

# THORACIC SURGERY IN A COVID-19 FRONTLINE HOSPITAL. ARE THE PATIENTS SAFE?

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## Abstract

**Introduction and Objectives:** COVID-19 pandemic forced a change in health care resources and provision due to the emergence of a new group of patients, requiring extraordinary protective measures and the adoption of new organization for the treatment of urgent or priority COVID-19 negative patients. We reviewed our practice during the first pandemic period to evaluate our surgical outcomes and identify if patients COVID-19 negative submitted to thoracic surgery had an increased risk of being infected or die.

**Methods:** We retrospectively reviewed our surgical results between 11th March and 15th May 2020. Thirty patients underwent thoracic surgery at the Department of Cardiothoracic Surgery of Centro Hospitalar Universitário de São João.

**Results:** None of the patients was COVID-19 positive and cross-transmission of the disease was not recognized. The majority of patients were admitted from home, with a high priority indication, namely an oncological disease. There was only one case of in-hospital mortality.

**Conclusion:** During the first wave of the pandemic it was safe to be admitted and submitted to thoracic surgery at CHUSJ. Our patients, including oncological patients, received the adequate surgical treatment without an increase of risk of death or infection.

**Keywords:** COVID-19 Pandemic; Thoracic Surgery; Patient non-COVID-19 Safety; Priority Surgery

## INTRODUCTION

COVID-19 was declared a pandemic by the World Health Organization (WHO) on March 11<sup>th</sup>, however incoming patients with diseases other than COVID-19 related infection that required priority or urgent treatment continued to exist.

The fear of being infected in the hospital facilities pushed away or delayed patients from the adequate treatment<sup>1</sup> and our experience can be very useful to set orientations for an eventual second wave.

Without a vaccine or a specific medication, with the ending of strict confinement measures, the national health system will have to readjust in order to maintain an attempted response to other severe diseases while ensuring adequate protective measures to the staff and patients<sup>2,3</sup>.

Centro Hospitalar Universitário de São João (CHUSJ), the major Hospital of the North of Portugal, with the largest Cardiothoracic Department of the Portuguese National Health Service, was the main hospital in the North of Portugal on the front line against COVID-19.

Our hospital had to adjust its activity and during the first wave of COVID-19 pandemic most of the surgical elective cases were postponed. The majority of patients submitted to thoracic surgery from March 11<sup>th</sup> to May 15<sup>th</sup>, 2020 were operated in a specific operating room (OR), from the three specific of the department. Our department reorganized its activity with the creation of "COVID-free circuits" and, with the reduction of the staff and number of surgeries, all patients submitted to surgery in this period of time were urgent, emergency or high priority out-patient cases, exclusively oncological patients.

We retrospectively reviewed our surgical results from March 11<sup>th</sup> to May 15<sup>th</sup> 2020 to understand if admissions on CHUSJ increased the risk of being infected or die when submitted to thoracic surgery and to evaluate the surgical outcomes during the COVID-19 pandemic.

## METHODS

Between 11<sup>th</sup> March and 15<sup>th</sup> May 2020, thirty patients underwent thoracic surgery at the Department of Cardiothoracic Surgery of CHUSJ. Population was characterized by demography and clinical variables and surgical results were displayed. Study protocol was approved by the Ethics Committee of CHUSJ.

### Statistical Analysis

Descriptive analysis was performed and data presented as counts and proportions for categorical variables. Measures of central tendency and dispersion were applied for continuous variables, according to their distribution. Specific group analyses were conducted using Mann-Whitney and Spearman's correlation test. Results were considered statistically significant if  $p < 0,05$ .

## RESULTS

### Demography and Clinical Presentation (Table 1)

None of our patients tested COVID-19 positive before or during admission. Until March 26<sup>th</sup> only symptomatic (new onset or persistent symptoms like cough, shortness of breath or fever) patients were tested for COVID-19. From the 26<sup>th</sup> March, all patients (even asymptomatic) who underwent thoracic surgery were tested on admission and every five days during their hospital stay.

The majority of this group (60%) was admitted from home, with a high priority indication for surgery and only one case was performed as an emergency surgery (hemothorax).

