tumor Board meetings of the Oncology and Gastrointestinal Surgery Departments at Binh Dan Hospital, and it was determined that thoracoscopic lobectomy surgery was the most suitable possibility for treating pulmonary metastases from colorectal cancer. These discussions are thoroughly documented in the medical records.

- All patients had preoperative Internal Medicine and Anesthesiology consultations based on preoperative tests, which determined that they were appropriate for complete thoracoscopic lobectomy operation.

These findings indicate that all patients in the study were deemed appropriate candidates for thoracoscopic lobectomy surgery for pulmonary metastasectomy from colorectal cancer [6], [12].

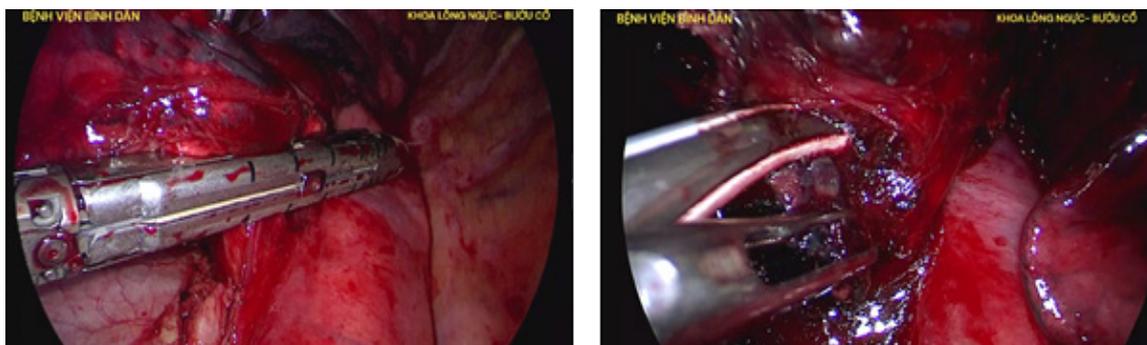
Postoperative pathological results: 100% showed differentiated adenocarcinoma. 100% of immunohistochemical staining results: TTF1(-), CK 7(-), CK20(+), and CDX2(+): Tumor of glandular epithelium from the digestive tract, confirming these as pulmonary metastases from colorectal cancer.



**Figure 2.** Histopathological and immunohistochemical results of the patient (N.D.H.) post-surgery (source: Binh Dan Hospital)

- Evaluating the safety of complete thoracoscopic lobectomy for pulmonary metastasectomy from colorectal cancer

All patients underwent complete thoracoscopic lobectomy without any reported cases requiring conversion to open surgery. Among our patients, 10 cases had complete resection of a single lung lobe containing the metastatic tumor, and 2 patients (16.7%) had tumors invading into the lower and middle lobes of the right lung, necessitating complete resection of both lower and middle lobes of the right lung. Lymph node dissection (N2) biopsy was performed in 8 patients (66.7%), and postoperative results showed no malignancy in any of the dissected lymph nodes. Therefore, none of the patients in our study had metastasis to the mediastinal lymph nodes. This is a favorable prognostic factor for patients after surgery, as metastasis to the mediastinal lymph nodes reduces the 5-year survival rate from 24.7-50% to 0-24%. [6], [8].



**Figure 3.** Images of lobectomy with lymph node dissection via complete thoracoscopic surgery. Patient N.D.H. (Source: Binh Dan Hospital)

Our average operation time was  $168.33 \pm 20.04$  minutes. This result is similar to the study on surgical treatment of secondary lung cancer by the author group Nguyen Hoang Binh (2018), where the average operation time was 3.69 hours. [1]. Our study found an average blood loss of  $124.17 \pm 53.34$  ml, which is consistent with the findings of authors A. Rodríguez-Fuster and Rotolo [4], [5]. The more blood loss, the higher the risk of intraoperative and postoperative problems such as organ failure or cardiovascular events. Longer operation times increase the risk of surgical and anesthesia-related problems, postoperative

lung collapse, mucus obstruction resulting in pneumonia, prolonged postoperative respiratory and ventilator support, and even postoperative mortality. As a result, minimum blood loss and shorter operation times are important considerations for evaluating the safety and feasibility of complete thoracoscopic lobectomy for treating colorectal cancer pulmonary metastases [10].

