(International Print/Online Journal)

SJIF IMPACT FACTOR: 5.565
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 4, Issue 5, Page No: 1307-1313
September-October 2021

IJMSCR

Cavitary Lung Lesions in Covid 19 Recovery Patients: Case Reports

Mamidi Rohini Reddy[1*], Karthik S.R[2], Gaurav Venkat Cuddapah[3], Kalyani Bottu[4], Hari Kishan J[5]
[1*,2,4]Final Year Resident,[3]House Surgeon,[5]Associate Professor and Consultant,
[1*,2,3,4]Department of Internal Medicine,
[1*,2,3,4,5]Kamineni Academy of Medical Sciences and Research Centre, Hyderabad, IND

***Corresponding Author:**
Mamidi Rohini Reddy
Department of Internal Medicine, Final year Resident, Kamineni Academy of Medical Sciences and Research Centre, Hyderabad, IND

Type of Publication: Case Report
Conflicts of Interest: Nil

Abstract

Two male patients in their 50's with no known comorbidities presented with new onset fever spikes, productive cough and increased respiratory distress 2 weeks after Severe covid-19 pneumonia, during their convalescent period. On CT Chest pulmonary cavitations were seen, considering a possible bacterial infection, both patients were started on empirical antibiotics, no microbiological pathogen was detected (Sputum analysis and bronchoscopy with bronchoalveolar lavage culture before empirical initiation of antibiotics). The etiology of cavitary lesions is not fully understood and necessitates further inquiry and follow up.

Keywords: Covid-19, Pulmonary cavitations, Tocilizumab, Corticosteroids

INTRODUCTION

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the pathogen responsible for the coronavirus disease 2019 (COVID-19) pandemic, which has resulted in a global healthcare crisis and strained health resources. As the population of patients recovering from COVID-19 grows, it is paramount to establish an understanding of the healthcare issues surrounding them. Early and late complications associated with COVID-19 are still unknown.

Usually, in clinically cured patients with viral pneumonia, the pulmonary lesions gradually resolve and show complete remission. In very few severely affected patients, there are residual lesions and fibrosis. Since SARS-CoV-2 is a new coronavirus, the reparative process of SARS-CoV-2 infected pulmonary lesions is not well known. Here we are discussing two case reports of COVID-19 pneumonia patients, who developed pulmonary cavities in the course of recovery.

Both patients had no history of smoking or immunocompromised state, both had extensive lung involvement with a CT severity score of 22/25 requiring ICU care for 10 to 14 days, Noninvasive ventilatory support, high dose glucocorticoid, and Inj Tocilizumab usage. In the absence of approved pharmacologic therapy for COVID-19, the inappropriate institutionalized practice guidelines for COVID-19 based on available in-vitro and clinical studies to aid clinicians with treatment decisions resulted in treatment that was either excessive or too frequent. Tocilizumab was recommended for those with evolving cytokine release syndrome (CRS) based on criteria that encompassed clinical, radiological, and laboratory parameters. Systemic steroids when administered, for the most part, were used injudiciously. The impudent misuse of tocilizumab, systemic glucocorticoids, or a combination of both leading to an immunocompromised state, may increase the risk of developing secondary bacterial, fungal infection with pulmonary cavitary formation in patients with COVID-19.

Case Presentation

Case 1: A 52 yr old male nonsmoker, with no comorbidities presented with a history of fever, cough, and shortness of breath for 8 days. The patient was apparently asymptomatic 8 days back then developed high-grade fever associated with chills and rigor, h/o of dry cough, sore throat since 8 days, h/o sob since 4 days. On examination PR:128/min, RR:34/min, BP:110/70mg, Spo2:80% on RA. Pulmonary examination revealed B/L diffuse crepitations, with the normal cardiac, neurological, and abdominal examination. On evaluation laboratory, studies showed lymphopenia, elevated CRP, LDH, Sr Ferritin levels, an initial Chest CT scan revealed extensive areas of central and peripheral ground-glass opacities with crazy pavement are noted involving bilateral lungs predominantly in subpleural location, with CT severity score of 21/25 (image 1) and positive Covid 19 RTPCR. He was admitted with a diagnosis of Acute viral pneumonia and treated with antiviral, antibacterial therapy, anticoagulants, high dose steroids, Tocilizumab, plasma therapy, and required NIV support during his stay. Patient RR and saturations were monitored regularly and reducing O2 requirement and normalizing lab parameters. After 10 days of treatment, the patient improved symptomatically and was discharged on home oxygen therapy with Spo2 90% on RA. He was doing well for around 2 weeks, after which he presented to the emergency with a high-grade fever,

