

COVID19 and Tension Pneumothorax— Life threatening complication of COVID -19 patients on Non-invasive ventilation or mechanical ventilation: Often missed but must not be missed

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We present a series of 3 confirmed cases of COVID-19 infection who presented with or developed pneumothorax during their stay in hospital.

Case 1: 46 years, male presented with 4 days history of fever, cough, shortness of breath, with history of polyuria and polydipsia, patient denied any comorbidities or any history of recent sick contact. He was admitted as a case of suspected COVID, CXR revealed: bilateral few ill-defined infiltrates more in right lower zones suggestive of viral Pneumonia. Patient was started on standard antibiotics therapy and was referred to medical for Diabetes ketoacidosis management, Patients oxygen saturation was around 90% non-rebreather mask (NRM) at 15 LPM however patient was requiring higher O₂ because he was desaturating on 15 LPM oxygen. His routine labs were normal, except for high ferritin, CRP, Blood glucose and dimer and lymphopenia which were suggestive of COVID-19 pneumonia. Nasopharynx Respiratory Screening Panel PCR was negative; however, RT PCR COVID test came positive.



Image 1: Chest PA radiograph: Bilateral mid and lower zone consolidation seen more so on the right side. Both hila are normal. CP angles are free. Cardia appears to be enlarged with LV configuration.

Patient was continued on antibiotics, antivirals and supportive measure

and high flow oxygen by NRM mask, but soon patient became more distressed and desaturated, hence patient was intubated and ventilated electively. After some time patient became hypotensive and desaturated and with absent breath sounds on right side hence an immediate CXR was done and revealed (Image 2) Newly developed massive right-sided pneumothorax with mediastinal shift to the left side Cardiothoracic was consulted to insert ICTD. All tubes are seen in place (Image 3)

PEEP was reduced to zero with 100 % FiO₂ and patient was continued to manage in ICU with uneventful recovery and after complete resolution of pneumothorax shifted to ward and the discharged home.

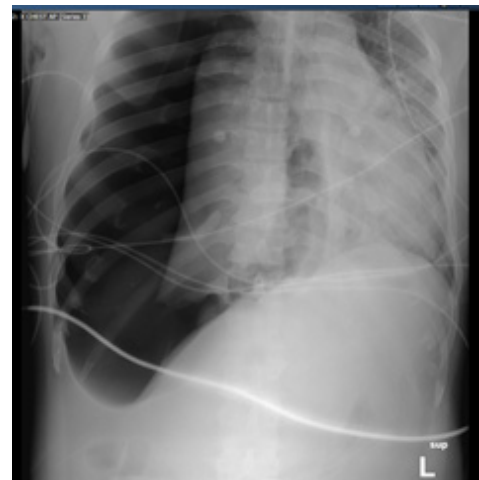


Image 2: Chest PA radiograph: significant tension pneumothorax on left side with contralateral mediastinal shift Bilateral mid and lower zone consolidation seen more so on the right side.

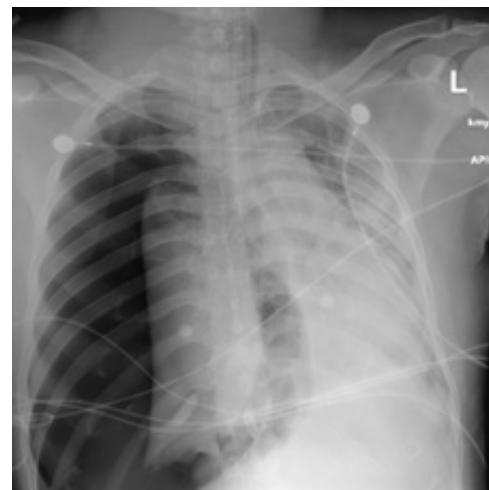


Image 3: Chest AP supine radiograph: significant tension pneumothorax on left side with contralateral mediastinal shift Bilateral mid and lower zone consolidation seen more so on

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Image 4: Chest AP supine radiograph: CXR after insertion of ICTD near complete expansion of lung with deep sulcus sign as CXR taken in supine shown as arrow



Image 5: Chest AP supine radiograph: Image 5: CXR after ICTD removal, complete expansion of lung

Discussion

1. In our case there was no previous respiratory history, non-smoker hence the possible etiology leading to tension pneumothorax could be spontaneous or high PEEP induces rupture of small bleb which was not evident on CXR.
2. Other hypothesized aetiologies for COVID patients developing pneumothorax could be as follows:
3. In ventilated patients high PEEP or insertion of central line could be the risk factor for development of pneumothorax which is not uncommon in ICU care.
4. Another possible hypothesis could be necrotizing small infarct of the lung secondary to micro and macrovascular thrombosis and which could lead to rupture in pleura and the risk is high if patient is ventilated and on high PEEP
5. Another associated infection viz TB, MRSA, bacterial pneumonia can also cause necrotising pneumonia followed by rupture in to pleural space and consequent pneumothorax.
6. Underlying COPD or blebs or bullae which are common in the smokers and old / middle age population can also lead to rupture following the vascular compromise after COVID induces micro embolism and necrosis.