Postoperative complications recorded included one case of postoperative pneumonia (8.3%). The patient developed a fever on the first day after surgery, which was managed with internal medicine treatment, and there were no

occurrences of respiratory failure or ventilator support. The patient was discharged on the 10th postoperative day after successful treatment. Author A. Rodríguez-Fuster also reported similar complications related to cardiovascular and respiratory systems, affecting up to 15% of patients who underwent lung resection out of 532 patients treated for pulmonary metastases from colorectal cancer. [4]. Our study results are similar to those reported by author Rotolo and colleagues, who also observed a postoperative pneumonia rate of approximately 8%. This complication often occurred in patients with pre-existing lung diseases, such as type II diabetes [5].

Our study did not record complications such as pneumothorax, pleural effusion, postoperative bleeding, or surgical site infection. In the study by author A. Rodríguez-Fuster, which included 532 patients undergoing complete thoracoscopic lobectomy, cardiovascular and pulmonary complications were reported to be up to 15.6%, including atrial fibrillation (1.7%), prolonged air leak requiring reoperation (3.4%), lung collapse (2.4%), and acute respiratory distress syndrome (ARDS) (1%) [4]

#### - **Evaluating short-term outcomes of complete thoracoscopic lobectomy for pulmonary metastasectomy**

Chest tube drainage: Prolonged chest tube drainage (CTD) can lead to complications such as pneumonia, tube site infection, and chronic pain. Complete thoracoscopic lobectomy offers advantages over open surgery or VATS combined with small thoracotomy. CTD is removed earlier compared to open surgery or VATS lobectomy, as reported in the study by Rotolo et al. [5]. On average, CTD is removed after  $3.67 \pm 0.67$  days. The average postoperative drainage time is shortened to  $6.92 \pm 1.39$  days. In Rotolo et al.'s study, CTD was removed after 5 days, with an average hospital stay of 7.2 days, shorter than the open surgery group, which had an average hospital stay of 9.6 days [5].

**Postoperative pain level:** We used the Visual Analogue Scale (VAS) to assess postoperative pain: Complete thoracoscopic lobectomy resulted in lower VAS pain scores and reduced

use of pain medication. The average pain level on postoperative day 1 was  $3.75 \pm 0.75/10$ . The average pain level at discharge was  $0.92 \pm 0.67/10$ . This is consistent with findings from Rotolo et al.'s study when compared to the open surgery group [5]. Complete thoracoscopic lobectomy is minimally invasive, less intrusive, and requires less operation time, with fewer complications and less postoperative pain, resulting in a speedier recovery. As a result, complete thoracoscopic lobectomy outperforms thoracotomy in terms of lung function preservation, pain management, and postoperative chemotherapy tolerance. Thus, complete thoracoscopic lobectomy for pulmonary metastasectomy from colorectal cancer can improve the survival rate of patients [2], [10].

#### **Early outcomes at one month post-surgery**

Our study evaluated early outcomes of patients at 1 month post-surgery: functional symptoms when patients were discharged home according to the Clavien and Anthony Yim classification of complication severity. Early results at 1 month showed a 100% rate of good outcomes: patients had no complications or only mild, insignificant ones, accompanied by no abnormal functional symptoms, allowing them to resume normal activities [13].

The results from our study show that complete thoracoscopic lobectomy for pulmonary metastasectomy from colorectal cancer yields good outcomes, with few severe complications and no mortality. These findings are similar to studies by other authors such as M. Zellweger, M. Cheang, and T. Treasure. [7], [8], [9].

We continued long-term follow-up for more than 6 months for 10 patients, with the longest follow-up being 17 months. Two patients were lost to follow-up after 1 month. One patient was recorded to have brain metastasis after 3 months. The remaining patients completed the full 8 cycles of chemotherapy and are still alive to date.

#### **4. CONCLUSION**

Average age:  $62.67 \pm 8.15$  years. Male: Female ratio: 5:1. Primary cancer originating mainly from colorectal cancer accounting for

75% (9/12 patients). Average disease-free survival time:  $34.23 \pm 16.72$  months.

100% of the patients met the indication for pulmonary metastasectomy from colorectal cancer. All patients underwent complete thoroscopic lobectomy for pulmonary metastasectomy. Among them, 10 out of 12 (83%) patients with single lung metastasis underwent complete resection. The average surgical time was  $168.33 \pm 20.04$  minutes, and the average blood loss was  $124.17 \pm 53.34$  ml. There were no reported intraoperative complications. Mild postoperative complications occurred in 8.3% of cases, mainly postoperative pneumonia. There were no severe complications or deaths.

Postoperative pain was minimal, and patients were discharged without residual pain. The duration of chest tube drainage was  $3.67 \pm 0.67$  days, and the postoperative hospital stay was  $6.92 \pm 1.39$  days. Overall, the treatment outcomes were favorable at the 1-month follow-up assessment.

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