

Lung surgery at the time of COVID-19: Clinical course of a patient infected with severe acute respiratory syndrome Coronavirus 2.

Edgardo Jimenez Fuentes M.D.

Erika Barlandas Quintana M.D.

Christian Marcelo Carrión Astudillo M.D.

Asya Zubillaga Mares M.D.

Braulio Ríos Muñoz M.D.

Mexico City, Mexico.

Case Report

THORACIC SURGERY



Abstract: Background: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection has spread rapidly resulting in a pandemic, causing a serious condition in thousands of patients around the world. Although the number of articles concerning this illness grows exponentially, there are few published clinical cases that describe long-term lung complications.

Case presentation: 57-year-old male with right pleural effusion secondary to Coronavirus disease 2019 (COVID-19). An endopleural catheter was placed without achieving complete lung expansion. An exploratory thoracotomy was performed finding necrotizing pneumonia, brochopleural fistula of the right middle lobe and pachypleuritis as late pulmonary complications of SARS-Cov2 infection

Conclusion: It is necessary to continue an arduous investigation regarding the great variability of complications due to COVID-19 and to propose surgical treatment for selected patients.

Key Words: COVID-19, SARS-CoV-2, lung complications

Introduction

In late 2019, a new coronavirus was identified as a cause of atypical pneumonia in a group of patients in Wuhan, China. This microorganism has spread rapidly since then, leading to a pandemic. This infection was named by the World Health Organization as COVID-19 disease (i.e., coronavirus disease 2019) [1]. The virus causing COVID-19 is termed Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). The increased morbidity and mortality caused by COVID-19 are mainly due to acute viral pneumonitis which progresses to acute respiratory distress syndrome (ARDS). In this article, we report the case of a patient with prolonged hospitalization and intubation due to COVID-19 disease, along with the pulmonary complications observed and their surgical resolution.

Case report

A 57-year-old male patient with a history of long-standing systemic arterial hypertension under treatment with losartan 50 mg every 12 hours. On 04-22-20 she began her current disease with odynophagia, asthenia and adynamia, for which she consulted a private doctor who diagnosed pharyngotonsillitis and indicated unspecified antibiotic treatment. On 04-27-20 she developed unquantified thermal rises, dry coughing spells, mild shortness of breath and slight limitation during ordinary activity, which led him to attend the emergency department for evaluation.

At the respiratory triage in our hospital, he was found to have an oxygen saturation of 45%, which led to the initiation of management with supplemental oxygen, raising it up to 55%, for which his admission to the shock room was decided as a type I priority. Due to evidence of respiratory insufficiency, airway management was started, performing sedation and neuromuscular blockade with midazolam and rocuronium, afterwards, orotracheal tube number 7.5 was placed at 21 cm from the dental arch; in turn, placement of a central venous catheter with right subclavian approach was decided, without complications.

Invasive mechanical ventilation was started with the following parameters: Total volume 30 ml, fraction of inspired oxygen (FiO₂) at 100%, respiratory rate (RR) 17 breaths per minute (BPM), positive end-expiratory pressure (PEEP) 14 cmH₂O, Inspiration: expiration ratio (I:E) 1:1.5, Peak pressure (P_{peak}) 36 cmH₂O, holding oxygen saturation (SaO₂) >90%. Management with norepinephrine 0.7 mcg/kg/min and dobutamine at 2.5 mcg/kg was also started. Ceftriaxone, oseltamivir and clarithromycin were administered. The following diagnoses were made: acute respiratory failure type 1, mixed acid-base imbalance (acute respiratory acidosis, lactic acidosis), suspected atypical pneumonia vs severe ARDS, hydroelectrolytic imbalance (mild hypocalcemia without electrocardiographic manifestations).

From the Department of General and Endoscopic surgery at General Hospital "Dr. Manuel Gea González". Mexico City, Mexico. Received on May 26, 2021. Accepted on June 5, 2021. Published on June 11, 2021.



Figure 1. Chest X-ray after chest tube (endopleural) insertion, showing right pleural effusion of approximately 80%.

A PCR swab test for SARS-CoV-2 was performed and tested positive on 04-27-20. The patient was admitted to the intensive care unit (ICU) on 04-28-20 due to being a confirmed SARS-CoV-2 patient, with severe ARDS and advanced airway management. Extubation was performed on 05-28-20, afterwards the patient developed a right pleural effusion of 80%, therefore the general surgery service was consulted on 06-05-20 for chest tube insertion (**figure 1**).