### Early outcome

The median waiting time for surgery was 16 days (range 0-50). The median post-operative length of drainage was 4 (range 1-28) days, and median post-operative length of stay was 4,5 (range 1-52) days.

One patient was re-operated for bleeding and another one had a new onset atrial fibrillation. Both recovered well and no other major complications occurred. We reported 6 minor complications (1 case of non-nosocomial respiratory infection and 5 cases of prolonged pulmonary air leak).

Among the thirty patients who underwent thoracic surgery at the Department of Cardiothoracic Surgery of CHUSJ, one patient was considered an outlier (initial operation prior March 11<sup>th</sup>) and was excluded when specific group analyses were performed. This patient was initially operated by Orthopedics and Thoracic Surgery with a thoracic spondylitis complicated with contiguous pneumonia and empyema. Despite the absence of pulmonary complications, this patient was submitted to a redo thoracotomy to drain an extrapleural hematoma. He eventually died of septic shock, due to uncontrolled nonthoracic infection.

There was no statistically significant differences in hospital length of stay according to patient's gender ( $p = 0.134$ ); presence of cardiovascular risk factors ( $p = 0.779$ ); smoking history [active or former smokers ( $p = 0.33$ )]; chronic obstructive pulmonary disease; [COPD ( $p = 0.801$ )] and a forced expiratory volume in 1 second (FEV1) inferior to 80% prior to surgery ( $p = 0.582$ ).

Patients with other neoplasms previously diagnosed were associated to shorter length of stay in the postoperative period ( $p = 0.039$ ). No association was found between surgical waiting time ( $p = 0.46$ ) [even in the subgroup of non-small-cell lung carcinoma (NSCLC);  $p = 0.472$ ] and the length of in-hospital stay.

Patients submitted to Video-assisted Thoracoscopic Surgery, VATS, (versus open technique) had statistically significant ( $p = 0,025$ ) lower in-hospital length of stay.

The subgroup of patients operated for pleural-space disease, other than pneumothorax (one case of hemothorax and three cases of empyema) were associated to a higher length of drainage ( $p = 0.013$ ) and a higher hospital length of stay ( $p = 0,025$ ) than the rest of the patients.

In our sample, a past medical history of ipsilateral surgery (reoperation) didn't increase the time of chest tube drainage ( $p = 0,896$ ) neither the length of in-hospital stay ( $p = 0.896$ ). As expected, there was a strong (Spearman's correlation = 0.847) and a significant ( $p < 0,001$ ) correlation between the number of days with a chest tube and the length of in-hospital stay. There was a trend for the patients with complications in the post-operative period to have a higher in-hospital length of stay, although it was not statistically significant ( $p = 0.059$ ).

**Table 1** Patients characteristics

Thoracic Surgery n=30		
Sex – n (%)	Male – 19 (63,3%); Female – 11 (36,7%)	
	Median (min-max)	
Age (years)	62 (23-77)	
Waiting Time for surgery (days)	16 (0-50)	
Tobacco	n (%)	
Active smoking	10 (33,3%)	
Former smoking	9 (30,0 %)	
Non-smoking	11 (36,7%)	
Comorbidities	n (%)	
Hypertension	11 (36,7%)	
Diabetes	5 (16,7 %)	
Dyslipidemia	10 (33,3%)	
CVD	4 (13,3%)	
CKD	0	
COPD	5 (16,7%)	
Asthma	1 (3,3%)	
FEV1 < 80%	8 (26,7%)	
Others Neoplasms	11(35,7%)	
Reoperation	6 (20,0%)	
Surgical indications	n(%)	
NSCLC	14 (46,7%)	
*Adenocarcinoma	*10	
*Squamous	*2	
*Neuroendocrine tumour	*2	
Solitary Pulmonary Nodule	2 (6,7%)	
Metastases	3 (10,0%)	
Pneumothorax	4 (13,3%)	
Hemothorax	1 (3,3%)	
Empyema	3 (10,0%)	
Anterior Mediastinal Mass	2 (6,7%)	
Extrapleural Hematoma	1 (3,3%)	
Surgical intervention	cases (%)	VATS (n)
Lobectomy	14 (46,7%)	14
Sublobar Resection	5 (16,6%)	5
Drainage of Hemothorax	1 (3,3%)	0
Pleural Decortication	3 (13,3%)	2
Blebs resection + Pleurodesis	4 (13,3%)	4
Mediastinal mass biopsy	2 (6,7)	1
Exploratory thoracotomy	1 (3,3%)	0

