Pneumatocele in a Ugandan female with SARS-CoV2 infection: A case report

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Abstract
Pneumatocele may complicate the course of SARS-CoV2 infection. Our article exhibits the value of early radiological imaging for the timely diagnosis and management of COVID-19 and its complications. Conservative management is the mainstay of the treatment of pneumatoceles; however, prompt surgical intervention is imperative for complicated pneumatoceles.

KEYWORDS
CO-RADS, COVID-19, pneumatocele, SARS-CoV-2, Uganda

1 | INTRODUCTION

Coronavirus disease 2019 (COVID-19) caused by the novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2; previously known as 2019-nCoV), has spread to more than 220 countries around the world since its discovery in 2019. More than 246 million cases and more than 5 million deaths have been reported worldwide,1 whereas Uganda alone has reported 126,272 cases and 3217 deaths.2

COVID-19 presents with a clinical syndrome caused by an intense inflammatory reaction due to a cytokine storm.3 COVID-19 patients usually present with radiologic findings of ground-glass opacities (83%), ground-glass opacities with consolidation (58%), pleural thickening (52%), interlobular septal thickening (48%), or air bronchograms (46%).4,5 Pneumomediastinum and pneumothorax are the commonly reported complications majorly resulting from mechanical or positive pressure ventilation, or directly related to COVID-19 pneumonitis.6

Pneumatocele, a thin-walled air-filled cystic lesion in the lung commonly develops, associated with acute pneumonia or after a severe infection like empyema.7,8 The development of pneumatocele secondary to COVID-19 pneumonitis appears rarer. COVID-19 pulmonary lesions can also present as pneumatocele in the form of emphysema (5.3%),9 cystic air spaces (37.5%),10 or cystic changes (10%).11

In this article, we present an unusual complication of SARS-CoV-2 infection, highlighting a pneumatocele secondary to COVID-19.

2 | CASE PRESENTATION

We report a 67-year-old female, non-smoker, non-alcoholic patient, known hypertensive for about 10 years
on medication: amlodipine and losartan, but no other prior history of lung disease and no history of vaccination against SARS-CoV-2. She had a week-long history of dry cough and high-grade fever with chills and rigors prior to admission. She was earlier diagnosed with COVID-19 by COVID rapid antigen test from a peripheral clinic and was being managed as an outpatient on zinc, vitamin D, ceftriaxone–sulbactam, dexamethasone, gentamicin, and ascorbic acid.

Two days prior to presenting to our hospital, she developed acute right-sided chest pain, which worsened with inspiration, and progressive shortness of breath. The diagnosis of COVID-19 was confirmed by reverse transcription-PCR for SARS-CoV-2.

On physical examination, she was significantly in severe respiratory distress, tachypneic at 44 breaths/minute, pulse oximetry of 57% at room air, followed by 91% on oxygen via non-rebreather mask at 10 liters/minute flow, temperature 37.5°C, blood pressure 124/64 mmHg, and heart rate 110 beats/minute. She also had stress hyperglycemia of 8.4 mmol/L secondary to the infection. Her respiratory examination revealed reduced air entry on the right lower lung zones with diffuse crepitations on the right middle and upper lung zones and lower left lung zones. Other systemic examinations were unremarkable.

## 3 | LABORATORY INVESTIGATIONS AND IMAGING

At admission, her C-reactive protein (CRP) was significantly elevated: 96.2 mg/L, total white blood cell count: 15.10 × 10^3/µl, lymphocytes: 1.46 × 10^3/µl, neutrophils: 12.65 × 10^3/µl, hemoglobin: 13.32 g/dl, and total Platelet count: 444.5 × 10^3/µl. Renal and liver function tests were normal.

High-resolution chest computed tomography (HRCCT) at admission revealed features of COVID-19 Reporting and Data System (CO-RADS)-5 with about 75% pulmonary involvement. Multifocal bilateral ground-glass opacities plus bilateral consolidations in the left lower lobe and right upper lobe, and a pneumatocele, a thin-walled round cystic space within the lung parenchyma in the right lower lobe measuring 8.54 × 5.27 cm (Figure 1 and 2).

