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## Case report

# Simultaneous Giant cavity pulmonary lesion and pneumothorax following COVID-19 pneumonia ☆,☆☆

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## ABSTRACT

Cavitary lung formation with spontaneous pneumothorax has been rarely reported as a complication of COVID-19 pneumonia. We report a rare case of a 38 years-old male patient affected by COVID-19 pneumonia, exceptionally complicated by a simultaneous giant cavity in the right upper lung and a small right pneumothorax in the right hemithorax. Whilst pneumothorax emphysema, giant bullae and pneumothorax with alveolar rupture are known to potentially develop in COVID-19 patients as a result of high-flow O<sub>2</sub> support, the exact origin of the giant lung cavitation in our patient could be not confirmed. Cavitary lesions – featured by high mortality rate - are reportedly associated with lung infarctions and can be the aftermaths of pulmonary embolism, a rather common sequela of COVID-19 pneumonia. Radiological imaging is critical to support clinical decision making in the management of COVID-19 pneumonia, since not only it can visualize and stage the disease, but it can also detect and monitor the eventual onset of complications over time, even following patient discharge from hospital.

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## Introduction

COVID-19 can present in various manifestations and computed tomographic (CT) imaging plays an critical role in diagnosing the stages of pneumonia caused by SARS-CoV-2 [1].

Idiopathic cavitary pulmonary lesions and pneumothorax are rare complications reportedly affecting a small proportion of COVID-19 patients [2–6].

Herein, we report a 38 years old male patient affected by COVID-19 pneumonia, developing simultaneous lung cavitation and pneumothorax.

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## Case presentation

On February 25, a 38-year-old-male patient presented to accident & emergency service (A&E) of Baqiyatallah hospital in Tehran (Iran) for fever (38°C), complaining shortness of breath, chilling and malaise during the preceding 4 days. The patient had no relevant medical history.

Baseline O<sub>2</sub> saturation at admission was 85%, increasing up to 92% following O<sub>2</sub> supplementation. Laboratory tests showed a white blood cell count of 10,200/mm<sup>3</sup> with 6.2% lymphocytes. The erythrocyte sedimentation rate (ESR = 84 mm/h) and the C reactive protein (CRP = 114.2 mg/L) were both importantly elevated. Liver function tests were also considerably abnormal [SGOT (AST) = 193 IU/L; SGPT (ALT) = 406 IU/L; alkaline phosphatase (ALP) = 609 IU/L]. Real time reversed polymerase chain reaction (RT-PCR) following nasopharyngeal swab samples resulted positive for SARS-CoV-2 infection.

A Spiral multi-slice chest CT scan, performed on the same day of A&E admission, showed bilateral multilobar patchy ground glass opacities (GGOs) and consolidative lung opacities (CLO) with peripheral lung distribution (Fig. 1A), a radiological pattern compatible with COVID-19 pneumonia.

The patient was treated with oral hydroxychloroquine sulfate 200mg twice a day, oral oseltamivir 75 mg twice a day, palliative therapy and O<sub>2</sub> supplements. After 10 days of the latter treatment regimen, the WBC count decreased to 4.90/mm<sup>3</sup> and the lymphocyte rate increased up to 24%. The ESR (95 mm/h) and CRP (115 mg/L) were still both elevated. The O<sub>2</sub> saturation increased up to 89% without respiratory support and the patient's symptoms improved. As the patient's health conditions were progressively improving, a follow-up spiral chest computerized tomography (CT) scan, performed after 10 days since hospital admission, showed a significant reduction of the CLO and GGOs. However, the CT scan also revealed a giant cavity of about 40mm diameter, with a thick irregular wall

in the right upper lung and a small pneumothorax in the right hemithorax (Fig. 1B).