Table1 – Thoracic Surgery: Min-minimum; Max-Maximum;CVD-Cardiovascular disease; CKD-chronic kidney failure; COPD-Chronic Obstructive Pulmonary Disease; FEV1-Forced Expiratory Volume in 1 Second;NSCLC-non-small-cell lung carcinoma; VATS-Video-assisted Thoracoscopic Surgery.  
\* Histology subtypes \*\* One case converted to toracotomy

## DISCUSSION

All patients who underwent thoracic surgery at the Department of Cardiothoracic Surgery of CHUSJ were COVID-19 negative and there was no evidence of cross-infection, among staff or patients or between staff and patient. This fact is further emphasized as, during the same period, 118 cardiac patients, originated from different referral areas of CHUSJ, such as Emergency, Cardiology or Pediatric Intensive Care Unit shared the same facilities with these thirty patients<sup>4</sup>. Although there is an ongoing debate over the benefits of COVID-19 Free Hospital for the treatment of specific pathologies, our experience revealed that the creation of “COVID-free circuits” in hospitals treating COVID-19 patients and the implementation of adequate protective measures, like individual protection equipment, policies to reinforce social distancing in clinical and social areas, strict standards for environmental sanitation, allows safe thoracic surgical interventions, even in oncological patients. We should highlight summing to the universal infection control measures, contact and droplet precautions were universally used. All aerosol generating procedures were substituted by closed circuit procedures and when indispensable, airborne precautions, as specialized garb and high efficiency filters were used.

We reported only one case of in-hospital mortality due to refractory septic shock, initially operated before the first pandemic wave was declared.

Our results are similar to other studies<sup>5</sup> reporting that patients submitted to VATS had a shorter hospital length of stay than patients submitted to open technique. However, in our group, the surgical indication could have biased this result, as two of the patients that underwent thoracotomy were submitted to pleural decortication for empyema and hemothorax, which were the diagnostics associated in the univariate analysis with a higher length of drainage and a longer in-hospital stay. This is further highlighted as patients with other previously diagnosed neoplasms (none of them had a case of empyema or hemothorax) were associated to shorter length of stay in the postoperative period.

As expected, there was a strong and significant correlation between the in-hospital stay and the days of chest tube drainage explained by the fact that our patients are discharged home in the day of chest tube removal.

We should disclose that in this high-risk group of patients, operated under extraordinary conditions during the first wave of COVID 19 pandemic, we tended to be extremely cautious about chest tube removal to prevent subsequent pleural procedures. This fact might explain why some of the patients might have a somewhat longer period of pleural drainage.

One limitation of our study is the small number of included patients. It may be the reason why we found a trend instead of statistically significant difference be-

tween the complications in the postoperative period and a higher hospital length of stay.

Surgical waiting time remains an issue of utmost importance when we consider the access to efficient health care provision. More than half of the patients who underwent thoracic surgery in this period of time were cancer patients. The patient with the highest waiting time for surgery (50 days) was a case of neoadjuvant treatment in which timing of different treatments were perfectly accomplished.

## CONCLUSION

It was safe to be admitted and operated in the Department of Cardiothoracic Surgery of CHUSJ during the first wave of the pandemic. The numbers of surgeries were reduced with the non-oncological cases postponed, maintaining prompt response to high priority or urgent cases.

The precautionary measures implemented avoided the patients-staff or staff-patients transmission of the disease, allowing the patients to receive the adequate surgical treatment in a COVID-19 reference Hospital without an increased risk of death or infection. The indication for surgery in more than half of the patients was lung cancer and most of them received treatment with a curative intent. Surgical results were not influenced by the COVID-19 pandemic.

Conflicts of interest: The authors have no conflicts of interest to declare.

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