

CASE REPORT ON PNEUMOMEDIASTINUM, PNEUMOTHORAX AND PNEUMONIA COMPLICATING THE CORONA VIRUS DISEASE (COVID-19 INFECTION

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Abstract : The main purpose of this report is to present and provide a view of patient with COVID 19 and Pneumomediastinum. The significance of pneumomediastinum in relation to the SARS-CoV-2 (COVID-19) disease and its harmful effect are crucial factors here. The COVID 19 is already known to have serious consequences for the lungs and the associated quality of life, some more severe and fatal than others. In view of this, we would like to discuss this relationship in more detail, precisely the viral infection with Coronavirus 19 and the pneumomediastinum, present it with potential risk factors and evaluate obvious recommendations for a better quality of life.

The ascertainment and diagnosis of pneumomediastinum is performed according to the following diagnostic tools: a plain thorax radiograph or chest computed tomography (CT).

The chest radiograph, also acquainted as chest X-ray (CXR) is a specific projection radiograph of the thorax utilized conditions that affect the chest, its important content and the adjacent structural tissues. The computer tomography (CT) belongs also to the X-ray examination methods, which use images created layer by layer to visualize the structure of the mesenchymal tissue of the body. In addition, it provides more reliable illustrations than the X-ray.

Individuals that suffer, due to infection, by the specific beta coronavirus severe acute respiratory syndrome (SARS-coV-2 – COVID 19) have a higher risk of developing a pneumomediastinum and this is proven by the fact that even the younger population can be affected.

Pneumomediastinum is a rare complication of Coronavirus disease 2019 and there is an inadequate amount of published literature that show sufficient data about the exact pathogenetic mechanism and assessment of COVID 19 in relation to the development of pneumomediastinum.

The connection between COVID 19 and complications like pneumothorax and pneumomediastinum should be investigated further in order to provide faster and better treatment for the patients. COVID 19 is generally treated by physicians with internal or infectious diseases and the surgeon society should be more aware that the COVID 19 infection can lead to surgical complications.

Additional data on these cases is still relatively small and the need to be collected more data is crucial. Many physicians still don't know the connection between these diseases.

Keywords: COVID 19, pneumonia, pneumomediastinum, pneumothorax

1. INTRODUCTION

Pneumomediastinum is the state in which air or gas is present in the mediastinum or mediastinal tissues, also referred to as mediastinal emphysema. The specific etiological factors may be penetrating thorax trauma, pulmonary barotrauma (Hyperbaric oxygen therapy) or progressive and restrictive pulmonary conditions such as Asthma bronchiale. All these agents may lead to excessive raise in intrathoracic pressure and increased intra-alveolar pressure, therefore leading to alveolar rupture, accompanied by air leakage into the adjacent bronchovascular tissues, characterized by dissection along these mediastinal tissues. Pneumomediastinum is a rare condition. Pneumothorax is marked by presence of air or gas in the thoracic cavity, but mainly in the pleural cavity. Pneumothorax developmental mechanism is predominantly featured when a communication develops between alveoli or other intrapulmonary air space and pleural space, leading to airflow into the pleural space until there is no longer a pressure difference. Intrapleural pressure is normally negative (-4 mmHg). This negative charge prevents the

natural elastic recoil mechanism of the lungs from contracting . In a Pneumothorax this mechanism is disrupted due to the lack of pressure differentials. Pneumonia is generally defined as inflammation and consolidation of the pulmonary parenchyma, especially affecting the microscopic air sacs – Alveoli and parenchyma . Parenchyma refers to alveolar tissue with respiratory bronchioles, alveolar ducts, terminal bronchioles, and blood vessels . Pneumonia is most common caused due to an infection with *Streptococcus pneumoniae* (pneumococcosis) , but also viruses, such as Adenoviruses. Influenza viruses are etiological factors that may lead to disruption of the respiratory epithelium and an increased inflammatory process that changes the expression of specific receptors to which bacteria adhere.

2. METHODS

The ascertainment and diagnosis of pneumomediastinum is performed according to the following diagnostic tools: a plain thorax radiograph or chest computed tomography (CT).

