

Unilateral Diaphragm Paralysis Following COVID-19 Infection

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Research Article

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Abstract

Background:

New neurologic manifestations of the SARs-CoV-2 virus are emerging. We report a rare case of unilateral diaphragm paralysis following COVID-19 infection.

Case Presentation:

A 55 year-old previously healthy person was infected with SARs-CoV-2 prior to the availability of a vaccine. This patient was intubated and pronated for respiratory failure. For 6-months after recovery he experienced new debilitating dyspnea and orthopnea. Dynamic chest radiography demonstrated severely impaired motion of the right hemidiaphragm, representing a new hemi-diaphragm paralysis. After surgical plication the symptoms resolved.

Conclusions:

This case demonstrates the importance of thorough evaluation for diaphragm paralysis in patients who have suffered COVID-19 infection when there is persistent dyspnea or orthopnea, as well as the neuroinvasive potential of the virus that has yet to be fully explained.

Background

As the COVID-19 pandemic continues, post infection complications are becoming more apparent. In particular, the neurologic manifestations propose a neuropathogenicity aspect of the SARs-CoV-2 virus similar to many other viruses. Here we present a case of a patient who developed right hemidiaphragm paralysis following COVID-19 infection, which is rarely reported.

Case Presentation

A 55-year-old male was admitted to the hospital for ongoing dyspnea in the setting of PCR positive SARs-CoV-2 infection prior to the availability of a vaccine. He had a history of obstructive sleep apnea, type II diabetes mellitus, primary hypertension, and raised body mass index (BMI = 36). His hospital course spanned 52 days where he was intubated and proned on two separate occasions for 14 days each due to severe pulmonary dysfunction. He was eventually weaned from mechanical ventilation and did not require tracheostomy. He did not require placement of a dialysis catheter or central line in the right internal jugular vein. Pre the patient he had his normal breathing capacity up to the time of his infection. Six months after discharge, he was unable to wean his supplemental oxygen and continued to have dyspnea with exertion and orthopnea prompting referral to a pulmonologist. While a chest radiograph from three years prior was normal (Figure 1A), computed tomography scan and chest radiograph revealed an elevated right hemidiaphragm (Figure 1B-C). He underwent a sniff test which demonstrated elevation of the right hemidiaphragm approximately 6 centimeters in comparison to the left. During

normal relaxed breathing, the left hemidiaphragm demonstrated 3 centimeters of excursion while the right demonstrated less than 1 centimeter. During sniff, the left hemidiaphragm demonstrated 4 centimeters of excursion while the right demonstrated less than 1 centimeter. No paradoxical movement was noted. Pulmonary function studies revealed an FEV1 of 65%, FVC of 54%, and DLCO 43%. There was no baseline test for comparison. Given these findings he was referred to a thoracic surgeon for evaluation.

The patient underwent a robotic assisted right hemidiaphragm plication with immediate subjective improvement in dyspnea and orthopnea on post-operative day 0. His post-operative chest radiograph demonstrated near symmetric position of the hemi diaphragms (Figure 1D). He was discharged home without complications and without oxygen.

Discussion And Conclusions

The neuroinvasive and neurotropic potential of coronaviruses has been well documented and described in the literature.^{1,2} Additionally, many studies have described the neurologic manifestations and subsequent complications associated with SARs-CoV-2infection. These include olfactory and gustatory symptoms along with Guillain Barre syndrome, Bell's Palsy, and encephalopathy, as well as cranial and peripheral neuropathies.³⁻⁵ However, there are only two reports of phrenic nerve paralysis following COVID-19 infection. In one report, the patient had baseline characteristics similar to the patient described in this report. He was also intubated for a significant period of time; however, he was never prone and ultimately required tracheostomy. He also developed unilateral, right hemidiaphragm paralysis, although this was discovered relatively early on in his disease course.⁶ Another report out of France describes a patient who presented with respiratory distress preceded by anosmia and dysgeusia but was without lung injury on CT scans. She was ultimately found to have PCR positive COVID-19 and x-rays demonstrated minimal movement of the diaphragms bilaterally during respiration.⁷ There are limitations to this report, such as no chest radiograph immediately prior to his hospitalization, which would be unexpected in someone without symptoms.

Although prolonged intubation and mechanical ventilation can be associated with diaphragm weakness and paralysis, an increasing number of studies are demonstrating the SARs-CoV-2's affinity for neural tissues resulting in peripheral nerve, muscle, and cranial nerve dysfunction. Given the rarity of such neuromuscular complications, these reports are crucial for understanding the neuropathogenicity of the virus which is still under research. Additionally, these reports highlight the importance of thorough diagnostic testing and the consideration of diaphragm paralysis in patients with ongoing respiratory dysfunction after covid infection.

