

## Research Article

# Lung Cancer Surgery in the COVID-19 Outbreak; Can it be Done, What Should be Considered, What is the Risk?

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### Abstract

**Objectives:** The aim of this study is to examine the results of ongoing pulmonary resection cases in our hospital during the COVID-19 outbreak and to make recommendations in line with our experience.

**Methods:** The results of patients who underwent surgery for lung cancer in our hospital between March 2020 and October 2020 were retrospectively evaluated. Measures taken to prevent contamination in patients and the surgical team during the COVID-19 outbreak were evaluated.

**Results:** A total of 21 patients, 20 male and 1 female, who underwent anatomical lung resection were included in the study. Seven of the patients had received neoadjuvant therapy, 18 patients had lobectomy, 1 patient had lower bilobectomy, and 2 patients had segmentectomy. During their postoperative follow-up and adjuvant treatments, COVID-19 outbreak was encountered in 2 patients.

**Conclusion:** In thoracic surgery practice, after neoadjuvant therapy or directly after diagnosis, the risk of contamination to patients can be minimized by taking necessary isolation measures while performing lung cancer surgery. In addition, we recommend that patients be evaluated with thorax CT and biochemical tests such as CRP, D-dimer, procalcitonin, ferritin and hemogram 1 day before the surgery.

**Keywords:** COVID-19, lung cancer, pulmonary resections

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The coronavirus 2019 pandemic has become a pandemic, causing significant mortality rates worldwide. Since there was no accepted specific treatment of the epidemic during this period, the main protection method was isolation. The first case was reported in our country in March 2020. Pandemic period, established by the Ministry of Health in Turkey has been governed by the decisions taken by the scientific committee.<sup>[1]</sup> Thanks to the measures taken, service is provided without any intensity or disruption in the health system. Unlike many countries, thanks to remain at a sufficient level of hospital occupancy rate in Turkey has allowed the continuation of surgical operation.

There was no delay in elective surgeries. It has been shown that especially cancer surgery operations can be continued with the protection measures applied in the preoperative, peroperative and postoperative periods.<sup>[2]</sup> However, during the pandemic process, it is important to identify patients who have contact or asymptomatic before the operation and to protect patients after the operation.

Considered a pandemic by the World Health Organization, COVID-19 disease most often affects people between the ages of 30-79. The median age of those with the disease is in the range of 49-59.<sup>[3]</sup> More than 50% of lung cancer patients, who constitute the most important patient group

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in the thoracic surgery department, are over 65 years old.<sup>[4]</sup> These patients are one of the most risky groups in terms of COVID-19, both due to the age range and because their immune systems are suppressed. Although they are risky, the fact that lung cancer surgery is a surgery that cannot be postponed has made it necessary to continue operations during the pandemic process. In this case, there are two important issues; The first is to identify asymptomatic patients before surgery and postpone the surgery accordingly, and the other is to prevent postoperative infection in patients undergoing surgery.<sup>[5]</sup>

Lung cancer surgery was actively continued in our hospital during the COVID-19 pandemic. In this study, we aimed to evaluate the results of patients who underwent surgery during the COVID-19 pandemic for lung cancer and to share our experiences.

## Methods

Between March 2020 and October 2020, 21 patients who underwent surgical treatment for lung cancer during the COVID-19 pandemic were included in the study. The demographic structure of the patients, surgical techniques applied, whether they received neoadjuvant therapy, preoperative and postoperative tomography findings, pathological diagnoses and the type of anatomical resection were evaluated retrospectively. Hemogram, biochemical examination, ferritin, D-dimer and CRP values were checked routinely before surgery. Nasopharyngeal swab samples were taken for all patients undergoing diagnostic bronchoscopy and SARS-CoV-2 Polymerase Chain Reaction (PCR) test was performed. Imaging was performed with contrast-enhanced thorax computed tomography (CT) in all patients the day before the surgery. Those with suspicious involvement in terms of COVID-19 in physical examination, history, thorax CT or blood tests were directed to PCR test. When the patient had symptoms compatible with COVID-19 infection, positive PCR or CT findings of the disease, the surgery was postponed.

Personal protective equipment was used by the anesthesia team during the peroperative period. Single lung ventilation was applied to all patients and video-laryngoscope was used for double lumen intubation. The anesthesia team used FFP2 mask during these procedures. The operating team wore a standard surgical mask during the operation. In the postoperative period, patients were taken to isolated intensive care rooms, and attendant and visitor restrictions were imposed for patients followed in the clinic. During their stay in the clinic, patients were used to use masks, and the use of surgical masks was required for the nurses who applied their treatment.

## Results

The results of 21 patients who underwent anatomical lung resection with a diagnosis of lung cancer in our clinic between March 2020 and October 2020 were retrospectively evaluated. Twenty (95.2%) of the patients were male and 1 (4.8%) was female. The mean age was  $65.9 \pm 6.9$ . All patients had a smoking history. The procedure was performed on the right side in 14 (67%) patients and on the left side in 7 (33%) patients. The surgery of 10 patients was performed by video-assisted thoracoscopic surgery (VATS) (Table 1). 7 (33%) patients had received neoadjuvant treatment, 5 of them received 4 cures of chemotherapy, 1 patient 6 cures of chemotherapy and 1 patient 6 cures of chemotherapy+curative radiotherapy.