## 4 | MANAGEMENT AND FOLLOW-UP

The patient was managed conservatively on a 7-day course of dexamethasone intravenous (IV) 6 mg once daily, piperacillin–tazobactam (IV) 4.5 g thrice daily, zinc sulfate per oral 20 mg once daily, enoxaparin subcutaneous 60 mg once daily, vitamin C per oral 1000 mg once daily, paracetamol (IV) 1 g thrice daily, and oxygen therapy as per requirement initially via non-rebreather mask, which was successfully progressively weaned off to nasal prongs, and finally, she was completely taken off oxygen. She showed marked clinical improvement with a significant improvement in CRP and white blood count. She was eventually discharged without any sequelae in stable condition, on a 5-day course of amoxicillin/clavulanic acid, and 7 days of montelukast, vitamin C, and vitamin D. She also continued her antihypertensive drugs throughout her hospital stay and after discharge. She was tested COVID-19 negative at 2 weeks; the review was unremarkable at 6 weeks, and she had no complaints. The repeat high-resolution chest computed tomography (HRCCT) at 10 weeks revealed regressing pneumatocele size with fibrotic changes (Figure 3).

## 5 | DISCUSSION

SARS-CoV-2 infection causes a cytokine storm leading to an intense inflammatory reaction. The mechanism of pneumatocele formation, subsidiary to this inflammatory reaction caused by SARS-CoV-2 infection, appears to be a combination of diffuse alveolar damage followed by necrosis of the airway walls,3,8 and obstruction and dilation of bronchi secondary to an intraluminal check-valve formation, which later ruptures causing air-filled cysts.8,12

Pneumatoceles often resolve spontaneously, and management is mostly conservative; however, in some...
instances, they can dissect through the pleural membrane and rupture to cause pneumothorax, pneumomediastinum, or pneumopericardium.\textsuperscript{13,14} They may as well undergo drastic changes in size, especially in patients on mechanical ventilation, compression of surrounding lung, and cardiorespiratory compromise or infected plus accumulation of pus. In our case, the patient was diagnosed with COVID-19 and was earlier being managed as an outpatient. However, later she deteriorated, and radiological imaging with high-resolution chest computed tomography (HRCCT) revealed multifocal bilateral ground-glass opacities and a large pneumatocele. She was managed conservatively and discharged on the 8th day with a marked improvement and an unremarkable follow-up.

Complicated pneumatocele warrants intervention; however, no firm algorithm has been found in the literature. Previously reported case reports and series have stressed successful image-guided percutaneous transcatheter aspiration and drainage of complicated pneumatoceles.\textsuperscript{15,16} Failure of this technique should lead to surgical pneumonostomy\textsuperscript{17} or resection.\textsuperscript{18,19} On the contrary, in critically ill patients, surgical approach seems more reasonable as the first choice of intervention, since it may be life-saving. In this case, the patient substantively recovered on conservative management without any need for surgical intervention. Although the patient was asymptomatic and in good general condition at a 6-week follow-up, the repeat high-resolution chest computed tomography (HRCCT) at 10th week revealed regressing pneumatocele size with fibrotic changes.

6 | CONCLUSION

Pneumatocele may complicate the course of SARS-CoV2 infection. Early radiological imaging significantly improves the timely diagnosis and monitoring of COVID-19 and its complications.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTION

Sanjanaa Srikant conceptualized the study, wrote the first draft, and edited and approved the final manuscript. Dave Darshit conceptualized the study, involved in patient follow-up, wrote the first draft, and edited and approved the final manuscript. Dhara Dave reviewed the manuscript for important intellectual content and contributed to editing, supervision, and the final approval of the case report.

ETHICAL APPROVAL

Institutional Review Board approval was not required to publish this article.

CONSENT

Written informed consent was obtained from the patient for the publication of this case report and accompanying images.
DATA AVAILABILITY STATEMENT
None.

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