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Case Report

Pulmonary necrosis and bronchopleural fistula in a patient infected with COVID-19: A case report

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Abstract

Objective: Bronchopleural fistula (BPF) is a pathological communication between the bronchial tree and pleural space. BPFs are commonly seen after lung surgery, and are less common in trauma, lung abscess, and radiation therapy. In this study, we describe the clinical course and surgery of a case of pulmonary necrosis and BPF in a patient infected with coronavirus disease 2019 (COVID-19).

Case Presentation: The patient was a 54-year-old man with multiple myeloma and end-stage renal disease from the last 8 years. He had a history of coronary artery bypass grafting from the last 3 years. He also suffered from progressive shortness of breath and dry cough since March 2019.

Conclusion: The results of this study showed that BPF is one of the most severe complications after thorax surgery, and there is no effective prevention method particularly in this patient who had COVID-19 pneumonia. Therefore, early intervention, especially when diagnosed at an early stage, by strengthening the stump inside the thorax or thoracotomy in the open window may eventually accelerate the closure of the BPF and improve the survival.

Keywords: Pulmonary necrosis, Bronchopleural fistula, COVID-19

Introduction

The outbreak of coronavirus disease 2019 (COVID-19) occurred in Wuhan, Hubei province, China, in December 2019 (1). It is important to notice that the clinical symptoms of this disease are not exactly clear. Common symptoms include fever, cough, myalgia, and fatigue. Patients may have nausea and diarrhea before they have a fever. In general, fever is one of the main symptoms, and a small number of patients may have a headache and show hemoptysis (2,3). Acute respiratory symptoms in old patients who have underlying diseases are due to the degradation of alveolar sacs (4). COVID-19 can quickly progress and involve many organs of the body (e.g. shock, ARDS, acute myocardial injury) and cause death of patients (5). There are a number of emergency surgeries that should be done immediately. If left untreated, these surgeries should be treated with laparoscopy to minimize postoperative effects on respiratory function. In the case of patients who need emergency care, two factors should be taken into account. They include (*a*) the principles of staff protection and (*b*) the minimization of interventions that affect the respiratory system. The clinical manifestations and prognosis of these patients are unclear to us. In other words, data on the clinical features and outcomes of patients with COVID-19 infection who are undergoing surgery are rare at present. But the importance of the impact of surgery as a risk factor on cellular immunity is well known (6). On the other hand, chest malignancy may be accompanied by mild respiratory symptoms. In addition, patients may have coughing, shortness of breath, a reactive fever, and postoperative radiological changes after thoracic surgery. These postoperative changes may overshadow the symptoms of COVID-19 Bronchopleural fistula (BPF) is a pathological communication between the bronchial tree and pleural space. BPFs are commonly seen after lung surgery, and are less common in trauma, lung abscess, and radiation therapy (7-9). In this study, we describe the clinical course and surgery of a case of pulmonary necrosis and Broncho pleural fistula in a patient infected with COVID-19.

Case Presentation

The patient was a 54-year-old man with multiple myeloma and end-stage renal disease from the last 8 years. He had

a history of coronary artery bypass grafting from the last 3 years. He also suffered from progressive shortness of breath and dry cough since March 2019. The patient was hospitalized in Kamkar hospital in Qom for treatment. At the onset of his treatment, there was an opacity in the CT of the right lung. He was finally transferred to Beheshti Hospital with the bronchoalveolar fistula diagnosis to do the thoracotomy procedure. For treatment purposes, the patient underwent spirometry and computerized tomography scan (Figure 1) which is reported to be 0.5 liters per forced expiratory volume spirometry. Also, patient counseling and thoracic surgery were requested. Due to the high risk of surgery, the patient was prepared for thoracotomy after obtaining permission from the patient and his companions. Nephrological counseling was also requested for the patient by performing 10 cryotherapy injections before the operation and dialysis according to the previous plan. According to the advice provided by the cardiovascular service, preoperative correction of the anemia and echocardiography were done for the patient. Also, routine tests were requested for the patient before the operation. More information is depicted in Table 1. The patient underwent thoracotomy with a diagnosis of right lung broncho alveolar fistula and empyema. Before the operation, the patient had SPO_2: 90% and stable vital signs. After the prep and drape, the patient was under general anesthesia, and in the left lateral position, the posterolateral thoracotomy was first performed on the right side, and the subcutaneous tissue, fascia, and muscles up to the ribs were opened with the help of a cutter. After opening the intercostal space, the thickness of the pleura was so thick that we could hardly enter the chest cavity and a thick pill could be seen in part of the upper and middle lobes of the right lung. Also, part of the lower lobe of the right lung was completely necrotic and detached from the lung tissue. In this part, the fistula was visible. First, the adhesions of the lung lobes were separated from the walls of the thorax and the upper and middle lobes were decorated and the pills were gradually separated. Then, the upper and middle lobes of the lungs were seen. But the lungs could not return due to necrosis. (Figure 2). Moreover, patient's right lobe of lung has been operated. Finally, the patient was transferred to the intensive care unit after intubation. After the recovery stage, the patient was admitted in the surgery ward. However, after the relative recovery of the patient, the rest of the cares perfirmed in isolated situation. The results of the patient's postoperative tests are also shown in Table 2.

