

# COVID-19 Associated Bronchiectasis and its Impact on Prognosis.

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December 21, 2020

## Abstract

COVID-19 associated bronchiectasis is an atypical finding and it's not commonly described sequel of the disease. Here, we present a previously healthy middle-aged man who developed progressive bronchiectasis evident on serial chest CT scans with superimposed bacterial infection following COVID-19 pneumonia.

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## Abstract:

Coronavirus disease 2019 (COVID-19), initially emerged in Wuhan, China, has rapidly swept around the world, causing grave morbidity and mortality. It manifests with several symptoms, on a spectrum from asymptomatic to severe illness and death. Many typical imaging features of this disease are described, such as bilateral multi-lobar ground-glass opacities (GGO) or consolidations with a prevalent peripheral distribution. COVID-19 associated bronchiectasis is an atypical finding and it's not commonly described sequel of the disease. Here, we present a previously healthy middle-aged man who developed progressive bronchiectasis evident on serial chest CT scans with superimposed bacterial infection following COVID-19 pneumonia. The patient's complicated hospital course of superimposed bacterial infection in the setting of presumed bronchiectasis secondary to COVID-19 is alleged to have contributed to his prolonged hospital stay with difficulty to wean off mechanical ventilation. Clinicians should have high suspicion and awareness of such a debilitating complication, as further follow up & management might be warranted.

**Key words:** COVID-19; Coronavirus; Bronchiectasis; CT; Case report.

## Key clinical message:

COVID-19 related extensive bronchiectasis is an unexpected debilitating outcome which might alter the course of illness; therefore, clinicians should have awareness of such a complication, as further management and follow up might be warranted.

## Introduction

Beginning in December 2019, a serial pneumonia outbreak reported in Wuhan City, Hubei Province, China. Further investigations revealed it was a new type of coronavirus, which was termed COVID-19. Symptoms are variable and nonspecific, include dry cough, fever, dyspnea, fatigue, myalgia, and anosmia<sup>1</sup>. The real-time reverse-transcription polymerase chain reaction (rRT-PCR) test is the current diagnostic method for confirming infection, performed using nasal or pharyngeal swab specimens.

CT thorax, as a routine imaging tool for pneumonia diagnosis, is of great importance in the early detection and treatment of patients affected by COVID-19. It may detect the early parenchymal abnormalities in the absence of positive rRT-PCR at initial presentation<sup>2</sup>. Numerous classical chest CT findings of this disease were described such as bilateral multi-lobar ground-glass opacification (GGO) with a prevalent peripheral or posterior distribution, mainly in the lower lobes, and sometimes consolidative opacities superimposed on GGOs could be found<sup>3</sup>. Up to our knowledge, bronchiectasis is not a classical finding in COVID-19 pneumonia with a paucity of reporting its development and progression during the disease.

## Case Presentation:

A 52-year-old male, with no comorbidities, presented to the emergency department with a 10-day history of fever and dry cough followed by progressive, exertional shortness of breath. The patient is a non-smoker and worked as a driver. Examination showed a febrile ill-looking patient, in respiratory distress with a respiratory rate of 36 breath per minute and requiring 6L of Oxygen via nasal cannula. Chest auscultation was significant for bilateral crackles, without evidence of raised JVP or lower limb edema. Other examination findings were within normal parameters. The initial investigation was significant for WBC –  $17 \times 10^3/\mu\text{L}$ , CRP – 131 mg/L, Ferritin – 836 ug/L and bilateral pulmonary infiltrates in Chest X-Ray (Figure 1). COVID-19 rRt-PCR tested positive; hence was diagnosed with severe COVID-19 pneumonia and was started on ceftriaxone, hydroxychloroquine, azithromycin, oseltamivir in addition to as-needed paracetamol. Over the subsequent five days, his oxygen requirements gradually increased, reaching 11 L via a nonrebreather mask. A follow-up chest x-ray showed progression of previously seen bilateral infiltrates (Figure 2).

He was started on methylprednisolone and non-invasive ventilation. Two weeks into admission, the patient's condition continued to deteriorate, and intubation was required. Two weeks later, the patient started to spike high-grade fever, with further septic work up revealing pseudomonas aeruginosa and stenotrophomonas maltophilia in tracheal aspirate culture; hence started on Piperacillin-Tazobactam and Teicoplanin. CT thorax was done and revealed bilateral diffuse ground-glass infiltrates and airspace involving almost all lung segments (Figure 3).

