
Presentation of Unusual COVID-19 pneumonia on CT scan with spontaneous pneumomediastinum and subcutaneous emphysema : A case report

Dr H. Laatoub, Dr H. Charaf, Dr M. Aharmim & Pr J.E Bourkadi

Hospital Moulay Youssef CHU Ibn Sina Rabat Morocco

Abstract

As the global COVID-19 pandemic goes viral uncommon manifestations are discovered, so the awareness of new presentations and complications has increased. In the following article we present a case of spontaneous pneumomediastinum with subcutaneous emphysema in non-ventilated COVID-19 patient. We also performed a relevant literature review using the database since the beginning of the spread of the pandemic.

Keywords : COVID-19 ; spontaneous pneumomediastinum ; subcutaneous emphysema.

1. Introduction:

Since December of 2019, the coronavirus (COVID-19) is currently spreading worldwide due to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

Many parenchymal and extra-parenchymal abnormalities have been observed in CT scan, However, spontaneous pneumomediastinum is a rare condition usually seen in patients with underlying pulmonary pathology, infections or mechanical intubation but still has been described in patients with COVID-19 pneumonia, despite no history of mechanical ventilation. [1]

Therefore, we describe a case of spontaneous pneumomediastinum in a patient with resolved and uncomplicated COVID-19 pneumonia.

2. Case report:

We report a case of 17-year-old male with no history, tested positive for SARS-CoV-2 four days prior to admission, with minimal symptoms of fever at 39C, dry cough and sore throat. He presented to the Emergency Department (ED) with sudden left chest pain and dyspnea.

On physical examination, the patient was hemodynamically stable with heart rate of 70 beats per minute, blood pressure 110/60 mmHg, respiratory rate 24 breaths per minute and oxygen saturation 96–97% while he was breathing ambient air. The crackling sound and crepitation were elicited on palpating the neck area, the lungs were clear on auscultation.

EKG, the troponine blood test and the cardiac ultra sound were correct.

The chest x-ray, CT chest revealed pneumomediastinum and a subcutaneous emphysema with normal lung parenchyma.



1



2

Figures 1, 2; axial CT chest shows the accumulation of a discrete amount of free air within mediastinal space, surrounding the trachea. Subcutaneous emphysema is also visible (with normal lung parenchyma).

3. Discussion:

Pneumomediastinum is defined as the presence of air in the mediastinum can be primary, or spontaneous, if the cause is idiopathic, or secondary if it responds to a known etiology, whether traumatic or iatrogenic[2].

Spontaneous pneumomediastinum (SPM) refers to the cases in which such traumatic history is absent, but can be associated with preexisting respiratory disease (such as asthma, interstitial lung disease and recent respiratory infection) and certain triggering events (such as persistent cough and strenuous physical activity)[2].

The symptoms of SARS-CoV-2 infection have been widely characterized in large studies, with fever, cough, and dyspnea being the most frequent. These same studies indicate that only 1–2% of patients developed pneumothorax; although it may occur as the disease progresses,[3] its presentation is still infrequent, like pneumomediastinum.[4]

In our case, SPM was diagnosed in view of absence of traumatic or iatrogenic causes, also the patient had no previous history of respiratory disease and did not suffer from persistent cough.

COVID-19 pneumonia managed without invasive or positive pressure ventilation is a newly reported risk factor for spontaneous pneumomediastinum.[5]

Ground-glass opacities, crazy paving appearance, air space consolidation, bronchovascular thickening and dilatation can be seen on CT scans of COVID-19 patients. In addition, patients with pneumomediastinum can have radiological signs of intraparenchymal lesions such as pneumatocele and interstitial emphysema [6]. Even though the mortality rate was not significantly different in patients with and without pneumomediastinum/subcutaneous emphysema, it has not been associated with increased mortality in COVID-19 patients.[7]

Chest radiography revealing these complications and providing a more accurate understanding of the patient's clinical status. This highlights the importance of regular radiological monitoring for hospitalized patients with COVID-19. Although SPM is mainly characterized by a benign clinical course and is usually self-limited.[8]

The exact mechanism by which spontaneous pneumomediastinum occurs in SARS-CoV-2 pneumonia is unknown.[9]

It may occur as a result of the cytokine storm induced diffuse alveolar injury or direct viral infection of type I and type II pneumocytes makes alveoli more liable to rupture resulting in alveolar membrane rupture, the resultant gush of air circulates through the peri-bronchial and perivascular sheaths to the mediastinum, popularly known as 'Macklin phenomenon'. Viral infection associated tracheal oedema increasing risk of tracheal injury during intubation.[10]

Also cough requires a Valsalva-like effort after the initial inspiratory effort, so as to generate extremely high airway pressures for the subsequent expiratory flow. In the spontaneously breathing patient, the inspiratory phase of the cough requires a rapid forceful activation of the diaphragm and inspiratory musculoskeletal apparatus, to generate a fall in intrathoracic pressure below atmospheric pressure. In doing so, the initial inhalation volume may range

between 50% of the tidal volume, to 50% of vital capacity [11].