Chen et al had one pneumothorax in a series of 99 patients with one more pt with areas of cavitation¹. Typical features of COVID-19 on initial CT are bilateral multilobar ground-glass opacification with a peripheral or posterior distribution, apparent in the outer lateral zone of lungs. Only about one percent of COVID-19 patient has pneumothorax. This case had spontaneous pneumothorax, pneumomediastinum and subcutaneous emphysema at the same time. Spontaneous rupture of a subpleural bulla is the cause of primary spontaneous pneumothorax.

Risk factors that contribute to the development of spontaneous pneumothorax include tobacco smoking, age, thin stature, male sex, low body mass index, prolonged cough, strenuous exercise and some diseases such as chronic obstructive pulmonary disease. Spontaneous pneumomediastinum, usually a rare condition, refers to alveolar rupture due to an increase in intrathoracic pressure. Subcutaneous emphysema occurs when air gets into tissues under the skin, with pneumothorax often being followed by air dissection through the broncho vascular sheath into the mediastinum².

In one case series, COVID 19 patients demonstrated an organizing pattern characterized by peripheral predominant distribution and reversed halo or atoll sign in some cases. Additionally, one of our cases also developed a small focus of cavitation³, which has not been previously described⁴.

It should be kept in mind that in patients with Covid-19 pneumonia, it may develop in pneumatoceles secondary to parenchymal damage. Mortality rates can be reduced in patients with early diagnosis and treatment⁵.

Sana S et al. They investigated imaging findings in 919 Covid-19 positive patients and detected ground-glass densities in 88% of cases. 87.5% of parenchymal attitudes were observed to be bilateral. none of them encountered pneumothorax⁶

In severe acute respiratory failure syndrome, sudden alveolar pressure increase may cause interstitial emphysema and air leak, leading to the development of mediastinal emphysema⁷

In this study, we presented 46 year patient with Covid-19 pneumonia and followed by tension pneumothorax after the initiation of NIV. Pneumothorax may develop in Covid-19 pneumonia due to alveolar damage. This can cause increased mortality and morbidity. For this reason, pneumothorax should always be kept in mind in the treatment and follow-up of Covid-19 infection.

Summary

Pneumothorax could be an inevitable and could be life threatening complication of COVID patients as they may have following aetiologies:

1. Some undiagnosed blebs or bullae due to chronic smoking status or due to COPD
2. Area of necrosis due to the intrinsic disease processes and could be small necrotic infarcts in lung which may rupture when patient are kept on high PEEP or high Inspiratory pressure support by ventilator especially high PEEP,

hence in any patient who is suddenly deteriorating, and on ventilator we should have strong suspicion of pneumothorax and a proper sitting CXR should be done because sometimes the mild pneumothorax may be missed in the supine CXR which are usually carried out in ICU,

Hence this case report emphasizes the importance of sitting CXR in

suddenly deteriorating patient apart from stating the possible life-threatening tension pneumothorax as a complication of COVID patients secondary to high PEEP during ventilation.

Conclusion

Any patient who is suddenly clinically deteriorating and on NIV or ventilator, we should have strong suspicion of pneumothorax and a proper sitting CXR (ideally erect or 90 degree sitting or 30 or 45 degree sitting) should be done because sometimes the mild pneumothorax may be missed in the supine CXR which are usually carried out in ICU.

Hence this case report emphasize the importance of sitting CXR in suddenly deteriorating patient apart from stating the possible life-threatening tension pneumothorax as a complication of COVID patients secondary to high PEEP during NIV or mechanical ventilation.

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Biography

Mayank Vats is Senior Specialist - Interventional Pulmonologist, Pulmonologist, Intensivist & Sleep Physician at Rashid Hospital and Dubai hospital and developed interventional pulmonology department in Rashid hospital. Before coming to UAE, he was consultant, Respiratory Medicine, Critical Care Medicine, Sleep Medicine in Escorts heart institute and Apollo hospital, New Delhi India, tertiary level of care hospitals in India. Vats focus interest is to utilize his Professional Knowledge and Interpersonal Skills in order to provide highest degree of patient care & satisfaction. Having worked in a busy tertiary level teaching hospital & specialty corporate hospital as a consultant, he has been exposed to a complete spectrum of Respiratory, Critical Care & Sleep Medicine. He has more than 80 international and national publications to his credits including research articles/ review article, chapters contribution and many articles are undergoing. He has published 3 books from Europe, on respiratory infections, Sleep Apnoea: Recent Advances, Tuberculosis and two more books are under publication on Noninvasive ventilation and Interventional Pulmonology.