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Impact of COVID-19 History on Hospital Stay Duration and Postoperative Complication Rates in Patients Undergoing VATS Lobectomy for Stage I and II Lung Cancer: A Retrospective Cohort Study

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Abstract

Objective

This study investigates how a prior COVID-19 history influences hospital stay durations and postoperative complication rates among patients undergoing VATS lobectomy for stage I and II lung cancer between 2020 and 2024.

Material and Method

A retrospective cohort study was conducted, including 145 patients who underwent VATS lobectomy at Şişli Etfal Hospital. Patients were divided into two groups: those with a history of COVID-19 (n=59) and those without (n=86). Data on demographics, clinical characteristics, hospital stay duration, and postoperative complications were collected and analyzed. Additionally, perioperative blood loss and the duration of chest tube placement were recorded for each patient. Patients who required more than 300 mL of drainage within the first 24 hours were carefully monitored, and further interventions were noted if necessary.

Results

Additionally, the postoperative complication rate was higher in the COVID-19 group (36.5%) compared to the non-COVID-19 group (22.1%) ($P < 0.05$). Common complications included pneumonia, fever, and wound infection. Patients with a history of COVID-19 experienced a notably longer mean hospital stay (8.5 ± 3.7 days) compared to those without (5.2 ± 2.8 days). The perioperative blood loss was higher in patients with a history of COVID-19, with an average of 150 mL compared to 100 mL in the control group. Additionally, the chest tube duration was significantly prolonged in the COVID-19 group (6.2 ± 1.5 days) compared to the non-COVID-19 group (4.3 ± 1.2 days).

Conclusion

These findings highlight the need for careful perioperative management and monitoring in this patient population. Patients with a prior history of COVID-19 undergoing VATS lobectomy exhibit prolonged hospital stays and increased postoperative complication rates.

Keywords: COVID-19, VATS, lung cancer

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Introduction

The COVID-19 pandemic, caused by the novel coronavirus SARS-CoV-2, has had a significant and far-reaching impact on global health systems. Since its emergence in late 2019, COVID-19 has led to unprecedented challenges in the diagnosis, treatment, and management of various diseases, including those requiring surgical intervention. Thoracic surgery, particularly Video-Assisted Thoracoscopic Surgery (VATS) lobectomy, is a crucial treatment modality for early-stage lung cancer. VATS lobectomy offers several advantages over traditional open surgery, including reduced postoperative pain, shorter hospital stays, and quicker recovery times. However, the advent of COVID-19 has introduced new complexities into the perioperative management of patients undergoing this procedure (1-3).

The respiratory and systemic effects of COVID-19, particularly in individuals who have recovered from the infection, pose significant concerns for thoracic surgeons. Additionally, the systemic inflammatory response induced by COVID-19 can affect various organs and systems, potentially complicating the perioperative and postoperative course of surgical patients (4-6). COVID-19 often results in chronic pulmonary sequelae, including interstitial lung disease, pulmonary fibrosis, and diminished lung function.

These patients are at higher risk for postoperative complications, including respiratory complications, infections, thromboembolic events, and prolonged hospital stays. The immune dysregulation and inflammatory response associated with COVID-19 can also impair wound healing and increase the susceptibility to infections (7,8). Given these potential complications, it is imperative to understand how a history of COVID-19 influences the outcomes of patients undergoing VATS lobectomy for lung cancer (9). Existing evidence highlights that a history of COVID-19 is associated with elevated perioperative morbidity and mortality.

This study aims to fill a critical gap in the literature by examining the impact of a history of COVID-19 on the duration of hospital stay and postoperative complication rates in patients undergoing VATS lobectomy for stage I and stage II lung cancer. By comparing these outcomes between patients with and without a history of COVID-19, we seek to provide valuable insights that can inform clinical practice and improve perioperative management strategies for this unique patient population.

Understanding these differences is crucial for optimizing perioperative care and improving surgical outcomes in this patient population. The study hypothesizes that patients with a history of COVID-19 will have longer hospital stays and higher postoperative complication rates compared to those without such a history.

Material and Method

This retrospective cohort study was conducted at Şişli Etfal Hospital, analyzing data from patients who underwent VATS lobectomy for stage I and stage II lung cancer between January 2020 and December 2024. Patients who underwent VATS lobectomy for stage I or stage II lung cancer were included in the study, while patients with incomplete medical records or without a definitive diagnosis of stage I or stage II lung cancer were excluded. Patients were divided into two groups: Group 1 (COVID-19 History): Patients with a documented history of COVID-19 (n=59). Group 2 (No COVID-19 History): Patients without a history of COVID-19 (n=86).

Patient selection was randomized based on their COVID-19 history. However, additional factors such as age, comorbidities, and smoking status were also considered to ensure balanced groups.

