

Beyond the Virus: Tracheal Stenosis as a Sequela of Severe COVID-19 – A Case Report

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Received: Aug 18, 2025

Revised: Oct 29, 2025

Accepted: Nov 19, 2025

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ABSTRACT

Coronavirus disease 2019 (COVID-19) is associated with a broad spectrum of respiratory manifestations and evolving airway complications. We report a 57-year-old female with congestive heart failure, hypertension, obesity, and recent prolonged intubation who presented with progressive shortness of breath. She tested positive for COVID-19, and high-resolution computed tomography of the chest demonstrated bilateral ground-glass opacities consistent with COVID-19 pneumonia. Notably, imaging also revealed significant tracheal narrowing. Clinically, the patient exhibited upper airway wheeze and a recent change in voice quality. Rigid bronchoscopy confirmed tracheal stenosis with surrounding hyperemia, and therapeutic dilatation was performed with marked symptomatic improvement. She was discharged in stable condition and reported sustained clinical recovery on follow-up. This case highlights tracheal stenosis as a potential post-COVID-19 airway complication, particularly in patients with recent intubation. Early recognition of persistent dyspnea and hoarseness, coupled with timely bronchoscopic evaluation, is essential for prompt management and improved patient outcomes.

Key words: COVID-19; SARS-CoV-2; Tracheal stenosis; Post-intubation complications; Airway narrowing

Cite this article as: Muslim MO, Abdullah M, Balouch A, Khan AM, Tariq A, Zahra SGE, Muslim S. Beyond the Virus: Tracheal Stenosis as a Sequela of Severe COVID-19 – A Case Report. *Ann Pak Inst Med Sci.* 2026; 22(1):121-123. doi: 10.48036/apims.v22i1.1547.

Background

Coronavirus disease 2019, more commonly referred to as COVID-19, is a contagious disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Declared a pandemic by the World Health Organization on the 11th of March 2020, the current strain of the single stranded positive sensed RNA virus has produced more than 500 million cases and 6 million fatalities worldwide.¹

Ever since its advent, COVID-19 has demonstrated possibly one of the widest ranges of presentation known to a disease.² In fact, certain health care professionals say "COVID-19 can present with anything except for a fracture and pregnancy". With such diversity in symptoms, in addition to limited sensitivity and specificity of the real time reverse transcription polymerase chain reaction (66-80% sensitivity according to a study², diagnosis can be a real challenge. Due to limited literature on the disease, symptoms are seen to be given precedence over a negative real time reverse transcription polymerase chain reaction

in the diagnosis, suggesting the need to establish diagnostic criteria or a scoring system (e.g. something similar to the RANSON criteria for pancreatitis).^{10,12, 15}

We present a case of tracheal narrowing in a patient – a feature that may possibly be used to hint COVID-19.

Case Report

A 57-year-old female - known to have Congestive Heart Failure, Hypertension, Pulmonary Hypertension, Obstructive Sleep Apnea, Gastroesophageal Reflux Disease and Obesity - presented to our emergency department with increasing shortness of breath over the previous few days. 17 days prior to visiting us she was discharged from another healthcare facility after a 3-week long admission for Congestive Heart Failure Exacerbation, which included several days of intubation. At home she was on 2 liters of oxygen, 50mg losartan (Cozaar), Psyllium (Metamucil) and 20mg Furosemide (Lasix) daily. She denied any fever, cough, chest pain, change in

bowel habits, smoking history and allergies, and revealed that her past surgical and family histories were insignificant. She had received 2 doses of the Pfizer vaccine against COVID-19 prior to seeing us.

Upon arrival at our facility, the patient was immediately started on Bilevel Positive Airway Pressure (BiPAP). Examination revealed bilateral pulmonary rhonchi and wheezes, and a husky voice. Further workup revealed cardiomegaly with vascular congestion on chest X-ray, respiratory acidosis with hypoxemia on arterial blood gases, a brain natriuretic peptide level of 63 and a positive COVID-19 real time reverse transcription polymerase chain reaction test. She was admitted to the stepdown unit with the diagnosis of Acute on chronic type 2 respiratory failure from COVID-19 pneumonia, Congestive Heart Failure and Obesity, and started on antibiotics, steroids and diuretics. A CT scan of the chest was ordered.

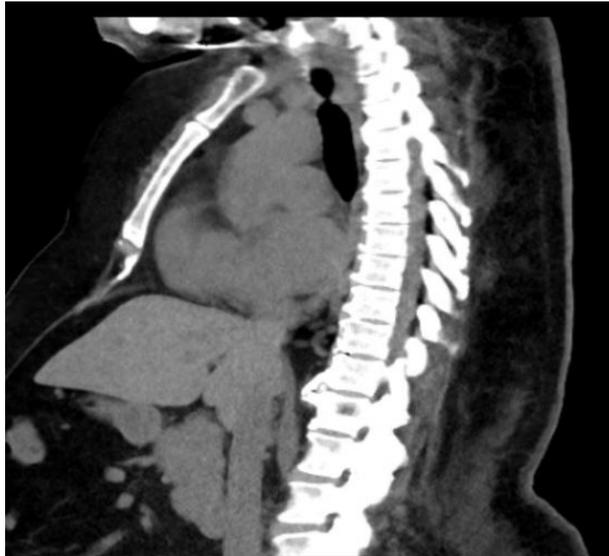


Figure 1. Sagittal CT scan of the chest showing cardiomegaly and a narrowed tracheal caliber.