breathlessness, and productive cough with blood-tinged sputum. He was readmitted and a repeat CT was done which showed irregular thick-walled cavitary lung lesions in the left upper and lower lobe, right lower lobe with adjacent consolidation and ground glass haziness, septal thickening, and fibrotic opacities in both the lungs representing post-COVID-19 sequelae (image 2) and negative RT-PCR for SARS-CoV-2. On general examination his PR:115/min, RR:32/min, Temp:102F, SpO2:86% on RA. On further evaluation his labs showed leukocytosis with neutrophilic predominance, elevated inflammatory markers, sputum culture sensitivity showed no growth and was negative for acid-fast bacilli or fungal elements. He was started on empirical antibiotics, oxygen therapy, and other supportive care is given. Bronchoscopy was performed and bronchoalveolar lavage samples were sent which showed no growth. The patient started showing symptomatic improvement with reducing fever spikes, cough, and respiratory distress. He recovered and was discharged on oral antibiotics, a short course of anticoagulants, and vitamins.

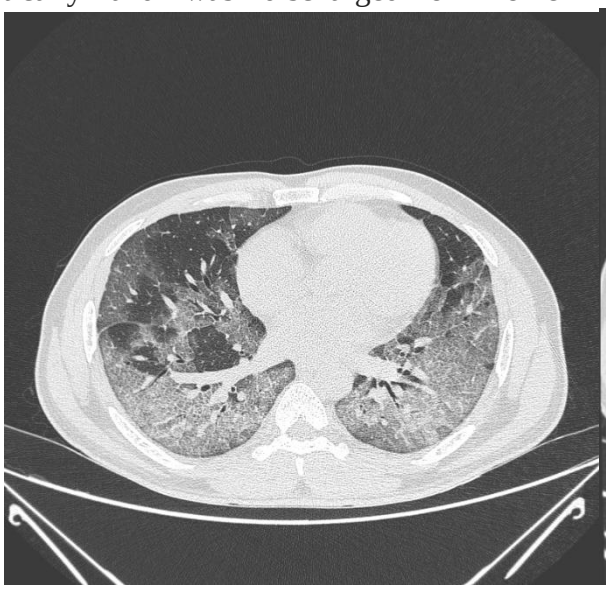

Image 1

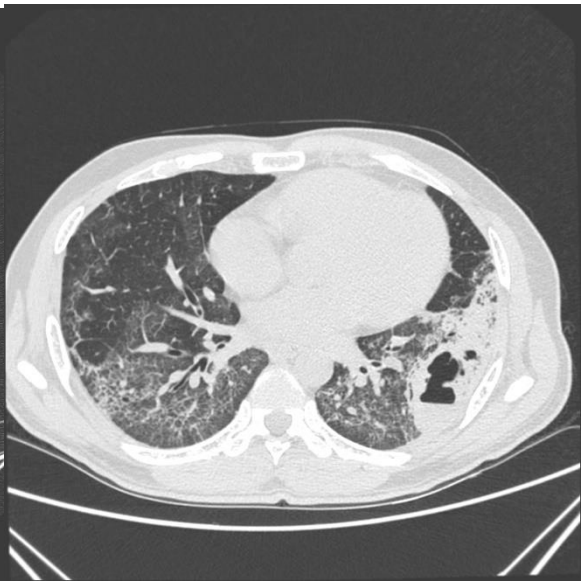

Image 2

Case 2: A 56yr old man nonsmoker, with no comorbidities came with complaints of fever, cough and shortness of breath since 6 days. Patient was apparently asymptomatic 6 days back then developed high grade fever associated with chills and rigor, h/o dry cough and shortness of breath present. On general

Volume 4, Issue 5; September-October 2021; Page No 1307-1312

examination his BP:130/90mmhg, PR:98/min, RR:34/min, SpO2:78% on RA.