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3. RESULTS

The protagonist of the case is a 35-year-old man admitted to the Pulmonology clinic who presented to the emergency department a progressive case of COVID-19 and bilateral pneumonia. The COVID-19 infection was confirmed by a positive antigen test, the patient was given a broad-spectrum antibiotic, consequently Azax (macrolide azithromycin) and anti-symptomatic medications, which were unsuccessful. Due to his serious physical well-being and condition, he was admitted to the emergency room once again. The middle-aged man presents symptoms such as myalgia, arthralgia, dizziness, excessive fatigue and hyperthermia (38 degrees Celsius for one week) but has no known underlying disease. He presented himself in a generally poor physical condition but was mentally adequate . Physical examination revealed a dry tongue with small lesions and white spots indicative of central intoxication. This intoxication was established by a corona disease and should therefore be interpreted in this context. He is also marked with clear dehydration. Examination of the respiratory system revealed evidence of bilateral wet wheezes, rhonchi and manifested pulmonary vascular breathing. In the examination of the cardiovascular system, he showed tachycardia (100 beats per minute) and arterial hypotension with a blood pressure of 90-60 mmHg. Other abnormalities were not present. A routine check-up on his hemogram showed significantly increased values in the laboratory analysis. His ferritin level was elevated 1023.7 ng/ml (1). His D-dimer level was also above the reference range at 1.19 mg/L (4). In addition, the microbiological examination revealed a *Candida* fungal infection. The 35-year-old man, who presented to the emergency room with severe bilateral pneumonia and a COVID-19 infection, was initially examined radiologically. X-rays of his chest were taken on August 17, 2021 because of a COVID-19 infection. A second X-ray was then taken in September 3rd, 2021 in the pulmonology clinic as the general condition was deteriorating, the patient was complaining of the presence of gas in his left neck area and crackles, which had been accompanied by bilateral lung failure and pneumonia. There was also a suspicion of partial pneumothorax and pneumomediastinum. Because of these complications, surgeons were consulted to adequately assess the situation. A computer tomography (CT) was performed to reliably establish the diagnosis, which confirmed a severe COVID-19 infection and a pneumomediastinum. However, the etiological factor and cause of this condition has not been clearly established. The patient was treated conservatively with 8 L/min oxygen. The pneumonia was treated intravenously with Bacteripim, twice a day with one gram in the morning and one in the evening.

In addition, the patient was given Levoxa intravenously as an additional antibiotic once per 500 mg per day. For respiratory arrest he was given 1000ml of fluid intravenously. This was also supported with corticosteroids (Dexamethasone) 4 mg 2 times daily (morning and evening). Along, he was given platelet aggregation inhibitors (antithrombotics) in the form of fraxiparin 0.4 ml subcutaneously once a day. Vitamin supplements in the form of ascorbic acid (Vit. C) were given to support the immune system. Last but not least, he also got proton pump inhibitors in the form of Quamatel, one ampoule a day.

Figure 1: frontal chest radiograph showing severe COVID-19 Infection (17.08.2021)



Figure 2a and b): CT showing COVID Pneumonia with suspicion of partial Pneumothorax and Pneumomediastinum (03.09.2021)

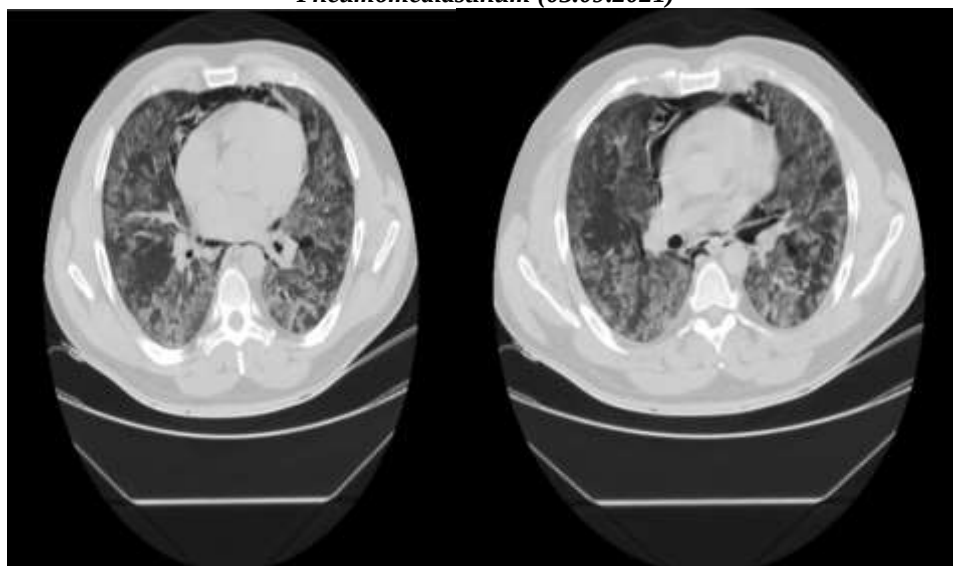


Figure 3 a) and b): CT showing resolved Pneumomediastinum (17.09.2021)