This is followed by a compressive phase, in which the glottis is transiently closed against expiratory effort. Isometric contraction of respiratory muscles (diaphragm, intercostal, and accessory muscles), which limits the rise in transpulmonary airway pressure by increasing pleural pressure, thereby preventing the barotrauma that would ensue through the generation of intrathoracic pressures [11]. Cough creates a traumatic mechanical stress upon the airway wall, with neutrophilic airway inflammation and increased cough hypersensitivity that is self-propagating in animal models. Microscopic injury to the respiratory epithelial mucosa by such a self-perpetuating cycle has been demonstrated clinically in chronic obstructive pulmonary diseases and lower respiratory tract infections [11].

Pneumomediastinum is generally a self-limited condition that resorbs with prophylactic antibiotics and conservative treatment without prolonged hospitalization. However, evacuation of air with mediastinotomy may be required in tension pneumomediastinum.[7]

4-Conclusion:

Due to the fast spread of the disease worldwide; all medical practitioners dealing with these patients should be aware of all new possible presentations of COVID-19 and the pneumomediastinum is one of them, in order to prevent diagnostic errors and clinical underestimation, particularly in case of asymptomatic or paucisymptomatic individuals.

The specificity of our case is that COVID-19 infection complicated with pneumomediastinum and subcutaneous emphysema in the absence of detectable alterations of lung parenchyma.

Reference:

- [1]Mohan V, Tauseen RA. Spontaneous pneumomediastinum in COVID-19. *BMJ Case Rep.* 2020 May 25;13(5):e236519. doi: 10.1136/bcr-2020-236519. PMID: 32457032; PMCID: PMC7252963.
- [2]Sahni S, Verma S, Grullon J, Esquire A, Patel P, Talwar A, 2013. Spontaneous pneumomediastinum: time for consensus. *N Am J Med Sci* 5: 460–464.
- [3]Quincho-Lopez A, Quincho-Lopez DL, Hurtado-Medina FD. Case Report: Pneumothorax and Pneumomediastinum as Uncommon Complications of COVID-19 Pneumonia-Literature Review. *Am J Trop Med Hyg.* 2020 Sep;103(3):1170-1176. doi: 10.4269/ajtmh.20-0815. PMID: 32705978; PMCID: PMC7470555.
- [4]Kangas-Dick, A, Gazivoda, V, Ibrahim, M, et al. Clinical characteristics and outcome of pneumomediastinum in patients with COVID-19 pneumonia. *J Laparoendosc Adv Surg Tech A* 2021; 31: 273–278.
- [5]Xu Z, Shi L, Wang Y, Zhang J, Huang L, Zhang C, et al. Pathological findings of COVID-19 associated with acute respiratory distress syndrome.
- [6]Lemmers DHL, Abu Hilal M, Bnà C, Prezioso C, Cavallo E, Nencini N, Crisci S, Fusina F, Natalini G. Pneumomediastinum and subcutaneous emphysema in COVID-19: barotrauma or lung frailty? *ERJ Open Res.* 2020 Nov 16;6(4):00385-2020. doi: 10.1183/23120541.00385-2020. PMID: 33257914; PMCID: PMC7537408.

[7]Ergün D. , Ergün R. , Atalay N. , Kanat F. , Tülek B. Spontaneous Pneumomediastinum in COVID-19 patient: A Case Report. *J Contemp Med.* 2022; 12(1): 159-161.

[8]Kipourou M, Karozis K, Lampridis S, et al. Spontaneous pneumomediastinum and subcutaneous emphysema in the course of COVID-19 disease: A case report and review of the literature. *Pneumon.* 2021;34(2):7. doi:10.18332/pne/136001.

[9]Gorospe L, Ayala-Carbonero A, Ureña-Vacas A, Fra Fernández S, Muñoz-Molina GM, Arrieta P, Almonacid-Sánchez C, Ramos-Sánchez A, Filigheddu E, Pérez-Fernández M. Spontaneous Pneumomediastinum in Patients With COVID-19: A Case Series of Four Patients. *Arch Bronconeumol.* 2020 Nov;56(11):754–6. doi: 10.1016/j.arbr.2020.06.004. Epub 2020 Oct 5. PMID: PMC7535617.

[10]Machiraju PK, Alex NM, Safinaaz, Baby NM. Pneumomediastinum in COVID-19: A series of three cases and review of literature. *SAGE Open Medical Case Reports.* 2021;9. doi:10.1177/2050313X211011807.

[11]Somasundram K, Agbontaen K, Singh S. Pneumomediastinum in COVID-19: Merely a Matter of Lung Frailty? *Respiration.* 2021;100(12):1251-1255. doi: 10.1159/000518367. Epub 2021 Aug 27. PMID: 34515225; PMID: PMC8450820.