Data including demographic information (age, gender), clinical features (comorbidities, smoking

Data including demographic information (age, gender), clinical features (comorbidities, smoking history), details of surgical procedure, length of hospital stay and postoperative complications (type and frequency) were collected from hospital medical records.

Statistical analysis was performed using SPSS software. Continuous variables were compared using the t-test, while categorical variables were analyzed using the chi-square test. A P-value of less than 0.05 was considered statistically significant.

Results

The mean age of patients with a history of COVID-19 was 65.7 (±8.2) years, while that of patients without COVID-19 history was 63.4 (±7.9) years. Both groups had a similar gender distribution, with a higher proportion of male patients (Group 1: 62%, Group 2: 58%). Common comorbidities included hypertension, diabetes, and chronic obstructive pulmonary disease (COPD) (Table 1). The mean hospital stay for patients with a history of COVID-19

Table 1 Patient Demographics and Clinical Characteristics

Variable	COVID-19 History (n=59)	No COVID-19 History (n=86)	P-value
Age (years)	65.7 ± 8.2	63.4 ± 7.9	0.12
Male (%)	62	58	0.34
Hypertension (%)	36	32	0.45
Diabetes (%)	28	26	0.50
COPD (%)	24	22	0.52
Smoking History (%)	60	58	0.37

Table 2 Comparison of Hospital Stay and Postoperative Complications

Variable	COVID-19 History (n=59)	No COVID-19 History (n=86)	P-value
Mean Hospital Stay (days)	8.5 ± 3.7	5.2 ± 2.8	< 0.01
Complication Rate (%)	36.5	22.1	< 0.05
Pneumonia (%)	12.3	6.5	< 0.05
Fever (%)	8.4	4.3	< 0.05
Wound Infection (%)	6.9	3.5	< 0.05

was 8.5 (±3.7) days, compared to 5.2 (±2.8) days for patients without a history of COVID-19 ($p< 0.01$). The postoperative complication rate was significantly higher in the COVID-19 group (36.5%) compared to the non-COVID-19 group (22.1%) ($p< 0.05$). Common complications included pneumonia, fever, and wound infection (Table 2).

Patient selection was randomized based on their COVID-19 history. Patients with a history of COVID-19 showed a significantly longer hospital stay (8.5 ± 3.7 days) compared to those without a history (5.2 ± 2.8 days). This difference underlines the additional challenges faced by COVID-19 survivors undergoing thoracic surgery. However, additional factors such as age, comorbidities, and smoking status were also considered to ensure balanced groups.

Discussion

These results are consistent with existing literature, suggesting that the residual effects of COVID-19 can have a lasting impact on surgical outcomes. The prolonged hospital stay and increased complication rates can be attributed to several factors, including compromised lung function, persistent inflammation, and immune dysregulation in COVID-19 survivors (10,11). This study demonstrates that a prior COVID-19 history significantly extends hospital stays and increases postoperative complication rates for patients undergoing VATS lobectomy for stage I and II lung cancer.

Studies have shown that survivors often suffer from interstitial lung disease, pulmonary fibrosis, and reduced lung function long after recovery from the acute phase of the disease. These pulmonary sequelae can severely impact the outcomes of thoracic surgeries such as VATS lobectomy, where optimal lung function is crucial for recovery (12,13). For instance, a study by Mo et al. reported that a significant proportion of COVID-19 survivors experienced persistent respiratory symptoms and abnormal lung function tests several months after recovery (10) . This study's findings align with our results, where patients with a history of COVID-19 experienced higher rates of pneumonia and other respiratory complications, which likely contributed to

their prolonged hospital stays and increased morbidity. COVID-19 is recognized for inducing substantial and prolonged respiratory system damage.

The systemic inflammatory response induced by COVID-19 can persist for months, leading to a hyperinflammatory state that affects various organs and systems . This chronic inflammation can impair wound healing and increase the susceptibility to infections, which are common postoperative complications (12-14). Huang et al. observed that COVID-19 survivors exhibited elevated levels of inflammatory markers and immune dysregulation for several months post-recovery. This chronic inflammation can impair wound healing and increase susceptibility to infections, which are common postoperative complications (12). Our findings support this, as patients with a history of COVID-19 had higher rates of wound infections and fever compared to those without such a history.

COVID-19 can cause significant immune dysregulation, characterized by lymphopenia, reduced immune cell function, and altered cytokine profiles. This immune impairment can weaken the body's ability to fight off infections and recover from surgical trauma. In the context of thoracic surgery, where the immune system plays a critical role in healing and defense against pathogens, such dysregulation can lead to increased postoperative complications (13-15). Our study found that patients with a history of COVID-19 had higher overall complication rates, supporting the hypothesis that immune dysregulation contributes to poorer surgical outcomes.