Pulmonary examination revealed B/L diffuse crepitation with the remainder of systemic examination being unremarkable. Laboratory investigation revealed normal leucocyte count and raised inflammatory markers. Initial Chest CT scan revealed extensive areas of ground glass densities with consolidation and septal thickening involving B/L lungs predominantly in subpleural location, with CT severity score of 22/25 (image 3) and positive RT-PCR for covid 19. Patient was admitted with diagnosis of Acute Covid-19 Pneumonia and treated with NIV support, Antiviral, anticoagulants, Tocilizumab, high dose corticosteroids. Patient improved symptomatically after 14 days of treatment with saturation maintaining on RA and was discharged on oral medications.

Patient had no complaints for around 2 weeks, after which he presented with complaints of high-grade fever, productive cough since 5days and right sided chest pain since 3 days. H/o of cough associated with sputum, small quantity, blood tinged, whitish color, foul smelling, no diurnal or positional variation. H/o chest pain on right side, continuous sharp pain, aggravated on sleeping on same side and relieved on medication. On general examination BP:120/80mmhg, RR:34/min, SpO2:85% on RA, Pulmonary examination revealed rales over the right lower lung zone with reminder of systemic examination being normal. Laboratory investigations revealed leukocytosis with neutrophilic predominance, elevated inflammatory markers and negative RT-PCR for SARS-CoV-2.A Repeat CT chest revealed post covid sequelae with thick walled cavitary lesion with adjacent consolidation in posteriobasal segment of right lower lobe and moderate right sided pleural effusion (image 4). Sputum sent for AFB, gram stain, fungal stain, C/S, gene Xpert, KOH mount came to be negative. He was started on empirical antibiotics, anticoagulants, nebulization, oxygen therapy and other supportive care. In view of continuous fever spikes and respiratory distress USG guided pleural tap was done and 250 ml of brownish clear fluid was aspirated which on evaluation showed features of reactive pleural effusion. Later, Bronchoscopy and bronchoalveolar lavage done which showed budding yeast cells with plenty of viable and degenerative neutrophils and no growth. In due course of hospital stay patient developed spontaneous right sided pneumothorax, for which ICD tube placement was done. In view increasing respiratory distress CT Pulmonary angiogram was taken up which confirmed right intercostal tube in situ, large loculated hydropneumothorax involving right posterior segment of right lower lobe patchy ground glass opacities, exudative collection, patchy area of consolidation with traction bronchiectasis involving right upper and middle lobe and normal pulmonary vasculature. ICD tube repositioning was done and fluid was drained with was sent for work up which revealed no growth. Patient started showing improvement with no further fever spikes, reducing respiratory distress and labs showing normalizing leucocytes count and inflammatory markers. He was monitored regularly and ICD tube removed. Patient recovered and discharged on oral antibiotic course for about 2 weeks.