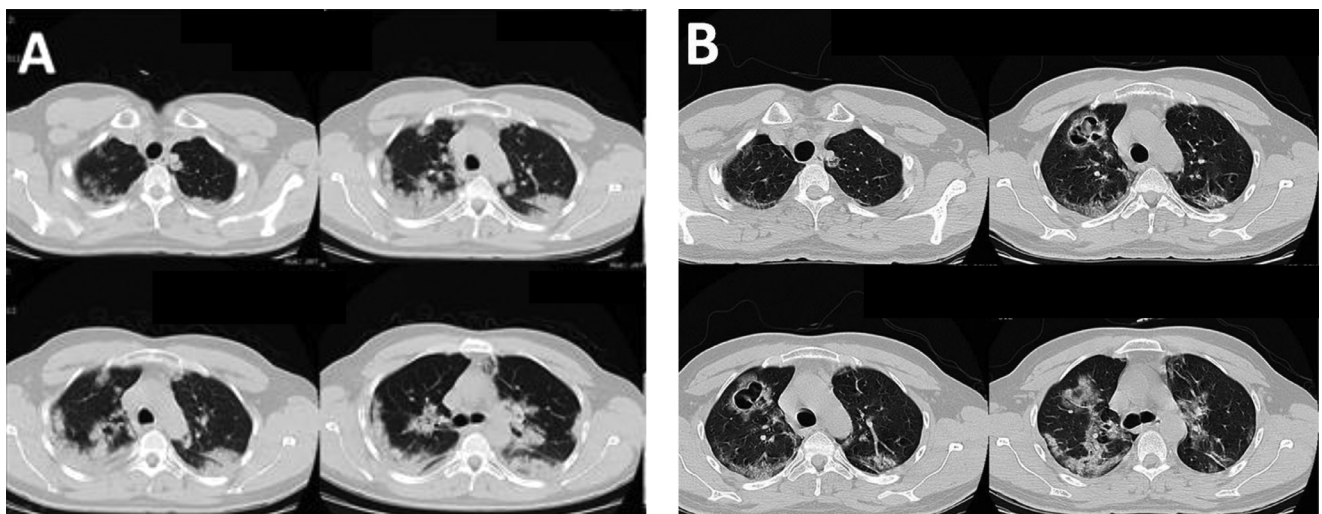
## Discussion

Classic COVID-19 pneumonia presents with GGO and CLO, predominantly in the lower lung lobes, without cavitory lesions, pneumothorax, lymphadenopathy and pleural effusion [3,4,7,8]. Complications of COVID-19 pneumonia can still arise over time and cavitory lung lesions (also of gigantic size) as well as pneumothorax have also been reported [2,4,9-13]. Nevertheless, a simultaneous pneumothorax as well as cavitory lung formation is an exceptional and idiopathic feature.

Spontaneous pneumothorax can be a late evolution of COVID-19 pneumonia [14], although a bilateral sudden onset was also described in a 50 year old male smoker with history of mandibular carcinoma [15]. Emphysema, giant bullae and pneumothorax with alveolar rupture can develop in COVID-19 patients as a result of high-flow O<sub>2</sub> support [12].

By contrast, pulmonary cavitory lesions are usually associated with mycobacterial diseases, fungal or parasitic infections, malignancies or autoimmune disorders [16,17]. Although the exact origin of the giant lung cavitation in our patient was not confirmed, diffuse alveolar damage, intra-alveolar haemorrhage and parenchymal necrosis associated with COVID-19 pneumonia can be explanatory factors [18,19]. Furthermore, cavitory lesions are reported in 4%-7% lung infarctions and can be the aftermaths of pulmonary embolism, a rather common complication of COVID-19 pneumonia [20, 21].

High mortality rates are reported with cavitations with due to pulmonary infarctions, whether infected or not [22]. Radiological imaging is therefore critical to support clinical decision making in the management of COVID-19 pneumonia, since not only it can visualize and stage the disease, but it can also



**Fig. 1 – (A) Four IMAGES (on the first day, at hospital admission): multifocal subpleural patchy consolidative opacities compatible with COVID-19 pneumonia confirmed by RT-PCR test. (B) Four IMAGES (10 days later, at same chest level): significant clinical response to drug treatment, with a small right pneumothorax (black arrow) and an irregular wall cavitory lesion of about 40 mm in diameter (white arrow) at the right upper lung lobe.**

detect and monitor the eventual onset of complications over time, even following patient discharge from hospital [4].

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### Authors' contributions

All authors contributed equally to the drafting, designing and writing of the manuscript and provided critical revision. All authors read and approved the final manuscript.

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### Ethics approval and consent to participate

This case report has been described in accordance with the ethical standards laid down in the "Declaration of Helsinki 1964."