Figure 2. Axial section of the chest on high-resolution CT scan showing nodular opacities in the lungs.

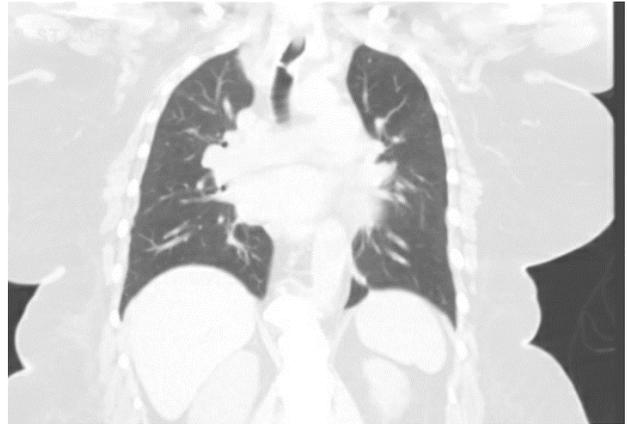


Figure 3. Coronal section of high-resolution CT scan of the chest showing bilateral ground-glass opacities highly suggestive of COVID-19.

The CT revealed cardiomegaly with an enlarged pulmonary artery, and patchy bilateral nodular pulmonary ground glass opacities (figures 1, 2 and 3). Most strikingly we discovered a narrowed tracheal diameter. On repeat examination, wheezing was heard over the upper airway. The patient also revealed that she had noticed a change in voice quality over a period of 1-2 weeks. We transferred her for rigid bronchoscopy with dilation, which not only gave us visual evidence of tracheal stenosis Figure 4), but also greatly improved our patients' symptoms. Our patient was discharged 4 days after the procedure. Follow-up 2 weeks later revealed significant improvement in breathing and voice quality.

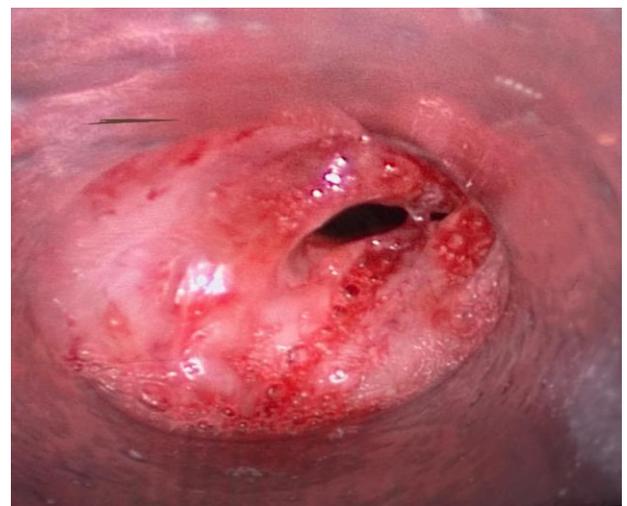


Figure 4. Tracheal narrowing with surrounding hyperemia seen on rigid bronchoscopy.

Discussion

Tracheal stenosis (TS) has been increasingly described as a significant complication in patients following recovery from COVID-19, particularly in patients having been intubated for prolonged time or tracheostomy placement. The increased prevalence of TS during the pandemic may stem from the following causes: ¹ prolonged mechanical ventilation, ² traumatic intubation, and ³ inflammatory injury due to SARS-CoV-2 infection.^{5,6}

A multicenter study performed in Italy found 8.5% of the COVID-19 patients in sticking with extended ventilation experienced TS, in which tracheostomy and alcohol were risk elements.³ Causes of inflammation (e.g., viral infection) together with ischemic injury from pressure of the endotracheal tube will cause the mucosa to necrose, ulcerate and finally scar in the wall of the trachea.^{7,8}

Histopathological findings add weight to the idea that SARS-CoV-2 can directly cause airway inflammation, possibly leading to post-infectious tracheal stenosis even in the absence of previous intubation.^{8,9} This contrasts with the classical view of TS mainly as a complication of mechanical injury and further implies an extended pathophysiological significance of COVID-19 itself.

Approaches to the management of post-COVID TS Key features of post-COVID TS management include the severity and duration of the stenosis.^{10, 11} Rigid bronchoscopy, balloon dilatation, and stenting of the airway have proven to be successful in some cases, however, with larger lesions, surgical resection and primary anastomosis may be indicated.^{10,11} One recent retrospective review indicates that rigid bronchoscopy can be diagnostic and therapeutic, and may produce rapid symptomatic relief.^{10, 11}

Given the increasing population of COVID-19 survivors and the lag between the onset of TS symptoms—including dyspnea, hoarseness, or stridor—and the COVID-19 symptomatology, clinicians should maintain a high index of suspicion in high-risk patients.¹² Imaging earlier in the course and assessment of the airway may be key to intervening sooner and avoiding complications. Finally, making airway evaluations part of post-COVID-19 follow-up, particularly in intubated patients, would likely be helpful.

Conclusion

We propose that in patients with relevant risk factors and symptoms of tracheal narrowing, suspicion of COVID-19 is warranted. As time passes by with the pandemic, and newer disease features continue to unsurfaced, diagnostic

approaches could use some of these features as tools to steer health care providers into an early diagnosis. This can in fact allow early initiation of intervention and greatly influence patient outcomes.

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