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Commentary: Pneumatocele and cysts in a patient with severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection—yet another new complication associated with coronavirus disease 2019 (COVID-19)

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In December 2019, an outbreak of pneumonia traced to a wet market in Wuhan, China, proliferated into a global pandemic with seemingly exponential vehemence and in just 8 months spread globally, with more than 800,000 deaths.^{1,2} Coronavirus disease 2019 (COVID-19) is caused by the novel betacoronavirus severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), which is characterized by extreme virulence and a complex spectrum of pathologies ranging in severity from mild constitutional symptoms to multiorgan failure³ and death. Over the past 8 months, our knowledge of the pathophysiology and lung parenchymal manifestations has grown tremendously, yet despite this we are constantly discovering new manifestations and new pathologies associated with this deadly virus. With most of the literature currently focused on treatment strategies and symptom recognition, it's easy to forget that unique and potentially fatal complications are yet to be identified.

In the current issue of *Journal*, Brahmbhatt and colleagues⁴ provide a single case report describing a newly

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COVID-19 and its parenchymal changes have been documented. However, this case report demonstrates that while we have obtained a greater understanding, we still have more to learn about this virus.

discovered, potential life-threatening complication, more specifically, pneumatocele and cyst formation in a patient following SARS-CoV2 infection with acute respiratory distress syndrome (ARDS). This is the first such report of this complication. Brahmbhatt and colleagues⁴ provide a detailed case report beginning with diagnosis and proceeding to the corrective clinical steps. Our cardiothoracic surgery community has become accustomed to equating COVID-19 computed tomography image findings as bilateral, peripheral/subpleural, or posterior ground-glass opacities with or without consolidations. The global community is rapidly realizing that the manifestations of COVID-19 infection have yet to be fully elucidated. To illustrate this point, Brahmbhatt and colleagues⁴ describe their case of a 66-year-old female patient with SARS-CoV2 ARDS resulting in novel COVID-19–related complications. Their patient had several known high-risk factors for poor outcome with a course typical of those manifesting a rapid decline postinfection. With a rapid decline in oxygenation, treatment with hydroxychloroquine was initiated. We now know that hydroxychloroquine has no benefit and may in fact increase mortality. This highlights the rapid evolution of our knowledge of COVID-19 while reminding us that we have a great deal more to learn about this disease.

As described by Brahmbhatt and colleagues,⁴ COVID-19 can result in significant lung injury leading to substantial morbidity. Brahmbhatt and colleagues' manuscript

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highlights a novel finding in the presence of pneumatoceles. The development of spontaneous pneumothoraces are just starting to be reported.^{5,6} Brahmbhatt and colleagues' finding suggests that a substantial percentage of COVID-19 pneumothoraces may actually be as of a result of cystic or pneumatocele rupture. Their team treated the pneumatoceles with computed tomography-guided pig-tail insertion. This may not be the first choice of treatment, however, as pneumatoceles are usually treated by observation alone. While observation works in a majority of cases, it may not be appropriate in patients with COVID-19, especially with the high likelihood of respiratory and oxygenation status deterioration. Given the current recommendation to avoid intubating and placing patients with COVID-19 on ventilators to reduce lung injury—especially in a patient with a pneumatoceles—treatment with percutaneous drainage was the more appropriate and wiser choice. Their case also illustrates one additional mechanism through which intubating and mechanically ventilating patients with COVID-19 results in worsening clinical and radiologic status. While Brahmbhatt and colleagues⁴ effectively treated the pneumatoceles and the patient, the concern that I raise is the need for a national standardized approach and treatment protocols for SARS-CoV2 ARDS. However, the most vital conclusion is that we are still learning and discovering new manifestations of COVID-19. If we lose sight of this valuable lesson, our patients may ultimately pay the price in morbidity and mortality. The manuscript by

Brahmbhatt and colleagues⁴ is yet another reminder of the importance of the cardiac surgical team remaining hypervigilant in identifying novel, as well as known, manifestations and complications of COVID-19 before they become life-threatening.

The aggressive spread and multifaceted evolution of COVID-19 mandates that the cardiac surgical community understand the effects of COVID-19 and remain vigilant toward undiscovered manifestations to guide future treatment strategies. As the disease continues to proliferate across all continents, Brahmbhatt and colleagues' findings are yet another reminder that we must remain hypervigilant at identifying new manifestations and improving our treatment strategies.

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