Eighteen patients had lobectomy, 1 patient had lower bilobectomy, and 2 patients had segmentectomy. In the pathology results of the patients, squamous cell carcinoma in 10 (47.6%) patients, adeno carcinoma in 9 (42.8%) patients, neuroendocrine carcinoma in 1 (4.8%) and in 1 (4.8%) patient adeno carcinoma and small cell carcinoma was seen together (Table 2). The mean hospital stay of the patients was  $5.76 \pm 1.7$  days. No mortality was observed in the postoperative 1<sup>st</sup> month, complications developed in 3 patients, prolonged air leakage was present in 2 patients, and expansion defect developed in 1 patient. The patients were discharged as soon as possible. On discharge, he was given dexketoprofen 25 mg 3x1, cefuroxime axetil 500 mg 2x1, n-acetylcysteine+vitamin c (1200-400 mg) as routine treatment.

There were 2 patients with TONOMO in the postoperative staging of the patients. Positive lymph node pathology; N1: 2 patients, and N2: 2 patients were identified. The number of patients according to TNM stages were Stage I: 11, Stage II: 6, and Stage III: 2. The mean tumor diameter was determined as 2.5 cm. The treatments of patients who received neoadjuvant chemotherapy were completed, and radiotherapy was added to the treatment of patients with positive mediastinal lymph nodes in the postoperative period. Due to the T factor, 3 of our patients were directed to adjuvant chemotherapy. There were no patients who were diagnosed with COVID-19 disease in the preoperative and peroperative periods and whose surgery was delayed. After 2 patients had complaints during their postoperative follow-up, they were examined for COVID-19 and the PCR test was found positive. Covid-19 disease was detected in our 49-year-old male patient who underwent right lower bilobectomy and was followed-up due to prolonged air leak (Fig. 1). Our other patient was a 75-year-old male patient who had a right upper lobectomy, he had cough and weakness during routine follow-up and his PCR test was positive (Fig. 2). Both of our patients had lung involvement on

**Table 1.** Demographic informations of patients and type of preoperative treatment

	n=21	%
Age	65.9±6.9	-
Gender		
Male	20	95.2
Female	1	4.8
Side		
Right	14	67
Left	7	33
Neoadjuvan treatment		
4 cures of chemotherapy	5	23.8
6 cures of chemotherapy	1	4.8
6 cures of chemotherapy+curative radiotherapy	1	4.8

**Table 2.** Surgical procedures, pathologic diagnosis and postoperative tumor stages

	Thoracotomy (n=11)	VATS (n=10)	%
Surgical procedures			
Lower lobectomy	5	2	33
Upper lobectomy	6	5	52.4
Lower bilobectomy	-	1	4.8
Segmentectomy	-	2	9.5
Pathologic diagnosis			
Squamous cell carcinoma	10		47.6
Adeno carcinoma	9		42.8
Neuroendocrine carcinoma	1		4.8
Adeno carcinoma+small cell carcinoma	1		4.8
Postoperative tumor stages			
Stage 0	2		9.5
Stage I	11		52.4
Stage II	6		28.6
Stage III	2		9.5

VATS: Video-assisted thoracoscopic surgery

thorax CT. Favipiravir and hydroxychloroquine treatment was administered in these patients in accordance with the recommendation table of the Ministry of Health. In addition, the patients were supplemented with vitamins and mucolytics. The PCR tests of both of our patients became negative and the patients were followed up routinely.

## Discussion

The first COVID-19 patient in our country was reported on March 10, and the first death due to the epidemic was re-

ported on March 17.<sup>[6]</sup> Following this, it was aimed to control the disease and to keep the occupancy rates of hospitals within a certain limit. In addition, there were various discussions about whether oncological treatments should continue or not, since the immune systems of the patients were suppressed.<sup>[7]</sup> However, patient-based decisions have come to the fore in multidisciplinary hospitals where cancer treatments are performed. Some of the oncological treatments were delayed or stopped during the months when the first cases were reported. Later, by keeping the number of patients who develop contamination in the pandemic under control, an opinion emerged that cancer patients could continue their treatment.<sup>[8]</sup>