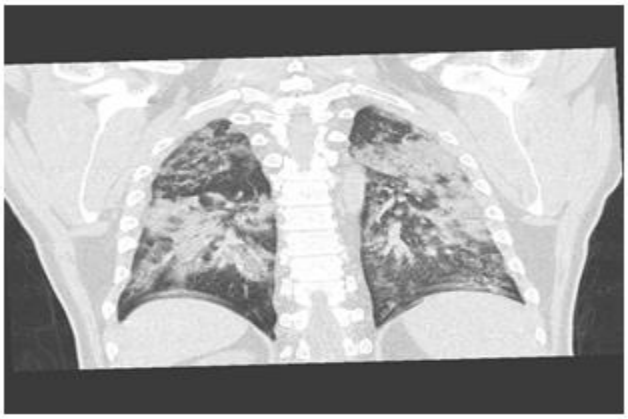

Image 3

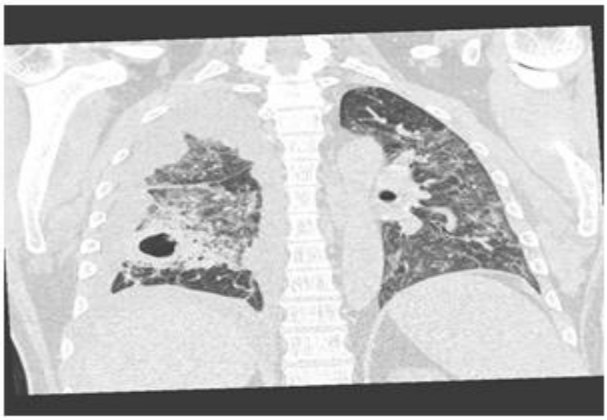

Image 4

Volume 4, Issue 5; September-October 2021; Page No 1307-1312

Differential diagnosis and Treatment:

Both our patients were extensively evaluated with sputum, bronchoalveolar lavage analysis and other laboratory investigations, no microbiological, serological, clinical or distinct radiological characteristics of any particular cause were identified.

Discussion

Covid-19 is mainly a pulmonary infection caused by SARS-CoV-2. This virus can reproduce in bronchiole mucosa or alveolar epithelial cells, resulting in the mixed injury of pulmonary parenchyma and interstitial tissue of alveoli, interlobular septa, and peri-acinar microvascular network [1,2].In 2003, Chiang CH et al [3] described SARS as another aggressive coronavirus that also caused a viral pneumonia pandemic in China. Notably, for SARS patients in the later stage of recovery, pulmonary secondary infections caused by mold, tuberculosis, and other bacteria were very common, especially for severe patients who used antibiotics, glucocorticoids, and ventilators for a long time [3,4]. After clinical treatment of viral pneumonia, the lung lesions are gradually absorbed and dissipated, for a few severe cases, fibrosis can be left in the lung [5]. Since Covid-19 is a new pandemic with less available research on post covid follow-up, this available data from previous pandemics can be used as a base for further understanding and assessing the course of the disease.

According to Wang Y et al, the CT findings of COVID-19 pneumonia present in the form of typical lung injury patterns similar to other viral pneumonia, characterized by rapid changes in the imaging patterns [6]. Chung et al described the typical CT findings that were seen in COVID-19 pneumonia which includes ground-glass opacities, consolidation, reticular opacities, septal and pleural thickening, nodules, halo sign, reverse halo sign, and crazy paving pattern [7,8]. Cavitation, lymphadenopathy, and pleural effusions are rare presentations, Jacobi et al did report cases of cavitation on chest radiography accompanied by spontaneous pneumothorax [9]. In case 1, multiple cavitary lesions were seen while in case 2 a single right large cavitary lesion with moderate pleural effusion was later complicated by right spontaneous pneumothorax.

Both of them were started on empirical antibiotics and continued for 2 weeks as they showed clinical and lab wise improvement. Follow up consultation was done after 4 weeks. Physical examination, laboratory studies and chest imaging revealed remission of the disease.

By definition, a cavity is an air-filled space forming within an area of pulmonary consolidation, mass, or nodule, as a result of liquefication of the necrotic portion of the lesion and the discharge of this necrotic material via the bronchial tree. The exact process involving cavity formation in areas of the lung where ground-glass opacities were initially seen, is not known. Parker et al described Cavitary lung disease as many causes like infectious, neoplastic, vasculitis, etc [10]. According to Kruse et al [11] in critically ill Covid-19 patients causes for the formation of cavitary lung lesions may also include ventilator-induced lung injury, pulmonary thromboembolism, and infarction, pulmonary hypoperfusion, immunocompromised state due to the use of glucocorticoids and Tocilizumab leading to superadded infections with bacterial and fungal elements.