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### Patient consent

Informed written consent was taken from the patient

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### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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### REFERENCES

- [1] Campagnano S, Angelini F, Fonsi GB, Novelli S, Drudi FM. Diagnostic imaging in COVID-19 pneumonia: a literature review. *J Ultrasound* 2021;1–13.
- [2] Zoumot Z, Bonilla MF, Wahla AS, Shafiq I, Uzbeck M, El-Lababidi RM, et al. Pulmonary cavitation: an under-recognized late complication of severe COVID-19 lung disease. *BMC Pulm Med* 2021;21(1):24.
- [3] Chen Y, Chen W, Zhou J, Sun C, Lei Y. Large pulmonary cavity in COVID-19 cured patient case report. *Ann Palliat Med* 2021;10(5):5786–91 Jun 9:apm-20-452.
- [4] Selvaraj V, Dapaah-Afryie K. Lung cavitation due to COVID-19 pneumonia. *BMJ Case Rep* 2020;13(7):e237245.
- [5] Martinelli AW, Ingle T, Newman J, Nadeem I, Jackson K, Lane ND, et al. COVID-19 and pneumothorax: a multicentre retrospective case series. *Eur Respir J* 2020;56(5):2002697.
- [6] Alhakeem A, Khan MM, Al Soub H, Yousaf Z. Case report: COVID-19-associated bilateral spontaneous pneumothorax—a literature review. *Am J Trop Med Hyg* 2020;103(3):1162–5.
- [7] Chung M, Bernheim A, Mei X, Zhang N, Huang M, Zeng X, et al. CT imaging features of 2019 novel coronavirus (2019-nCoV). *Radiology* 2020;295:202–7.
- [8] Haseli S, Khalili N, Bakhshayeshkaram M, Taheri MS, Moharramzad Y, et al. Lobar distribution of COVID-19 pneumonia based on chest computed tomography findings; a retrospective study. *Arch Acad Emerg Med* 2020;8:e55.
- [9] Afrazi A, Garcia-Rodriguez S, Maloney JD, Morgan CT. Cavitory lung lesions and pneumothorax in a healthy patient with active coronavirus-19 (COVID-19) viral pneumonia. *Interact Cardiovasc Thorac Surg* 2021;32(1):150–2.
- [10] Ammar A, Drap é J, Revel M. Lung cavitation in COVID-19 pneumonia. *Diagn Interv Imaging* 2021;102(2):117–18.
- [11] Marchiori E, Nobre LF, Hochhegger B, Zanetti G. Pulmonary infarctions as the cause of bilateral cavitations in a patient with COVID-19. *Diagn Interv Radiol* 2020 (16 December)<https://doi.org/10.5152/dir.2020.20865> [Epub Ahead of Print].
- [12] Vural A, Kahraman AN. Pulmonary embolism and giant cavitory lesion developing after COVID-19 pneumonia. *HCA Healthcare J Med* 2020 1: Iss. 0, Article 11.
- [13] Ufuk F, Yavas HG, Kis A. An unusual cause of spontaneous pneumothorax: post-COVID-19 pulmonary fibrosis. *Am J Emerg Med* 2021 S0735-6757(21)00371-5.
- [14] Shirai T, Mitsumura T, Aoyagi K, Okamoto T, Kimura M, Gemma T, et al. COVID-19 pneumonia complicated by bilateral pneumothorax: a case report. *Respir Med Case Rep* 2020;31:101230.
- [15] Teng E, Bennett L, Morelli T, Banerjee A, et al. An unusual presentation of pulmonary embolism leading to infarction, cavitation, abscess formation and bronchopleural fistulation. *BMJ Case Rep* 2018 2018.
- [16] Koroscil MT, Hauser TR. Acute pulmonary embolism leading to cavitation and large pulmonary abscess: a rare complication of pulmonary infarction. *Respir Med Case Rep* 2017;20:72–4.
- [17] Menter T, Haslbauer JD, Nienhold R, Savic S, Hopfer H, Deigendesch N, et al. Post-Mortem examination of COVID19 patients reveals diffuse alveolar damage with severe capillary congestion and variegated findings of lungs and other organs suggesting vascular dysfunction. *Histopathology* 2020:198–209.
- [18] Yao XH, Li TY, He ZC, Ping YF, Liu HW, Yu SC, et al. A pathological report of three COVID-19 cases by minimal invasive autopsies. *Zhonghua Bing Li Xue Za Zhi* 2020;49:411–17.
- [19] Libby LS, King TE, LaForce FM, Schwarz MI. Pulmonary cavitation following pulmonary infarction. *Medicine (Baltimore)* 1985;64(5):342–8.
- [20] Griffin DO, Jensen A, Khan M, Chin J, Chin K, Saad J, et al. Pulmonary embolism and increased levels of d-Dimer in patients with coronavirus disease. *Emerg Infect Dis* 2020;26(8):1941–3.
- [21] Butler MD, Biscardi FH, Schain DC, Humphries JE, Blow O, Spotnitz WD. Pulmonary resection for treatment of cavitory pulmonary infarction. *Ann Thorac Surg* 1997;63(3):849–50.