Declarations

Ethics approval and consent to participate: Approval was waived for this case report because no patient identifiers were used.

Consent for publication: The patient has given consent for this publication.

Competing Interests: The authors declare that they have no competing interests.

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Author Contributions: MK and RD conceptualized and wrote the report; MV and LC performed critical revisions.

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Figures

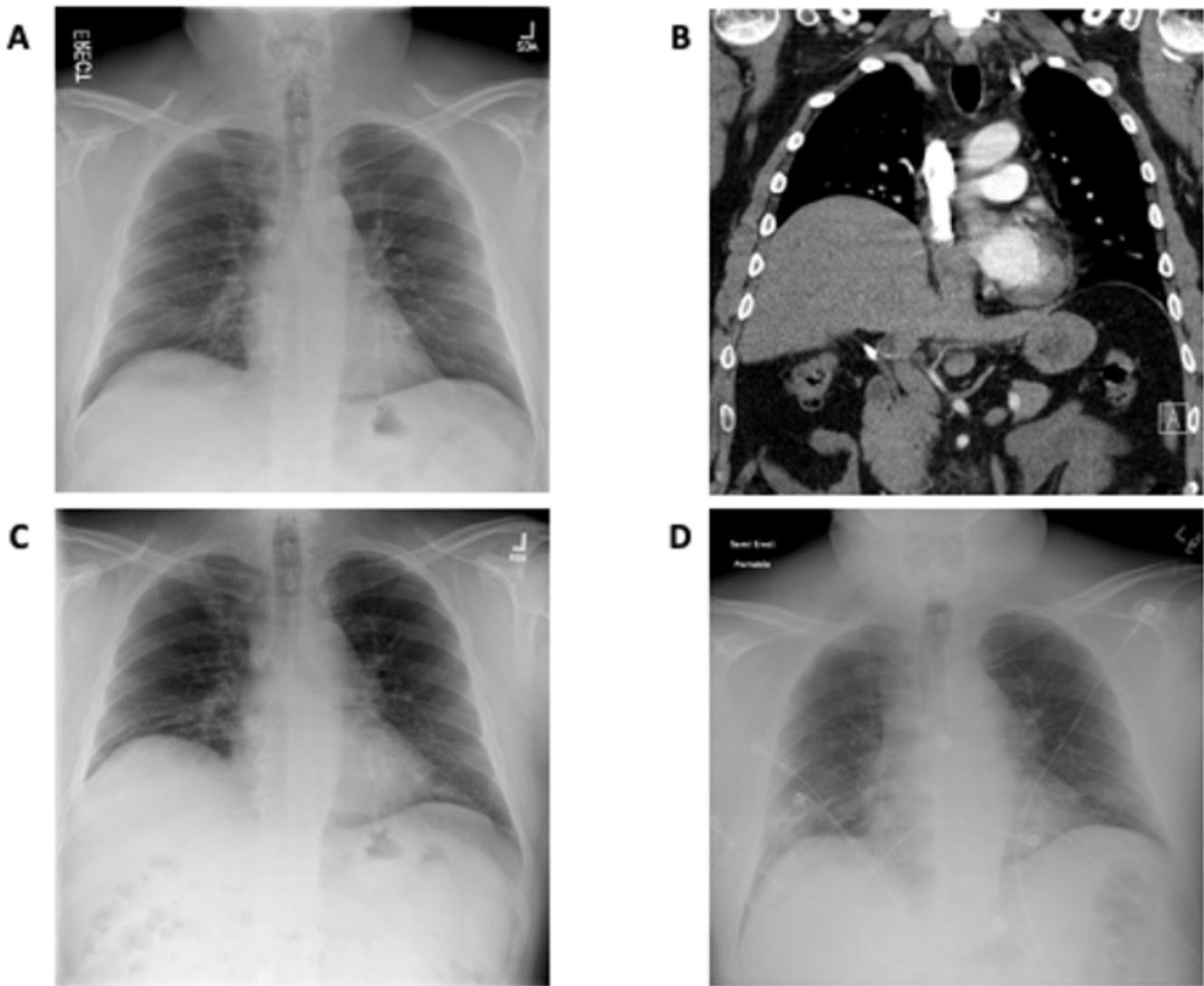


Figure 1

(A) Baseline chest radiograph three years previously. (B) CT scan demonstrating elevation of right hemidiaphragm; (C) Chest radiograph prior to surgery demonstrating elevated right hemi-diaphragm (D) Chest radiograph after diaphragm plication.

Supplementary Files

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