However, the patient progressed poorly, without reaching pulmonary reexpansion, so on 06-10-20 a right posterolateral thoracotomy was performed on the patient, transoperational findings were necrotizing pneumonia (NP), bronchopleural fistula of the right middle lobe and pachypleuritis (**figure 2**); approximately 200 cc of cloudy / turbid fluid were drained, cultures were taken and sent, and a chest tube (endopleural tube) and two Jackson-Pratt-type drains were left, one anterior and the other posterior (**figure 3**).

Due to the improvement of the patient's condition chest tube (endopleural catheter) was removed on 06-15-20; extubation was performed on 06-18-20 followed by the removal of the anterior Jackson Pratt drain on 06-19-20. He was discharged home on 06-23-20 to continue outpatient follow-up. Subsequently, the pathology report was gathered, which reported "acute fibrinopurulent and chronic pachypleuritis arranged with few foreign-body-type giant cells"; histological findings compatible with ulcerated bronchopleural fistula with granulation tissue, chronic inflammation with few foreign-body-type giant cells, recent and old hemorrhage. Irregular fibrosis of scar type in adjacent lung parenchyma.



Figure 2. Bronchopleural fistula in the middle lobe of the right lung measuring approximately 1x1.5 cm during posterolateral thoracotomy.

Discussion

After the acquisition of SARS-CoV-2 infection, multiple associated complications can develop. Age seems to be the main risk factor predicting progression to acute respiratory distress syndrome (ARDS) [2,3,4,5]. Comorbidities, high fever ($\geq 39^{\circ}\text{C}$), smoking history, and certain laboratory features also predict progression and death due to COVID-19. The need for mechanical ventilation in those who are seriously ill is high, ranging from 30 to 100% [3,5,6,7,8]. However, lung compliance is higher compared to other ARDS etiologies. Incidence of barotrauma in those patients who require mechanical ventilation has been reported in up to 25% of patients despite the use of low tidal volumes and peak pressures [9]. Furthermore, pleural effusions are considered unusual [10].

There is a paucity of data describing the pulmonary pathogenesis of COVID-19 pneumonia in critically ill patients. The majority of autopsy reports describe mononuclear inflammation [11,12], hyaline membrane changes, and microvessel thrombosis which are suggestive of early ARDS (i.e., exudative and proliferative phases of diffuse alveolar damage [DAD]) [12-14]. Additional findings include: bacterial pneumonia (isolated or superimposed on DAD) and viral pneumonitis. Less common features include acute fibrinous and organizing pneumonia (AFOP) (late stages) [19], amyloid deposition, and rarely alveolar hemorrhage and vasculitis [14].

In our patient's case histopathological findings were congruent with chronic inflammation with scarce giant cells of the foreign body type; as well as "less common" or "atypical" features such as pachypleuritis, ulcerated bronchopleural fistula, hemorrhage, and adjacent pulmonary parenchyma fibrosis.



Figure 3. Chest X-ray, 24 hours after the intervention, showing adequate lung expansion, along with two Jackson Pratt drains (anterior and posterior) and an endopleural tube.

The percentage of patients with long-term sequelae is currently unknown, however, a retrospective study involving 110 patients with COVID-19 reported lingering abnormalities in pulmonary function at hospital discharge in patients with mild and severe pneumonia [15].

Conclusion

In conclusion, this case leads us to consider the wide variety of possible complications secondary to this new virus, and the consequent need for further research. Furthermore, this case proves the need to consider surgical management for critically ill patients whose pulmonary compliance is compromised and who do not improved with conventional medical treatment. However, we believe that patients should be carefully selected in order to avoid further harm and to offer resolutive treatment to those who are candidates for it.

Conflicts of interests

There was no conflict of interest during the study, and it was not funded by any organization.

Acknowledgements

Special recognition to the health care workers (medical staff, nurses, stretcher-bearer, cleaners, and administrative personnel) for their invaluable efforts to fight the pandemic and take care of our patients.

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Erika Barlandas
Department of General and Endoscopic Surgery
General Hospital "Dr. Manuel Gea González"
Mexico City, Mexico
barlandas@gmail.com