Over the next few days, the patient was afebrile, however, repeat tracheal aspirate culture was persistently positive for pseudomonas and stenotrophomonas maltophilia. Five days later, the patient was extubated; but was re-intubated due to respiratory distress and hypoxemia. After multiple failed attempts to wean the patient off mechanical ventilation, he was tracheostomized and eventually de-cannulated. The patient was transferred to the medical ward after staying in the critical care unit for a total of 38 days. The patient was on room air when admitted to the medicine ward. However, a few days later, he started to desaturate gradually. Repeated CXR showed diffuse coarse reticular interstitial changes. COVID-19 rRT-PCR was negative and sepsis workup was unrevealing. A follow-up CT chest was done for further assessment, it showed a slight improvement of the diffuse bilateral ground-glass opacities with re-demonstration of some

crazy-paving appearance at both apical segments of upper lobes and it also showed progression of the interstitial fibrotic and bronchiectatic changes predominantly in the anterior aspects of both lungs (Figure 4). The patient was transferred to a long-term care hospital for oxygen supplementation, chest physiotherapy, and physical therapy for his critical care myopathy.

## Discussion:

Since the initial outbreak of COVID-19, the routine use of CT chest has been useful in detecting early parenchymal lung changes suggestive of COVID-19 infection and in monitoring disease progression, coinfection, or disease stability <sup>2</sup>. Several radiological features were attributed to be classical of COVID-19 infection. A recent systemic review & meta-analysis of 13 studies identified the most encountered CT signs of COVID-19 being peripheral and bilateral lung involvement with ground-glass opacity (GGO) and consolidation <sup>3</sup>.

Bronchiectasis is defined by the presence of permanent and abnormal dilation of the bronchi with CT features of bronchus internal diameter larger than that of its accompanying vessel, lack of bronchial tapering in the periphery of the chest, and visualization of bronchi in the outer 1–2 cm of the lung fields <sup>4</sup>.

Gram-negative bacteria are the most frequently identified organisms in the sputum of patients with bronchiectasis. It has been shown to correlate with disease severity, a greater decline in lung function, more frequent exacerbations, and reduced quality of life compared with other bacteria <sup>5</sup>.

Bronchiectasis is not a classical or well-described finding in COVID-19 pneumonia. However, its association has been recently reported. In one retrospective study, bronchiectatic changes were described in one out of 121 COVID-19 patients <sup>6</sup>. Furthermore, a total of four cases of COVID-19 with bronchiectasis were recently reported as well<sup>2,7</sup>.

We present a patient with severe COVID-19 pneumonia who developed progressive bronchiectasis within 4 weeks of symptoms onset. It must be noted that the patient had an evident superadded bacterial infection with *Pseudomonas aeruginosa* and *Stenotrophomonas maltophilia* which required intravenous antibiotics, and a prolonged hospital stay with multiple failed attempts to wean off mechanical ventilation. The complicated course of COVID-19 pneumonia is an anticipated outcome, however, whether the development of bronchiectasis is a contributing factor remains unclear. Worth mentioning, the previously reported cases of COVID-19 induced bronchiectasis showed a paucity of any superadded bacterial infection.

Despite the lack of baseline CT chest of the patient upon presentation, being previously healthy without any preceding hospitalization, non-smoker, unrevealing bronchiectasis and Tuberculosis (TB) work up supports the suspicion that his rapidly evolving bronchiectasis is induced by COVID-19 pneumonia.

In conclusion, the COVID-19 pandemic is a public health emergency, nonetheless, its long-term pulmonary complication is not well studied. The pathophysiology, reversibility, and prognostic implication of COVID-19 associated bronchiectasis require further clinical studies. The main aim of this study is to highlight the rapid progression of bronchiectasis as a sequela of COVID-19 infection, which might impact the prognosis, hence further management, closer follow up and interval imaging is warranted.

## Ethics approval and consent to participate

The case report was approved by the Medical Research Centre at Hamad Medical Corporation and the Hamad Institutional Review Board (IRB) under number MRC-04-20-821.

## Consent for publication

This case report does not contain any personal identifier of the patient e.g. name, photograph, etc. It only includes radiological and pathological imaging.

A written patient informed consent of patient information, diagnostic images and publication was signed by the patient.

### **Author agreement**

All authors gave final approval of the version to be published and agreed to be accountable for all aspects of the work

### **Availability of data and material**

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

### **Acknowledgements**

We acknowledge the Qatar National Library for funding the open access publication of this article. We also acknowledge the Medical Research Center at Hamad Medical Corporation for their support.

### **Author contribution**

**A.M.S** conceived and designed the idea, literature review, wrote the manuscript and over all organized the case report; **B.W.B & A.A.F** contributed to data collection and helped in initial manuscript writing; **A.M.E** helped in in the radiology figures and manuscript writing; **M.R.A** helped in manuscript writing; **A.S.A** managed patient care and revised the final draft of the manuscript.

### **Disclosure**

The authors report no conflicts of interest in this work.

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Figure 1: Bilateral predominantly peripheral alveolar infiltrates with loss of left hemidiaphragm silhouette on anteroposterior

Chest X-Ray.

Figure 2: Progression of the bilateral pulmonary consolidation on Chest X-Ray.

Figure 3: CT-Chest showing bilateral consolidation and ground glass opacities with air-bronchogram and evidence of

bronchiectasis more on the right side.

Figure 4 (A & B) : CT-Chest showing extensive ground glass opacities in both lung fields with progression of the traction bronchiectasis particularly in the right lung.