The study reported by Yousaf Z et al [12] discussed that Infection with Mycobacterial Tuberculosis (MTB) is also a common cause of lung cavitation and can occur as a coinfection in COVID-19 patients. In both our patients, MTB infection was ruled out with smear for AFB and gene Xpert both testing negative Lansburg et al [13] showed that a small portion of COVID-19 patients has fungal or bacterial co-infections, which are reportedly less than that of a previous influenza pandemic. A study by Intra et al [14] showed that Amongst COVID-19 patients, those who were admitted to the Intensive Care Unit (ICU) had a higher probability (57% of ICU cases) of acquiring a fungal or bacterial secondary infection, which was higher than an earlier study (only 14%). Many studies reported superimposed fungal infections mostly 14 days after the appearance of COVID-19 symptoms. In both, our patient's fungal infections have been ruled out as there were no microbiological or radiological characteristics of the same.

Kruse et al [11] described that cavitating lung lesions occur frequently in severely ill COVID-19 patients and provided evidence that pulmonary hypoperfusion

and occlusion of pulmonary arteries play an important role in the pathogenesis of cavitary lesions, which were supported by Ackermann et al [15] who found a high incidence of microvascular thrombi and signs of endothelialitis during the autopsy of seven COVID-19 patients. Lang et al [16] using dual-source computer tomography, discovered severe perfusion abnormalities in the lungs of three COVID-19 patients and postulated a significant contribution of altered perfusion to the etiology of respiratory failure in COVID-19. In case 2 thromboembolic cause has been ruled out with CT pulmonary angiogram showing normal pulmonary vasculature while in case 1 it was not done. Both of the patients were given appropriate anticoagulation therapy.

Both of our patients received Inj Tocilizumab, a recombinant humanized monoclonal antibody directed against both the soluble and membrane-bound forms of the interleukin-6 (IL-6) receptor, in the early stages of a CRS. Tocilizumab is currently approved by the US Food and Drug Administration (FDA) for the treatment of severe rheumatoid arthritis, systemic juvenile idiopathic arthritis, giant cell arteritis, and life-threatening CRS induced by chimeric antigen receptor T cell therapy. Recently it has been associated with improved survival in patients with severe COVID-19 pneumonia with evidence of CRS [17,18]. In general, tocilizumab is well tolerated but can induce neutropenia, and an increased risk of developing infections has been reported. Furthermore, it may predispose to a delay in detecting active infection because of the masking effect of a suppressed C reactive protein (CRP) response. The patients also received systemic glucocorticoids, which may have a survival benefit in COVID-19, but on the flipside suppress the immune system by impairing innate immunity. Hence these drugs should be used judiciously, keeping the side effects and complications in mind.

Conclusions

We, therefore, hypothesize that the causes of cavitation in these patients are multifactorial, with contributing factors including bacterial and fungal co-infection; the immunosuppressive effects of glucocorticoids and tocilizumab; SARS-CoV-2 specific inflammatory pathways; the COVID-19 related predisposition to venous thromboembolism and the potential to cause infarct and micro-infarcts leading to cavitation; and the severe morbidity of this patient population. Pulmonary cavitation in patients with severe COVID-19 lung disease can be associated with secondary complications of hemoptysis, pneumothorax, and confers a poor prognosis. With the emergence of a large number of clinically cured COVID-19 patients, it is particularly important to follow-up the convalescent patients, especially with chest radiography to make sure the full recovery of the patients.