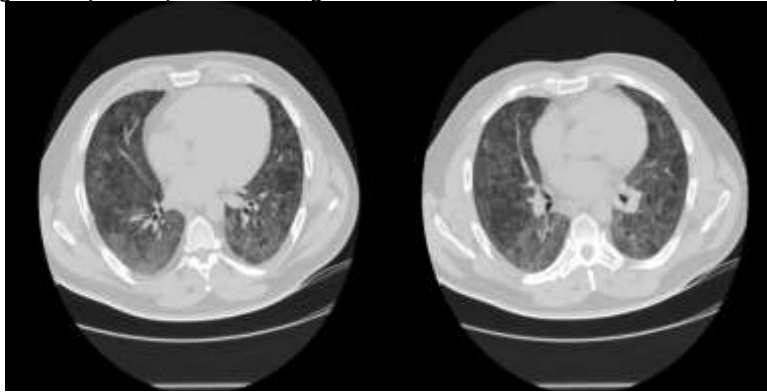


Figure 4: control chest X-ray showing resolved Pneumomediastinum und Pneumothorax (03.09.2021)



4. DISCUSSION

The severe acute respiratory syndrome caused by COVID-19 (SARS-CoV-2) was observed.

The findings and information contributed to this case clearly show that a COVID-19 infection can contribute to other extremely rare complications such as pneumomediastinum (9). It should not be left unnoticed that every gender as well as a different age group can be affected. COVID-19, which has become the newly established threat in the world, is not yet fully understood and therefore hides complications that we are unaware of and therefore cannot prevent. According to the World Health Organization, at the time of the report, over 481 million people worldwide had been infected with COVID-19 and around 6 million of them had died. Complications such as pneumonia, sepsis, acute respiratory syndrome were often noted, but much rarer complications such as pneumomediastinum are unfortunately less in focus and therefore less researched in view of a COVID-19 infection. Imaging methods, such as computer tomography, have proven to be valuable and useful tools, with their ability to detect complications earlier (11). In this corona case, the middle-aged male patient had a positive corona infection, which was confirmed by laboratory, CT scan, X-rays and other tests (5,7). He was admitted to the hospital and immediately developed pneumomediastinum as a result of his corona pneumonia. The occurrence of such clinical manifestation is extremely rare, as seen from statistics. According to an international statistic, 1 case of pneumomediastinum was reported in over 25,000 thousand COVID-19 patients. This corresponds to a very small proportion of $p < 0.01$ (8). The special pathophysiological course of a pneumomediastinum, which is also described

as the Macklin phenomenon, is characterized by progressive inflammation caused by SARS-CoV-2 in the respiratory tract and consequently by increased intrathoracic pressure (2,10). Consequently, this leads to rupture of the alveoli and dissection in the pulmonary parenchyma and bronchovascular tissues (6,10). This special air dissection results in abnormal and increased pressure within the mediastinum and in the soft and subcutaneous tissues of the thoracic, neck and abdomen. The results show that pneumomediastinum can very rarely form in a COVID-19 infection, but the risk still occurs. The advanced inflammation of the lung tissue in COVID-19 patients may lead to this. This particular case shows once again that we as doctors need to take precautions, possibly examine more carefully and research each case individually, regardless of age. It should also be noted that such complications do not lead to an increased mortality rate, but require narrower and more invasive therapies.

5. CONCLUSION

The findings in this case provide insight into an individual case reporting COVID-19 pneumonia complicated by pneumomediastinum. This dynamic complication is a valuable signal to treating physicians who come into contact with complex but also common COVID-19 cases on a daily basis. It is also evident that conservative methods of treatment make a positive contribution and even prevent it from getting worse. As seen in the follow-up, CT shows resolution of the pneumomediastinum (Figure 3a) and 3b).

In conclusion, there is a need for more research and epidemiological statistical evaluation of complication courses in COVID-19 disease.

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