Figure 1. CT scan of the patient's lungs

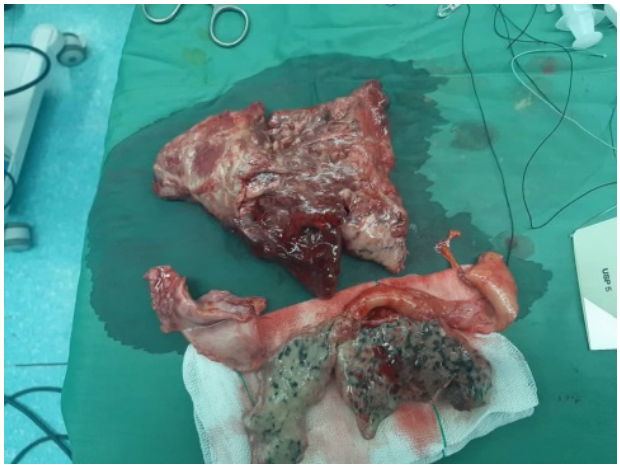

Figure 2. Lower lobe of the right lung.

Discussion

BPF is a rare but severe complication that can occur after anatomical removal of the lung. In this case, the pleural space is exposed to bacterial flora, and as a result, pleural effusion can leak into the main airways and spread to the surrounding alveolar space. This condition can cause severe aspiration pneumonia or empyema, which is potentially fatal (10,11). Many studies have described BPF as a severe and important complication that occurs after the lungs are removed from the anatomical site (11-13). Based on evidence, the incidence rate is 0.6% to 4.4% (13-16). The mortality rate after such a complication is 18% to 50% (11). In general, various risk factors for BPF have been reported after pulmonary anatomy. As noted, right ventricular pneumonectomy and right lung lobectomy are associated with a higher risk of BPF (11,12,17). The complication appears to be due to postoperative blood loss to the bronchial stump after rupture of the lymph nodes and preoperative treatment (18,19). In our study, lobectomy was performed on the patient's right lung and caused the complication. Recent studies have often reached the same conclusion (20). The operation was performed on a patient with coronavirus who had a very difficult course of action. However, after the operation, the patient was transferred to the intensive care unit and after the care process; he was transferred to the general ward with a partial improvement. In one study, Cai and colleagues reported seven cases of confirmed SARS-CoV-2 infection in the postoperative period of lung removal. In

Table 1. Patient blood tests before surgery

CBC	Biochemistry	Coagulation	VBG
WBC: 3100 HB: 10.2 PLT: 78000	UREA: 62 CR: 2.9 NA: 136 K: 3.7 CA: 8.3 AST: 15 ALT: 10	PT: 14.4 PTT: 31 INR: 31.9	PH: 7.3 PCO2: 48.6 HCO3: 23.4

Table 2. Patient blood tests after surgery

CBC	Biochemistry	VBG
WBC: 5700 HB: 11.8 PLT: 39000	UREA: 89 CR: 3.3 NA: 140 K: 4.1 CA: 8.2	PH: 7.38 PCO2: 34.3 HCO3: 19.9

their study, three out of seven patients died of COVID-19 pneumonia. Lung removal surgery is considered as a risk factor for death in patients with COVID-19 in the postoperative period (21). This indicates a high risk of thoracotomy for these patients. In another study, the clinical course in patients with COVID-19 was evaluated after thorax surgery. During the postoperative period, pre-hospital screening and careful contact isolation should be considered (22).

Conclusion

The results of this study show that BPF is one of the most severe complications after thorax surgery, and there is no effective prevention method particularly in patients infected with COVID-19 pneumonia. Therefore, prompt action especially when diagnosed quickly by strengthening the stump inside the thorax or thoracotomy in the open window may eventually accelerate the closure of the BPF and improve survival.

Ethical issues

Informed consent was obtained from the patient for publication of this report.

Authors' contributions

Each author contributed equally to the study design, drafting the article, reading critically and accepted the final proof.

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