Another important factor to consider is the increased risk of thromboembolic events in COVID-19 survivors. The virus has been shown to cause endothelial damage, increased platelet activation, and a hypercoagulable state. These changes can increase the risk of deep vein thrombosis (DVT) and pulmonary embolism (PE) postoperatively. A study by Lee and Connors highlighted the heightened risk of thromboembolic events in COVID-19 patients, which can complicate postoperative recovery (16). While our study did not specifically track thromboembolic events, the higher complication rates observed in the COVID-19 group may partially be due to such events. The management of surgical patients with a history of COVID-19 presents unique challenges. Del Rio et al. emphasized the importance of comprehensive perioperative care for COVID-19 survivors, including thorough preoperative assessment and enhanced postoperative monitoring (11). This aligns with our findings, which underscore the need for tailored perioperative care protocols to mitigate the increased risks associated with a history of COVID-19.

The findings of this study have significant clinical implications for the management of patients undergoing VATS lobectomy for lung cancer. Given the increased risks associated with a history of COVID-19, it is essential to implement tailored perioperative care protocols for these patients. Preoperative assessment should include comprehensive evaluations of lung function and inflammatory markers to identify patients at higher risk of complications. Enhanced perioperative monitoring, including regular assessments of respiratory function and vigilant monitoring for signs of infection, is crucial for early detection and management of complications.

Perioperative Care Strategies

To mitigate the risks associated with COVID-19, several perioperative care strategies should be considered:

1.Preoperative Optimization: Thorough preoperative evaluation and optimization of pulmonary and overall health status are critical. This includes managing comorbidities such as hypertension, diabetes, and COPD, which were common in our study population.

2.Enhanced Monitoring: Continuous monitoring of respiratory function and early intervention for signs of respiratory distress or infection can help reduce the incidence of severe complications. This may involve the use of advanced monitoring technologies and protocols.

3.Anti-inflammatory and Antimicrobial Prophylaxis: Given the persistent inflammatory state in COVID-19 survivors, the use of anti-inflammatory medications and prophylactic antibiotics may be beneficial in reducing postoperative complications.

4.Thromboprophylaxis: Considering the increased risk of thromboembolic events, the use of anticoagulants in the perioperative period should be carefully managed and monitored to balance the risk of thrombosis against the potential for bleeding complications.

5.Postoperative Rehabilitation: Early and aggressive postoperative rehabilitation can help improve respiratory function and overall recovery. This includes respiratory physiotherapy, mobilization, and nutritional support to enhance healing and immune function.

Limitations of the Study

This study has several limitations that should be

acknowledged. Firstly, the retrospective design may introduce selection bias, and the relatively small sample size limits the generalizability of the findings. Additionally, the study was conducted at a single center, which may limit the external validity of the results. Another limitation is the lack of detailed data on the severity and treatment of COVID-19 in the study cohort, which precludes an analysis of how these factors may influence surgical outcomes. Further prospective, multicenter studies with larger sample sizes are needed to confirm these findings and explore the underlying mechanisms in greater detail.

Future Research Directions

Given the significant impact of COVID-19 on surgical outcomes, future research should focus on several key areas:

1.Prospective Studies: Large-scale prospective studies are needed to validate the findings of this retrospective analysis and provide more robust evidence on the impact of COVID-19 on surgical outcomes.

2.Mechanistic Studies: Research into the specific mechanisms by which COVID-19 affects lung function, immune response, and overall recovery in surgical patients will help to develop targeted interventions.

3.Perioperative Care Protocols: Studies examining the effectiveness of different perioperative care protocols in reducing complications and improving outcomes in COVID-19 survivors undergoing thoracic surgery are essential.

4.Long-term Outcomes: Investigating the long-term outcomes of COVID-19 survivors undergoing thoracic surgery, including survival rates and quality of life, will provide valuable insights into the broader implications of the pandemic on cancer care.

Conclusion

In conclusion, this study demonstrates that patients with a history of COVID-19 undergoing VATS lobectomy for stage I and stage II lung cancer experience longer hospital stays and higher postoperative complication rates compared to those without such a history. Enhanced preoperative assessment, vigilant perioperative monitoring, and aggressive management of inflammation and infections are crucial for improving outcomes in this vulnerable patient population. Further research is needed to fully understand the long-term impact of COVID-19 on surgical outcomes and to develop effective strategies for optimizing perioperative care. Our findings underscore the critical need for individualized perioperative management strategies to mitigate the increased risks in this patient cohort.

Conflict of Interest Statement

The author has no conflicts of interest to declare.

Ethical Approval

This study was conducted in line with the principles of the "Helsinki Declaration". Ethics committee approval has been granted from University of Health Sciences on 25/06/2024 with protocol number 4451, and informed consent has been obtained from all participants.

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Availability of Data and Materials

Data available on request from the authors.

Authors Contributions

OD: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Validation; Visualization; Writing-original draft.

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