References

1. Liu K, Fang YY, Deng Y, et al.: Clinical characteristics of novel coronavirus cases in tertiary hospitals in Hubei Province. Chin Med J. 2020, 133:1025-31. 10.1097/CM9.0000000000000744
2. Pan Y, Guan H, Zhou S, et al.: Initial CT findings and temporal changes in patients with the novel coronavirus pneumonia (2019 nCoV): a study of 63 patients in Wuhan, China. Eur Radiol. 202030, 3306:9. 10.1007/s00330-020-06731-x
3. Chiang CH, Shih JF, Su WJ, et al.: Eight-month prospective study of 14 patients with hospital-acquired severe acute respiratory syndrome. Mayo Clin Proc. 2004:1372-9. 10.4065/79.11.1372
4. Leung CW, Chiu WK: Clinical picture, diagnosis, treatment and outcome of severe acute respiratory syndrome (SARS) in children. Paediatr Respir Rev. 2004:275-88. 10.1016/j.prrv.2004.07.010
5. Yin J, Li K, Liu S, et al.: Radiology of Thoracic Complications in SARS. Journal of Capital Medical University. 2003:401-4. 10.1016/j.ejrad.2020.109008
6. Wang Y, Dong C, Hu Y, et al.: Temporal changes of CT findings in 90 patients with COVID-19 pneumonia: a longitudinal study. Radiology. 296:55-64. 10.1148/radiol.2020200843
7. Chung M, Bernheim A, Mei X, et al.: CT imaging features of 2019 novel coronavirus (2019-nCoV). Radiology. 295:202-207. 10.1148/radiol.2020200230

Volume 4, Issue 5; September-October 2021; Page No 1307-1312

8. Carotti M, Salaffi F, Sarzi-Puttini P, et al.: Chest CT features of coronavirus disease 2019 (COVID-19) pneumonia: key points for radiologists. Radiol Med. 4:1-11. 10.1007/s11547-020-01237-4
9. Jacobi A, Chung M,Bernheim A, et al.: Portable chest X-ray in coronavirus disease19 (COVID- 19): a pictorial review. Clin Imaging. 202064, 35-42. 10.1016/j.clinimag.2020.04.001
10. Parkar, A. P. & Kandiah, P: Differential diagnosis of cavitary lung lesions. J. Belg. Soc. Radiol. 100. 100-2016. 10.5334/jbr-btr.1202
11. Kruse J.M, Zickler D, Lüdemann W.M, et al.: Evidence for a thromboembolic pathogenesis of lung cavitations in severely ill COVID-19 patients. Sci Rep. 11:16039-2021. 10.1038/s41598-021-95694-0
12. Yousaf Z, Khan AA, Chaudhary HA, et al.: Cavitary pulmonary tuberculosis with COVID-19 coinfection. IDCases. 202022, 00973. 10.1016/j.idcr.2020.e00973
13. L. Lansbury, B. Lim, V. Baskaran W.S, et al.: Lim Co-infections in people with COVID19: a systematic review and meta-analysis J. Infect. 81:266-275. 10.1016/j.jinf.2020.05.046
14. J. Intra, C. Sarto, E. Beck, et al.: Brambilla Bacterial and fungal colonization of the respiratory tract in COVID-19 patients should not be neglected Am. J. Infect. Control. 48:1130-1131. 10.1016/j.ajic.2020.06.185
15. Ackermann M, Verleden SE, Kuehnel M, et al.: Pulmonary vascular endothelialitis, thrombosis, and angiogenesis in covid-19. N. Engl. J. Med. 383. 120-128. 10.1056/NEJMoa2015432
16. Lang M, Som A, Mendoza DP, et al.: Hypoxaemia related to COVID- 19: vascular and perfusion abnormalities on dual-energy CT. Lancet Infect Dis. 20, 1365:1366. 10.1016/S1473-3099(20)30367-4
17. Toniati P, Piva S, Cattalini M, et al.: Tocilizumab for the treatment of severe COVID19 pneumonia with hyperinflammatory syndrome and acute respiratory failure: a single center study of 100 patients in Brescia, Italy. Autoimmun Rev. 2020:102568. 10.1016/j.autrev.2020.102568
18. Guaraldi G, Meschiari M, Cozzi-Lepri A, et al.: Tocilizumab in patients with severe COVID- 19: a retrospective cohort study. Lancet Rheumatol. 2020, 10.1016/S2665-9913(20)30173-9

Volume 4, Issue 5; September-October 2021; Page No 1307-1312