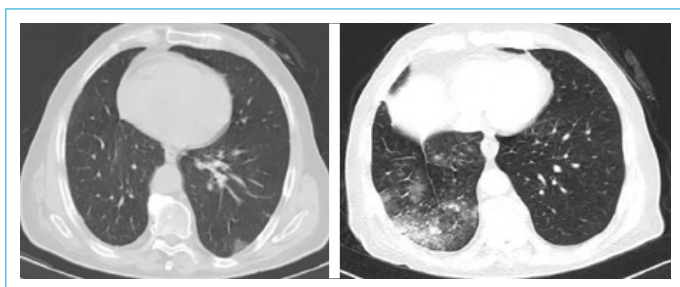
We made the decisions about our patients at the multidisciplinary oncology meetings we routinely hold in our hospital. The operations of all patients requiring surgery were continued without interruption. Patients in need of postoperative adjuvant treatment were treated at the most appropriate time without delay. In this process, the opinions and suggestions of our Ministry of Health, international Thoracic Surgery and Oncology associations were followed.<sup>[9,10]</sup> The bronchoscopy procedure continued to be used during the diagnosis phase. However, in line with the recommendation of the American Association of Bronchology and Interventional Pulmonology that "bronchoscopy is postponed in patients with suspected or confirmed COVID-19", bronchoscopy was not performed on these patients.<sup>[11]</sup>

On the other hand, it is suggested that it can be applied carefully in life-saving interventions such as massive hemoptysis or malignant airway stenosis. Since bronchoscopy is an aerosol-generating procedure, other diagnostic methods should be used whenever possible. In our series, diagnostic bronchoscopy was performed in 6 patients before the surgical procedure, positron emission tomography (PET) was also used as a diagnostic method. Due to the detection of a mass with suspected lung cancer on PET-CT in 8 patients, frozen section was studied peroperatively, and lobectomy was performed upon the diagnosis of primary lung carcinoma.

During the pandemic period, most of the elective surgical procedures have been postponed in many countries.<sup>[12]</sup> However, considering that only 15-25% of lung cancer has a chance of surgery, delays in surgery will cause the disease to progress.<sup>[13]</sup> For this reason, it has been suggested to bring flexibility in cancer surgery, it has been predicted that both patients and healthcare professionals can continue the treatment without being affected by the epidemic with appropriate personal protective equipment.<sup>[14,15]</sup> Studies have also shown that this surgery can



**Figure 1.** Thorax CT image of the patient, who was followed up due to prolonged air leak in the right lung, viral pneumonia areas are seen in the left lung.



**Figure 2.** In the thorax CT of the patient who underwent right upper lobectomy, areas of viral pneumonia involvement are seen in both lungs.

be performed without exposure to COVID-19 transmission under appropriate conditions.<sup>[16]</sup> Gupta and colleagues did not find patients exposed to coronavirus infection in their study, where they evaluated patients who underwent lung resection between February and April 2020. During this time, 44 patients underwent lung resection, and no patients had COVID-19 disease during their follow-up in the hospital. In our study, corona virus disease was not found in any patient in the postoperative 1<sup>st</sup> month, but it was seen in 2 (9.5%) of our patients during their follow-up. In addition, the absence of any patients from our anesthesia and surgery team has been associated with the correct use of personal protective equipment.

Minimizing aerosol transmission during surgery is also a protection mechanism. The study conducted by Rakovich et al.<sup>[17]</sup> for this purpose is remarkable. They have described several stages that can create aerosol in patients during thoracic surgery. Intubation and extubation phases, isolation of the lung and giving the patient the surgical position are critical preoperative stages. In the perioperative period, it is accepted that the process of entering the thorax and continuing the operation, whether by thoracotomy or video-assisted thoracoscopy, creates aerosol. As postoperatively; lung re-expansion and chest drainage set are also the main substances that can create aerosol.<sup>[17]</sup> Rakovich et al.<sup>[17]</sup> Reported that when these issues are taken into ac-

count, transmission from patients will be minimized.

It should not be forgotten that patients may be prone to infection after thoracic surgery operations. Duration of hospital stay, secretion retention, prolonged air leak or resected lung tissue size may pose a risk for COVID-19. Peng et al.<sup>[18]</sup> detected corona virus infection in 11 cases after thoracic surgery, and the average time from the onset of symptoms to the time when the test results were positive in these patients was found to be 8 days. While there were 3 deaths due to respiratory failure in the patients, 4 severe and 4 mild cases recovered and were discharged. The case fatality rate was found to be 27.3% in these patients diagnosed with COVID-19. They expressed the opinion that conditions such as insidious onset of symptoms, lymphopenia, postoperative leukocytosis and postoperative CT changes delay the diagnosis of the disease.<sup>[18]</sup> This study shows that attention should be paid to preoperative and postoperative screening and tight contact isolation in the postoperative period, as we did in our own hospital.

## Conclusion

In the thoracic surgery, in lung cancer surgery performed after neoadjuvant therapy or directly after diagnosis, the risk of contamination to patients can be minimized by taking the necessary isolation measures. For this purpose, it is very important to use personal protective equipment in both the patient and the surgical and anesthesia team. Patients should be evaluated with a good physical examination and anamnesis in the preoperative period. In addition, we recommend that patients be evaluated with thorax CT and biochemical tests such as CRP, D-dimer, procalcitonin, ferritin and hemogram 1 day before the surgery.

## Disclosures

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**Conflict of Interest:** None declared.



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