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Commentary: “How to Slay the Aortic Dissection Beast in a COVID-19 World”

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As of March 2021, the ongoing COVID-19 pandemic has claimed over 2.5 million lives worldwide and over 500,000 in the United States, with nearly 78 people dying each hour.¹ It has profoundly disrupted and strained the healthcare landscape, creating major challenges to the delivery of routine medical care.

In this issue of *Seminars*, Fukuhara et al² report the results of 52 patients who presented with acute Type A aortic dissection (ATAAD) during the COVID-19 pandemic in a retrospective, multi-institutional study from 2 Chinese centers in Wuhan (n = 6) and Changsha (n = 30) and one US center, the University of Michigan (n = 16). In this cohort (mean age, 52 years), 4% of patients presented with shock and tamponade and 39% with malperfusion. Each of the respective centers was the major aortic referral center in an area with high COVID-19 prevalence. Ninety percent of ATAAD patients proceeded to surgery.

In this series, COVID-19 was suspected in 46% of the patients (24/52); they underwent reverse transcription polymerase chain reaction (RT-PCR) testing, with results available within 24 hours. Meanwhile, 82% (23/28) of the patients without suspected COVID-19 still had RT-PCR. In total, 28 patients underwent immediate repair and 24 did not, instead either receiving nonoperative management (n = 5) or undergoing surgery after a 24-hour delay (n = 19) to allow time for RT-PCR results. Notably, one patient died during the waiting period.

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Conflict of Interest and Sources of Funding: D.T.E. consults for Edwards Lifesciences. J.S.C. consults for and participates in clinical trials with Medtronic and W.L. Gore; consults for, participates in clinical trials with, and receives royalties and grant support from Terumo Aortic, and serves as a coinvestigator for CytoSorbents. The remaining author has no other potential conflicts of interest with regard to the work described in this manuscript.

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DOI of original article: <http://dx.doi.org/10.1053/j.semtcvs.2020.10.034>.



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Central Message

Surgery for acute Type A aortic dissection carries a high risk of mortality and morbidity. Despite the challenges of the COVID-19 pandemic, very good outcomes can be achieved by experienced centers.

This report in many ways is a living history of the evolution of rapid testing for COVID-19. At the start of the pandemic (January/February in China and March 2020 in the United States), obtaining results from SARS-CoV-2 testing took at least 24 hours. This posed a distinct dilemma in cases of ATAAD. On one hand, this disease has a 1%–2% hourly mortality for the first 48 hours. On the other hand, proceeding directly to surgery required full personal protective equipment (PPE) precautions, including N-95 masks and layers of gowns and gloves; for an operation that lasts 4–7 hours, this is not an appealing option if it is not needed. Later, as testing improved, the rapid test was developed that produced results in 1 hour, effectively eliminating any meaningful wait to operate.

This series represents the largest published report to date (as we await the results of large registry database analyses) on ATAAD management during the COVID-19 pandemic. Previous reports from the authors describe 4 ATAAD procedures in Wuhan that had successful outcomes during the COVID-19 pandemic,³ and 1 patient from Michigan⁴ who died of respiratory failure postoperatively. The reported overall mortality of 6.4% is excellent in this difficult group of patients and mirrors the 6.1% mortality in a series of 33 patients from Anzhen, China, demonstrating that even in the difficult circumstances of the pandemic, surgical outcomes were not compromised.⁵ These results compare favorably with those of a large International Registry of Aortic Dissection (IRAD) study, whose 18% mortality rate has been considered the benchmark for ATAAD

results.⁶ Although the IRAD cohort was older (62 years vs 52 years) with a higher proportion of previous cardiac surgery (14% vs 8%) than this cohort, Fukuhara and colleagues' results are admirable nonetheless. There are multiple strategies that can be used in ATAAD involving various extents of resection proximally into the aortic root and distally into the arch, commissural resuspension, preserving or replacing the aortic valve, and placing endovascular stents in the descending aorta or to treat malperfusion.⁷ While it would have been interesting to see whether the results were similar across all 3 centers, the authors should be commended for judiciously using a variety of these strategies to achieve these excellent outcomes.

Of note, although only 3 patients presented with concomitant COVID-19 positivity and ATAAD, 1 of those patients died, and the other 2 had prolonged hospital courses, which the authors suggest increases patients' risk of mortality and major morbidity. While the authors stop short of advocating for avoiding surgery altogether in these patients, COVID-positivity alone would not justify denying surgery for ATAAD to an otherwise viable surgical candidate. It does, however, seem reasonable that the threshold at which salvage surgery and resuscitative efforts are deemed futile and thus not offered should be lower in this group of patients. The authors note that 24 patients did not undergo immediate surgery while 19 waited more than 24 hours for the RT-PCR results before surgery, and 5 elected nonoperative management. While the overall mortality in this group was low at 4% (1/24), it is worth noting that the 1 death resulted from an aortic rupture that occurred during the 24-hour waiting period before surgery. Fortunately, the speed of newer diagnostic tests can prevent that situation.

It is also interesting to note that the Michigan group did not see a reduction in their ATAAD surgical volume between 2019 and 2020. This contrasts markedly with the reductions of 60% in Houston⁸ and 76% in New York City⁹ during that time period. This may reflect differences in regional referral patterns or in the differential effect of COVID-19 surges in urban centers compared to suburban and exurban communities. It may have also been due to local hospitals referring more cases out to tertiary aortic centers as those hospitals worked within their own resource constraints. Larger and more detailed analyses will shed more light on whether the Michigan experience of increased ATAAD cases was an outlier or was observed elsewhere as well.

Finally, these recommendations are entirely consistent with the recent American Association for Thoracic Surgery (AATS) and Asian Society of Cardiovascular and Thoracic Surgery (ASCVTS) consensus document on managing aortic emergencies during the pandemic.¹⁰ As the current COVID-19 surge continues, it is important to recognize that ATAAD cases are highly resource-intensive (intensive care unit [ICU] beds, mechanical ventilators, PPE, and blood products), which requires thoughtful institutional planning. Patients who test positive for COVID-19 should undergo expeditious surgery in a designated COVID-19 operating room with full PPE for surgical, anesthesia, and nursing staff. Afterward, patients should

be managed in a dedicated COVID-19 ICU as local capacity permits. Because most COVID ICUs are staffed by medical intensivists with less familiarity with the management of perioperative aortic surgical patients, close collaboration is required among surgical and critical care teams.

The key lessons going forward are that multidisciplinary collaboration, prioritizing emergency ATAAD cases, and constant reevaluation of processes consistent with the recommendations outlined by the Society of Thoracic Surgeons can permit optimal care.¹¹ Indeed, specific considerations in patients with suspected or known COVID-19 infection can reduce the risk of aerosolization. This constant need for team training in the operating room and ICU for best practices may reduce the likelihood of provider transmission.¹² The authors underscore this lesson by noting that 1 patient in whom COVID-19 was not initially suspected underwent surgery and later tested positive, and 2 individuals involved that patient's care subsequently tested positive. In areas of high COVID-19 prevalence, N95 masks and powered air-purifying respirators should be used for all high-risk aerosol-generating procedures and high- and moderate-risk surgical procedures, regardless of whether the patient has tested positive or negative for COVID-19.¹³ Maintaining vigilance to keep the whole team as safe as possible is every member's responsibility.

As the next surge of the COVID-19 pandemic is, hopefully, mitigated by worldwide vaccination efforts, the lessons from these experienced surgical groups offer a meaningful guide to preparing for aortic emergencies and still achieving excellent outcomes.

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